Youth Crime, Sanctions, and Education

Four empirical essays

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FOUR EMPIRICAL ESSAYS

BY
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AALBORG UNIVERSITY
DENMARK

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SUMMARY

This dissertation consists of four empirical studies based on Danish administrative register data that explore the relationship between adolescents' criminal behaviour, sanctions and education from different perspectives. All in all, the research shows that the official sanctioning of adolescent or young adults involved in crime can have significant effects on their criminal and educational future outcomes. Furthermore, even at a young age the education trajectories differ for adolescents with and without reported criminal behaviour. Finally, the dissertation shows that if we want to diminish these differences by enhancing enrolment in upper secondary education, it is important to be aware of potential peer effects that can influence future offending.

Essay 1: *Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment.* The study investigates a reform in Denmark in 2006 introducing electronic monitoring (EM) to all offenders under the age of 25 with a maximum prison sentence of three months. Information on programme participation is used to estimate instrument variable models in order to assess the causal effects of electronic monitoring on young offenders' educational outcomes. The analysis shows that compared to imprisonment the Danish EM-programme increases the completion rates from upper secondary education significantly among programme participants three years post-release.

Essay 2: *Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education*. In 2010-2012 the Danish government lowered the minimum age of criminal responsibility from 15 to 14 years. This temporary reform of the legal system is used to analyse the causal effects on offending and educational outcomes in a quasi-experimental design. The study show no marginal general deterrent effect of lowering the minimum age in Denmark on reported offending rates of the 14-year-olds. Instead, the findings point to labelling effects as juvenile offenders who were affected by the reform and processed in the criminal justice system at the age of 14 have higher recidivism rates and lower educational outcomes.

Essay 3: *Building Human or Criminal Capital? Classmate Peer Effects on Future Offending.* This study explores peer effects in criminal behaviour among young students in upper secondary education. Classmates in upper secondary education are a natural peer group to adolescents at a time in their life when peer relations are of great importance. The study analyse a large panel dataset (n=27,525) with population data for all Danish students and use the exogenous variation in the composition of classmates across adjacent cohorts within the same colleges to identify causal peer effects. The analyses show that students who enter upper secondary education in programmes with a high proportion of peers with prior charges are more likely to be charged with a criminal offence within the first twelve months after commencing.

Essay 4: *Transitions in secondary education: Exploring effects of social problems*. This study investigates to which extent social problems during the upbringing can help explain the gaps in entry and dropout rates in upper secondary education in Denmark between students from different socioeconomic backgrounds. To control for educational selection and unobserved heterogeneity a dynamic selection model is used and formal decomposition analyses are carried out. The analyses show that social problems during the upbringing (including having a parent with a prison conviction) influence adolescents' educational transitions and those students with official criminal records have lower entry rates to and higher dropout rates from upper secondary education. Moreover, social problems explain about 20–30 per cent of the differences in educational outcomes between students with different socioeconomic backgrounds.

SAMMENFATNING

Denne afhandling består af fire empiriske studier baseret på danske administrative registerdata, der undersøger forholdet mellem unges kriminelle adfærd, sanktioner og uddannelse fra forskellige vinkler. Samlet set viser resultaterne fra afhandlingen, at sanktioner af unge, der er involveret i kriminalitet, kan have en væsentlig indvirkning på deres fremtidige kriminalitet og uddannelsesmæssige resultater. Samtidig viser analyserne, at der er betydelige forskelle på børn og unge med og uden registreret kriminalitet og deres veje og resulter i uddannelsessystemet. Endelig, hvis vi ønsker at mindske disse forskelle ved at øge optagelsen på ungdomsuddannelserne, er det vigtigt at være opmærksom, hvordan potentielle peer effekter kan påvirke unge i den forbindelse.

Essay 1: *Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment.* Studiet undersøger en dansk reform fra 2006, hvor afsoning med fodlænke blev introduceret til lovovertrædere under 25 år idømt en fængselsstraf på maksimalt tre måneder. Reformen bruges sammen med oplysning om deltagelse i fodlænkeordningen til at identificere kausale effekter af afsoning med fodlænke for unge lovovertræderes uddannelsesresultater. Undersøgelsen viser, at unge idømt en kort fængselsdom som afsoner med fodlænke har markant højere gennemførelsesprocenter fra ungdomsuddannelser 3 år efter endt afsoning.

Essay 2: *Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education*. I 2010-2012 sænkede den danske regering den kriminelle lavalder fra 15 til 14 år. Denne reform af straffeloven bruges til at analysere de kausale effekter på 14åriges kriminalitet og uddannelsesmæssige resultater i et kvasi-eksperimentelt design. Undersøgelsen viser ingen generelpræventive effekter af at sænke den kriminelle lavalder i Danmark på den rapporterede kriminalitet blandt 14-årige. I stedet viser analyserne højere tilbagefald til kriminalitet og lavere uddannelsesresultater for de 14årige straffelovsovertrædere, der fik deres sag behandlet i det strafferetlige system under reformen.

Essay 3: *Building Human or Criminal Capital? Classmate Peer Effects on Future Offending.* Denne undersøgelse studerer peer effekter i kriminel adfærd blandt unge på de erhvervsfaglige uddannelser. Studiet analyserer et stort panel datasæt (n = 27.525) med populations data for alle danske studerende og bruger den eksogene variation i klassesammensætningen mellem årgange inden for de samme skoler til at identificere kausale peer effekter. Analyserne viser, at unge, der starter på indgange med en høj andel af studerende med tidligere sigtelser er mere tilbøjelige til at blive sigtet for en strafbar handling inden for de første 12 måneder. Samtidig er der positive effekter for unge med flere tidligere sigtelser ved at starte på en indgang med helt nye klassekammerater, hvor kun få tidligere har begået kriminalitet.

Essay 4: *Transitions in secondary education: Exploring effects of social problems*. Dette studie undersøger i hvilket omfang sociale problemer under opvæksten kan bidrage til at forklare forskelle i frafald på ungdomsuddannelserne i Danmark mellem unge med forskellig socioøkonomisk baggrund. For at kontrollere for selektion i uddannelsessystemet (uobserveret heterogenitet) estimeres en dynamisk selektions model. Analyserne viser, at sociale problemer under opvæksten (herunder at have en forældre som er idømt en fængselsdom) påvirker unges uddannelsesmæssige overgange. Selv når man tager højde for socioøkonomiske forhold og andre sociale problemer har unge med en dom lavere chance for at starte på ungdomsuddannelse og højere frafaldsprocent. Endelige viser undersøgelsen, at sociale problemer forklarer mellem 20-30 procent af forskellene i uddannelsesmæssige resultater mellem unge med forskellig socioøkonomisk baggrund.

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I wish to thank the Rockwool Foundation, the TrygFonden's Centre of Child Research at Aarhus University, and KORA - the Danish Institute for Local and Regional Government Research, for providing me with the access to the register data for the four essays. The research group CASTOR, at Aalborg University also needs mentioning; thank you for the careful readings and constructive comments on my work. Fellow PhD student Julie Laursen has made these years so much more fun, and I am thankful that we travelled this this road (back and forth to Aalborg) together. A special thanks to Sarah van Mastrigt for mediating the contact and encouraging me to visit the Institute of Criminology at University of Cambridge, and thank you to Larry W. Sherman, Heather Strang, Maria Ttofi and David P. Farrington for welcoming me as a Visiting Scholar in Cambridge in the Spring of 2016.

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FOREWORD

The dissertation *Youth Crime, Sanctions, and Education* is based on the four empirical essays listed below:

Essay 1: Larsen, B. Ø. (2017). Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment. *Journal of Quantitative Criminology*, 33(1), 157-178. DOI: 10.1007/s10940-016-9287-8.

Essay 2: Damm, A.P., Larsen, B.Ø., Nielsen, H.S. and Simonsen, M. Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education. Planned submission to economic journal.

Essay 3: Larsen, B. Ø. and Kristensen, N. Building Human or Criminal Capital? Classmate Peer Effects on Future Offending. Planned submission to *Journal of Research in Crime and Delinquency.*

Essay 4: Larsen, B. Ø., Jensen, L., and Jensen, T. P. (2014). Transitions in secondary education: Exploring effects of social problems. *Research in Social Stratification and Mobility*, 38, 32-42. DOI: 10.1016/j.rssm.2014.05.001.

The four empirical essays are based on four separate datasets constructed from administrative register data for each study, specifically. The access to the data is provided by the Rockwool Foundation, KORA, the Danish Institute for Local and Regional Government Research, and TrygFonden's Centre of Child Research at Aarhus University. Unfortunately, a violation of the security rules by a foreign researcher led to termination of access for all users of the ECONAU server at Aarhus University from March 17, 2017 to April 18, 2017.

The lockout from the server resulted, without any prior notice, in a loss of all access to data for two studies during the last month of my PhD fellowship. This extraordinary situation prevented the final adjustments to the empirical analyses in Essay 2: *Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education.* Therefore, the four empirical essays are not included in this public version of the dissertation. Furthermore, as a consequence of the server lockout, the original fourth essay was replaced with the article 'Transitions in Secondary Education: Exploring Effects of Social Problems', which was published in *Research in Social Stratification and Mobility* during the first year of my PhD fellowship.

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CHAPTER 1. INTRODUCTION

This dissertation contributes with novel insights into the relationship between youth crime, sanctions, and education. The PhD project utilises classic criminological theories, uses refined quantitative methods and builds on extensive register data. The project contributes to the international literature by applying micro-econometric methods to identify causal effects and explore classic criminological theories with new and more rigorous methods using large population-based register datasets from Denmark. The aim of the PhD project is to contribute to the criminological literature by offering new knowledge about young peoples' criminal behaviour and the interrelationship between sanctions and education based on four empirical essays.

1.1. THE CONTEXT OF YOUTH CRIME, SANCTIONS, AND EDUCATION

In the last 10 years, there has been a considerable and continuous decline in youth crime in Denmark: from 2006 to 2016, the number of reported charges dropped by 72 percent for 10- to 14-year-olds and by 46 percent for 15- to 17-year-olds (Danish Ministry of Justice, 2017). The downward trend in youth crime is found in many other western countries, including the United States, the United Kingdom, the Netherlands, Germany, and the other Scandinavian countries (Danish Ministry of Justice, 2015; 2016) and is part of an international crime drop in reported offence rates in general (Balvig, 2017).[1] In many western countries, there are ongoing political discussions about the 'right' age limits in the criminal justice system, and lately there have been movements towards decriminalizing youth; in the US, for example, states have raised the majority age and changed legislation on transfers of juveniles to the adult criminal justice system (Loeffler and Grundwald, 2015).[2] In Denmark, however, criminal justice policies have become more politicized over the years, and this has led to enactment of tougher laws and more severe sanctions for young offenders (Kyvsgaard, 2004; Storgaard, 2013).[3] Moreover, the political debates about age limits in the criminal justice system have been dominated by advocacies towards lowering the minimum age of criminal responsibility. Despite the lowest level of youth crime

[1] When we look at this development in a longer perspective, it is clear that the crime drop actually reflects a downward trend beginning after a 'bubble' that started with increasing reported crime rates from the Second World War to the 2000s and since then has showed decreasing reported crime rates (Balvig, 2017).

[2] Other examples are the Netherlands, which changed the majority age to 21, and ongoing political debates in England, Scotland, and Wales about raising the minimum age of criminal responsibility.

[3] For example, amendments of the criminal code in 2004 and 2010 deleted a number of provisions in favor of lenient sentences and measures for young offenders (Storgaard, 2013).

since 2006, the political arguments of harsher punishments for juvenile offenders are more prominent than ever.

In this context, sound knowledge on the effects of official sanctions for young offenders is important. Criminological studies have shown that official processing of juveniles is associated with an increase in future offending (e.g., Bernburg and Krohn, 2003; Bernburg, Krohn, and Rivera, 2006; Farrington, 1977; Farrington et al., 2002a; Liberman, Kirk, and Kim, 2014; Lopes et al., 2012; McAra, and McVie, 2007; Morris and Piquero, 2013; Murray et al., 2014; Wiley, Slocum, and Esbensen, 2013). These results are substantiated by a review of randomized controlled studies, which concludes that traditional juvenile justice system processing results in more subsequent delinquency when compared with diversion to programmes, counselling, or doing 'nothing' (Petrosino, Turpin-Petrosino, and Guckenburg, 2010). The majority of the existing criminological studies on juveniles investigate effects of the 'softer' criminal justice system interactions whereas the literature on custodial sanctions (and non-custodial alternatives) primarily focuses on adult offenders and less is known about the effects for juveniles. One recent study that uses the random assignment of judges to investigate the causal effects of juvenile incarceration find significantly higher adult incarceration rates (Aizer and Doyle, 2015). Furthermore, studies of juveniles in correctional facilities and first-time prisoners in Danish prisons document causal peer effects, as young offenders serving together with peers who committed the same type of criminal offence are more likely to recidivate within the same type of crime after release (Bayer et al., 2009; Damm and Gorinas, 2016; Stevenson, 2014).

The literature on sanctions traditionally has a strong focus on recidivism, even in comparisons of imprisonment to non-custodial sanctions (such as electronic monitoring or community service) where the alternatives to incarceration often are introduced with rehabilitative purposes. Hence, very few studies have assessed the impact of juvenile justice system interactions on subsequent educational outcomes (Huizinga and Henry, 2008). The relatively small body of research that exists documents substantial effects of police contacts, court involvement and incarceration on juveniles' educational outcome (e.g. Aizer and Doyle, 2015, Bernburg and Krohn, 2003; Hjalmarsson, 2008; Kirk and Sampson, 2013; Sweeten, 2006). This implies that interactions with the criminal justice system may impose both direct and indirect negative effects on the employment status of young offenders - a direct effect by a criminal record decreasing ex-offenders' job opportunities (e.g., Pager, 2003; Uggen et al., 2014), and an indirect effect on employment opportunities through lower educational attainment (Hjalmarsson, 2008).

The interrelationship between education and crime is well established; across western countries, offenders with a conviction have significantly higher dropout rates from high school (and its equivalents) compared to the general population (Hjalmarsson, Holmlund, and Lindquist, 2015). In Denmark, less than 50 per cent of those with one

or more convictions complete upper secondary education by the age of 25, compared to 82 per cent of the rest of the population with no convictions (Statistics Denmark, 2016). At the same time, a large literature has shown that individuals with higher educational attainments are less likely to be involved in criminal activities (e.g., Aaltonen, Kivivuori, and Martikainen, 2011; Bäckman, 2017; Bäckman and Nilsson, 2011; Farrington et al., 1986; Sweeten, Bushway, and Paternoster, 2009; Thornberry, Moore, and Christenson, 1985) and documented negative causal effects of the number of years of compulsory schooling on adult offending (e.g., Hjalmarsson, Holmlund, and Lindquist, 2015; Lochner and Moretti, 2004; Machin, Marie, and Vujic, 2011). Therefore, education is important for juvenile offenders in keeping them from continuing on a criminal pathway and in determining individual life course outcomes, such as health, income, and employment (e.g., Card 1999; Oreopoulos and Salvanes, 2011).

The review of the existing research on crime, sanctions, and education points to important implications of official reactions to young offenders' recidivism rates. Furthermore, the previous findings also stress the importance of including not only criminal, but also educational outcomes, when evaluating the effects of juveniles' involvement in the criminal justice system. How we sanction young offenders in the criminal justice system and enhance their chances of completing lower and upper secondary education may be even more important in the future. Recent research has shown that the decline in youth crime in Denmark among 15- to 18-year-olds is driven by a change in the extensive margin and not at the intensive margin (Andersen, Anker, and Andersen, 2016). This means that the downward trend in youth crime is a result of fewer young people having contact with the criminal justice system, whereas the recidivism rates among those with criminal justice remain the same. From having been a majority behaviour in adolescence, youth crime has become a minority behaviour in Denmark (Balvig, 2017). This development can create even greater challenges in terms of formal and informal labelling effects for adolescents involved in criminal activities. Therefore, both education and official sanctions can play an important role in keeping young people from life-course-persistent offending, and from a policy perspective these aspects represent some of the 'handles' policy makers can turn when implementing new crime-prevention policies.

1.2. RESEARCH QUESTIONS

The dissertation explores the relationship between criminal behaviour, sanctions, and education among young people and consists of four different empirical studies investigating the following research questions:

- Essay 1: *Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment.* Research question: Do young offenders serving with an electronic monitor have higher completion rates from upper secondary education compared to offenders serving their sentence in prison?

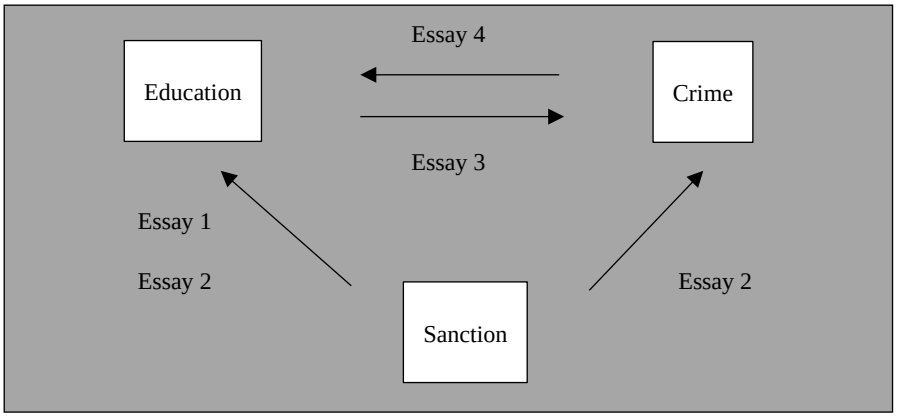
- Essay 2: *Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education*. Research question: Does lowering the minimum age of criminal responsibility deter young people from committing crimes? And is there a specific deterrent, null or labelling effect, of processing juvenile offenders in the criminal justice system?

- Essay 3: *Building Human or Criminal Capital? Classmate Peer Effects on Future Offending.* Research question: Do classmate peers in upper secondary vocational education influence young adults' criminal behaviour?

- Essay 4: *Transitions in Secondary Education: Exploring Effects of Social Problems*. Research question: Do social problems (including crime) during upbringing affect children's educational outcome? And do educational transitions of young offenders differ from adolescents with no interactions with the criminal justice system?

The PhD project investigates the relationship between education, sanctions, and crime for young people through four different angles, which is illustrated in Figure 1. Essay 1 investigates the causal effects of sanctions on young offenders' educational outcome. The study explores whether noncustodial sanctions can enhance young offenders' likelihood to complete upper secondary education by comparing young offenders with short prison sentences who serve with electronic monitoring to offenders serving their sentence in prison. Essay 2 investigates the causal effects of sanctions to juveniles' criminal behaviour and educational outcomes. The study evaluates a legal reform lowering the minimum age of criminal responsibility in Denmark and study how the threat of and experience with processing in the criminal justice system affects juveniles' likelihood to offend and influence their educational outcomes in lower secondary education. While Essays 1 and 2 analyse the effects of sanctions, Essays 3 and 4 explore the interrelationship between education and crime.

Figure 1. Illustration of the empirical focus in the four essays



Essay 3 investigates how education affects adolescents' criminal behaviour through classmate peer effects in upper secondary education. The study explores the transition from lower to upper secondary education, which includes changing classmates and analyses peer influence on young adults' offending. Finally, Essay 4 investigates the opposite direction of the interrelationship between education and crime. The study analyses effects of criminal involvement on young peoples' educational choices and attainments in upper secondary education.

1.3. LINKS BETWEEN THE FOUR ESSAYS

Although the four essays are designed as separate empirical studies using a variation of different theories, datasets, and methods, they also have a line of common features. First, all four essays use quantitative analyses of register-based datasets to answer the research questions. The datasets are constructed for each study specifically and exploit the extensive opportunities within the Danish registers to extract and combine information from a wide range of administrative sources for the years 1980–2015. Thus, the empirical analyses are based on longitudinal datasets that follow young people from birth to adulthood and link them to information about their parents and classmates in 9th and 10th grade as well as in upper secondary education. The potential in the administrative Danish registers has not until recent years been exploited for criminological research aimed at publications to an international audience (a seminal exception is Kyvsgaard, 2003, examples of recent studies: Andersen and Andersen, 2014; Andersen, Andersen and Skov, 2015; Dustman and Damm, 2014; Damm and Gorinas, 2016; Klement, 2015; Landersø, 2015; Landersø, Nielsen and Simonsen, 2016; Soothill et al., 2010; Wildeman and Andersen, 2017).

Second, the essays all contribute to the existing literature by studying new empirical aspects to some of the classic discussions within the criminological tradition: the effect of official sanctions, the peer influence, and the relationship between crime and education. This focus also implies that Essays 1–3 draw on the same three classic theoretical understandings of criminal behaviour in different combinations: deterrence theories, labelling theories, and social learning theories, and the results from Essay 4 can also contribute to the labelling discussions (as described in Chapter 4). Moreover, the four studies all use micro-econometric methods to identify causal effects and thereby provide harder empirical tests of some of the 'classic' criminological theories. The predominant statistical methods in the criminological literature are still multivariate regression models (combined with propensity score matching), whereas the number of studies using experimental or quasi-experimental designs are still limited (Barrick, 2014; Farrington and Murray, 2014; Paternoster et al., 2013). The four essays thereby contribute methodologically to the exiting literature with empirical studies using different natural and quasi-experimental designs.

Third, the research questions underlying this dissertation all originate from an interest in the Danish context and reflect the ambition to produce empirical results with relevance to the criminological literature as well as practitioners and policy makers. The PhD project evaluates the effects of two reforms in the Danish criminal justice system to young offenders' criminal and educational outcomes with reference to the grounds for changing the legislation. Essay 1 evaluates the effects of introducing electronic monitoring (EM) to young offenders on educational outcome. The policy reform was implemented with the intention to maintain labour market participation and educational enrolment of young offenders (Sorensen and Kyvsgaard, 2009). Essay 2 evaluates the effects of the legal reform that lowered the minimum age of criminal responsibility in Denmark from 15 to 14. This policy reform was introduced in 2010 by the right-wing government with reference to arguments of both general and specific deterrent effects on juvenile offending. Furthermore, Essays 3 and 4 explore transitions in the education system, and contribute with new knowledge about the vocational track in upper secondary education, which is generally under examined. Moreover, the Danish vocational education and training programme is a relevant case when investigating education and crime, as it has a much higher percentage of students with prior criminal records (approximately 20 per cent of the students) than the general track. Essay 3 investigates peer effects in vocational education, and the findings from this study can provide important knowledge to probation officers who often include enrolment in education as part of the release programmes for young ex-offenders. Overall, the hope is that the results from the dissertation can inform future crime policies and contribute to enhance educational outcomes and minimize adverse effects of official sanctions to adolescents.

The remainder of the chapters are organized in the following way. Chapter 2 describes and discusses the theoretical perspectives on criminal behaviour included in the four empirical essays. Chapter 3 describes the methodology underlying the empirical work, and discusses the use of administrative register data. Chapter 4 draws conclusions about the findings from this dissertation and discusses contributions and limitations as well as directions for future research.

CHAPTER 2. THEORETICAL PERSPECTIVES ON CRIME

In my PhD thesis, I draw on three different theoretical perspectives on crime: deterrence theories, labelling theories, and social learning theories. These criminological theories are included based on their relevance and contributions to the four different empirical studies. This implies that the selection of theoretical perspectives is driven by the empirical questions, and it does not form or reflect one integrated understanding of criminal behaviour in the PhD project. Hence, in all four essays the theoretical perspectives are included based on existing literature and in Essay 1 and Essay 2 also with reference to the political intentions of the two legal reforms. The empirical evidence from previous studies is in some cases inconclusive and use of quasi- or experimental designs are still too limited to say whether to anticipate positive, null or negative effects on offenders' subsequent outcomes. Therefore, the essays often include contradicting theoretical predictions on 'treatment' effect in order to keep it an open question to answer in the empirical analyses. In the following sections, I briefly describe each of three different theoretical perspectives, evaluate the empirical evidence, and outline the contribution from the empirical essays to theoretical discussions.

2.1. DETERRENCE THEORIES: 'THE BENEFITS AND COST OF CRIME'

Deterrence theories draw lines back to the classic school with Cesare Beccaria's (1764) concepts of certainty, severity, and celerity, and Jeremy Bentham's (1789) understanding of the balance in pain and pleasure as determining behaviour (Paternoster, 2010). The deterrence perspective has been the cornerstone in the economic models of criminal behaviour since the 1970s, but it has had a less prominent and more debated position within the criminological tradition. Even though, the crime policies in Denmark in many ways differ significantly from the United States, deterrence theories have also affected Danish political debates with arguments of increasing certainty and severity of formal punishments. The tightening of the laws during the 1990s and 2000s, especially on violent offences (Jørgensen, 2016), and the lowering of the minimum age of criminal responsibility are some of the examples of legal reforms in Denmark implemented with intentions to deter criminal behaviour by increasing the severity of official sanctions.

Deterrence theorists argue that crime is a rational choice, as the individual will decide to engage in crime (like in any other behaviour) whenever the expected benefits exceed the expected costs (Becker, 1968; Gibbs, 1975). Hence, the financial (or nonmonetary) rewards can lead individuals to choose a criminal path instead of undertaking legal work if, for example, the expected likelihood of apprehension,

conviction, and severity of punishment are low enough (Becker, 1968). This understanding of criminal behaviour also implies that deterrence would occur in situations where the individual refrains from committing a crime because the costs are higher than the benefits. In this perspective, cost includes several different aspects, for example both monetary and nonmonetary (i.e., social disapproval) cost and expected punishment (Apel, 2013). The punishment is defined by the perceived certainty, severity, and celerity of the sanction, which means the risk of detection, apprehension, and conviction (certainty), the harshness of the sanction (severity), and the swiftness (celerity) by which the sanction is imposed on the offender.

Deterrence theories have been devolved and extended from the ideas of the classical theorists in both economics (e.g., Becker, 1968; Ehrlich, 1973) and criminology (e.g., Gibbs, 1975; Nagin, 1998; Paternoster, 1987; Stafford and Warr, 1998). The fundamental understanding of criminal behaviour among deterrence theorists across the two traditions is very similar, however the use of the deterrence concept is somewhat different. In criminology, the concept is typically divided into general and specific deterrence, where the first term refers to deterrent effects of legal sanctions and their enforcement within the general population (including both offenders and non-offenders), and the second term describes deterrent effects to individuals who experience punishment themselves on their future offending (Gibbs, 1975). In economics, the concept refers to the response to the threat of punishment, i.e., the anticipated cost of committing a crime, and what criminologists would name specific deterrence is viewed as an update of the individual's information and perception of sanctions (Chalfin and McCrary, 2017). One important premise to note in relation to the application of this theoretical perspective to evaluate deterrent effects of formal sanctions (in both general and specific terms) is the individual's perception of punishment. As stated by Nagin (1998: 6), 'deterrence is ultimately a perceptual phenomenon'. This implies that legal reforms can only have marginal general deterrent effects if the general population changes its perceptions of the punishment, and specific deterrence can only take place if the experiences with the criminal justice system change the offender's perception of the costs and benefits of criminal behaviour. As argued by Paternoster (2010: 786), 'deterrence theory is a social psychological theory of threat communication in which the causal chain runs from the objective properties of punishment through the perceptual properties of punishment to crime'.

Empirical evidence of deterrence theories

The effect of punishment has been a classical research topic in both the criminological and economic literature, and the deterrence literature has grown rapidly in recent years (Chalfin and McCrary, 2017). Hence, an extensive literature has investigated the effects of sanctions — either the general deterrent effects on aggregated crime rates or the specific deterrent effects on individual recidivism (e.g., Bales and Piquero, 2012; Cochran, Mears, and Bales, 2014; Drago, Galbiati, and Vertova, 2009; Hjalmarsson, 2009a; Jørgensen, 2016; Nagin and Snodgras, 2013; Steiner and

Wright, 2006). The empirical studies of deterrence theory have included everything from state-level comparison of employment and crime rates, hot spot policing experiments, and 'three strikes laws' to individuals' perception of the risk of arrest. The following review of the literature is therefore restricted to two lines of research with specific relevance to my empirical studies: research on imprisonment and noncustodial sanctions and research on age limits in sentencing.

The criminological literature on imprisonment has been dominated by studies using multivariate regression techniques to account for confounding variables, and the number of studies applying experimental or quasi-experimental designs is still limited (Bales and Piquero, 2012; Nagin, Cullen, and Jonson, 2009). Previous reviews of the impact of imprisonment on reoffending state that the empirical evidence of deterrent effects of imprisonment is nonconclusive (Mears, Cochran, and Cullen, 2015; Nagin, Cullen, and Jonson, 2009). This description also holds when including the new line of research that has appeared in recent years in both criminology and economics, which uses more rigorous methods to address the methodological challenges and nevertheless identify diverse results (e.g., Bales and Piquero, 2012; Cochran, Mears, and Bales, 2014; Helland and Tabarrok, 2007; Kuziemko, 2013; Morris and Piquero, 2013). Mixed results are even noticeable among studies that use the same methodology, in this case random assignment of cases to judges to identify causal effects of imprisonment. Hence, Nagin and Snodgrass (2013) find little evidence that incarceration has an impact on rearrests; Bhuller, Dahl, Mogstad, and Løken (2016) show significant deterrent effects on recidivism rates; Aizer and Doyle (2015) find criminogenic effects of incarceration to juvenile offenders; Green and Winik (2010) show no incarceration effects on recidivism rates; and finally Di Tella and Schargrodsky (2013) find lower recidivism rates for offenders serving with electronic monitoring compared to incarcerated offenders. In relation to the Danish context, it is relevant to mention that a relatively large part of the recent criminological studies using quasi-experimental designs to evaluate the effects of noncustodial sanctions is from Denmark. These studies document lower recidivism rates, higher income and employment, as well as lower risk of relationship dissolution among offenders who experience noncustodial sanctions compared to offenders serving in imprison (Andersen, 2015; Andersen and Andersen, 2014; Fallesen and Andersen, 2017; Jørgensen, 2011; Klement, 2015).

There is a relatively limited body of research evaluating the effects of age limits in the criminal justice system. The studies of changes in the severity of the punishment related to age thresholds to a great extent focus on the majority age and transfers of juvenile offenders to the adult justice system. This literature includes older criminological studies using time-series data on arrest rates for US states to study the effects of transferring juveniles charged with serious crimes to adult court (e.g., Jensen and Metsger, 1994; Risler, Sweatman, and Nackerud, 1998; Singer and McDowall, 1988; Steiner and Wright, 2006). They find little or no deterrent effect of the file transfer laws on the arrest rates for the most serious offences. More recent studies

applying difference-in-difference or regression discontinuity design to address selection bias yield mixed results; there are examples of studies both finding no effects of the majority age (e.g., Hjalmarsson, 2009b; Loeffler and Grundwald, 2015) and documenting small deterrent effects (Hansen and Waddell, 2014; Lee and McCrary, 2009; Levitt, 1998). Chalfin and McCrary (2017: 31) sum up their review of this literature with this description: '[the] literature around the age of criminal majority produces little evidence of deterrence among young offenders'.

Contributions to the literature

The deterrence perspective is included in Essay 1 (electronic monitoring) and Essay 2 (minimum age of criminal responsibility), which evaluate policy reforms of sanctioning young offenders, and the dissertation contributes to the theoretical discussions along three lines. First, the legal reform in Denmark in 2010 that lowered the minimum age of criminal responsibility from 15 to 14 makes it possible to study both general and specific deterrence of one policy change at the same time. The Danish right-wing government introduced the policy reform with reference to arguments of both general and specific deterrent effects on juveniles' offending. For example: 'I am convinced that lowering the age of criminal responsibility will have a preventive effect. It will make some young people and children think twice and keep them from committing crimes'. Kim Andersen, liberal conservative party (Venstre) and ' There is a need to raise the consequences for young people who commit crimes'. Marlene Harpsøe, Danish folk party (DF).[4] The reform constitutes a natural experiment that gives us the opportunity to investigate the general deterrent effect of a more severe punishment introduced to a younger age group from one day to the next. A general deterrent effect would imply that the reform would lower crime rates of 14-year-olds during the reform period. This behavioural change rely on a general understanding that the severity of the punishment does increase when offenders cross the minimum age limit. At the same time, the reform also creates exogenous variation in the age limit of the prosecution, conviction, and sanctions of young offenders in the Danish criminal justice system, and I can investigate whether different official reactions and enforcements of the criminal law affect juvenile offenders' recidivism rates. The reform can have specific deterrent effects on future offending if the experiences with the criminal justice system change young offenders' perception of the costs and benefits of criminal behaviour.

Second, the majority of previous studies on specific deterrent effects of the severity of sanctions have focussed on adult offenders (Aizer and Doyle, 2015). Hence, both Essay 1 and Essay 2 contribute to the deterrence literature by studying effects of sanctions for juvenile and young offenders Furthermore, Essay 2 adds to the literature on general deterrence by investigating 14-year-olds at the fringes of the criminal

4 http://www.ft.dk/samling/20091/lovforslag/l164/beh1-75/2/forhandling.htm?startItem=#nav http://www.ft.dk/samling/20091/lovforslag/l164/beh3-101/forhandling.htm?startItem=-1

justice system. As there is no separate juvenile system in Denmark, the minimum age of criminal responsibility defines whether the case with a young offender is handled by the social authorities or in the criminal justice system. Prior research focussing on the majority age answers the question of whether the threat of being treated as an adult (with the raise in severity of punishment that follows) deters adolescents, whereas Essay 2 poses the question of whether the threat of being prosecuted, convicted, and sanctioned in the criminal justice system deters young adolescents from committing crimes.

Third, I contribute to the literature by including educational outcomes in both Essay 1 and Essay 2 and relate education to the deterrence perspective. This complements previous studies on sanctioning, which to a large extent focus solely on recidivism as outcome measure, even though studies document substantial effects of arrest, court involvement and incarceration on adolescents' educational outcome (e.g. Aizer and Doyle, 2015, Bernburg and Krohn, 2003; Hjalmarsson, 2008; Kirk and Sampson, 2013; Sweeten 2006). In line with Sweeten (2006), I argue that one could expect a positive influence on educational outcomes through a raise in school engagement if interactions with the justice system reduced not only criminal activities but also more broadly deviant behaviours. Moreover, following economists' opportunity cost argument, time not spent on criminal activities can be used to engage in school activities instead.

2.2. LABELLING THEORIES: 'CONSEQUENCES OF A PUBLIC MARK'

When evaluating the effects of programmes, interventions, or formal sanctions, it is important to recognize the risk of unintended and diverted effects to offenders (e.g., Welsh and Rocque, 2014). In this respect, labelling theories have played a significant role by highlighting the negative effects of official processing and public labelling to especially juvenile offenders. Although labelling theories have been subject to extensive criticism over the years, this perspective on criminal behaviour still contributes with essential insights that also today are important to include in the discussions in empirical studies on the official sanctioning of young offenders.

Labelling theories fall into two overall traditions: one focusses on what and who is defined as deviant by society, and one focusses on how the label as a deviant influences offenders' subsequent delinquency (Farrington and Murray, 2014; Paternoster and Iovanni, 1989). The following descriptions and discussions are restricted to the latter theoretical tradition, which is relevant to the empirical work in this dissertation. The labelling theories in this tradition are based on symbolic interactionism and draw lines back to Mead and Durkheim with the notions of self-images created in social interactions and societal reactions to deviant behaviour (Matsueda, 2014). The theories of labelling argue that the formal reactions to deviant behaviour from society and informal reactions from social groups can lead to increased future delinquency. Frank Tannenbaum (1938) first described the labelling

process, by which an individual receives an official status as 'criminal', as one in which 'the person becomes the thing he is described as' (Tannenbaum, 1938: 20). The theory was further conceptualized by Edwin Lemert, who introduced the concepts of primary and secondary deviance (Lemert, 1951). Primary deviance is initial acts by juveniles, which can be seen as situational 'acting out' that does not fundamentally change the individual's self-perception or social status. Secondary deviance defines the stage when deviant acts lead to severe societal reactions, the individual accepts a deviant self-concept, and organized everyday life is around this role. It is a progressive reciprocal process that leads to secondary deviance where deviant behaviour is reinforced by societal punitive reactions and stigmatization (Lemert, 1951). Howard Becker (1968) made several seminal contributions to labelling theories and emphasized how the process of being caught and publicly labelled is a crucial step in becoming a lifetime offender.

The labelling perspective became popular with the writings of Lemert (1951, 1967) and Becker (1963), and by the 1970s it was a dominant paradigm in criminology (Farrington and Murray, 2014). In the 1980s, the validity of the theory was questioned due to unclear theoretical concepts and lack of empirical evidence (Paternoster and Iovanni, 1989). This critique led to revisions of the theory, including exactitudes of the underlying mechanisms and mediating processes from the official labelling to future deviant behaviour (e.g., Link, 1982; Matsueda, 1992; Paternoster and Iovanni, 1989). Hence, the notions that labelled youth are excluded from conventional opportunities, roles, and social groups, put forward by Tannenbaum (1938) and Lemert (1951), for example, have been further elaborated by labelling theorists since the 1990s. Moreover, the key elements in labelling theory have also been integrated in developmental and life-course theories (Farrington, 2006). This includes for example the work of Sampson and Laub (1993), who describe how criminal involvement reduces contact to pro-social peers, influences education and job stability, and in turn enhances risk of future delinquency.

Empirical evidence of labelling theories

There is a large literature that explores the effects of official sanctions, such as arrest, processing in the justice system, and incarceration, on recidivism (e.g., Aizer and Doyle, 2015; Bhati and Piquero, 2008; Cochran, Mears, and Bales, 2014). To some extent these empirical studies of sanctions evaluate both deterrence and labelling theories. Here, exemplified by the study of Aizer and Doyle (2015), who do not find specific deterrent effects of incarceration to juvenile offenders, but document higher adult incarceration rates and include the labelling perspective in order to explain these criminogenic effects of imprisonment. With this broad definition of research evaluating the labelling perspective, there is an overlap with the empirical research included in the review of deterrence studies, and I therefore refer to previous discussions of the literature on imprisonment and age limits in criminal justice systems presented in that section. This section extends the review of existing literature

to studies of police contacts and criminal justice interactions and studies of the effects to educational outcomes.

The 'classic' criminological studies of labelling are based on longitudinal studies with both self-reported data and official records (e.g., Bernburg and Krohn, 2003; Bernburg, Krohn, and Rivera, 2006; Farrington, 1977; Farrington et al., 2002a). These studies often show effects of official processing (over and above self-reported delinquency) leading to an increase in future offending (e.g., recent studies by Lopes et al., 2012; Morris and Piquero, 2013; Murray et al., 2014; Liberman, Kirk, and Kim, 2014; Wiley, Slocum, and Esbensen, 2013). The majority of criminological labelling studies apply multivariate logistic regression models to identify the effects of official sanctioning on recidivism (Barrick, 2014). This approach has in recent years been improved methodologically by using propensity score matching (e.g., Liberman, Kirk, and Kim, 2014; McAra and McVie, 2007; Morris and Piquero, 2013; Murray et al, 2014; Wiley, Slocum, and Esbensen, 2013). The number of studies based on natural experiments like random assignment of judges with different sentencing practices (e.g., Aizer and Doyle, 2015) or social experiments (e.g., Klein, 1986) are still rare. Petrosino, Turpin-Petrosino, and Guckenburg (2010) identify 29 randomized (quasi-randomized) controlled studies from 1973 to 2008 that studied the effects of diversion (programmes) compared to juvenile system processing, and find that processing in the traditional juvenile justice system results in more subsequent delinquency when compared with diversion or doing 'nothing' (Petrosino, Turpin-Petrosino, and Guckenburg, 2010).

In relation to the work in Essay 1 (electronic monitoring), Essay 2 (minimum age of criminal responsibility), and Essay 4 (educational transitions), it is also relevant to briefly describe the line of research that investigates the effects of official sanctions on young offenders' educational outcomes. This research documents substantial effects of police contacts/arrest, juvenile system or court involvement, and incarceration on juveniles' educational outcome (e.g., Aizer and Doyle, 2015; Bernburg and Krohn, 2003; Hjalmarsson, 2008; Kirk and Sampson, 2013; Sweeten, 2006). They explain the link between official sanctions and lower educational outcomes by different means such as poor quality in the mandated education in juvenile correctional institutions (Hjalmarsson, 2008), lower likelihood of returning to the school system, and higher likelihood of receiving a classification of emotional or behavioural disorders among those who do return to the school system (Aizer and Doyle, 2015) and explicit references to labelling theory (Bernburg and Krohn, 2003; Kirk and Sampson, 2013; Sweeten, 2006).

Contributions to the literature

The labelling perspective is included in Essay 1 and Essay 2 and relevant to explain the results from Essay 3, and the research in this dissertation contributes to the theoretical discussions about labelling along three lines. First, all three empirical studies complement the existing literature by using research designs and estimation

methods that address the methodological challenges of unobserved heterogeneity and selection bias, which are critical when assessing the impact of interactions with the police and/or the criminal justice system, which by definition lack random assignment. For example, the two studies of sanctions to juveniles exploit policy reforms that constitute natural experiments creating exogenous variation in sanctions with introducing electronic monitoring and lowering the age limit for processing juveniles in the criminal justice system. The quasi-experimental designs are less likely to be affected by selection issues as the policy reforms introduce new sanctioning practices from one day to the next. Additionally, as highlighted in previous reviews of criminological labelling studies (e.g., by Huizinga and Henry, 2008; Krohn, Lopes, and Ward, 2014) the number of studies based on random samples of the general population are still limited. Hence, the essays extend prior research by using population-based register data, including full birth cohorts and all individuals affected by the reforms.

Second, I contribute to a relatively small literature studying the labelling effects of official sanctions on educational outcomes (Krohn, Lopes, and Ward, 2014). In Essay 2 I analyse the effects of processing 14-year-old offenders in the criminal justice systems (including receipt of a criminal record) on their educational outcomes. I extend prior research by investigating the effects of softer punishments compared to Aizer and Doyle (2015), for example, who study incarceration of juvenile offenders and explore educational effects to younger age groups than for example Bernburg and Krohn (2003), Hjalmarsson (2008), Kirk and Sampson (2013), and Sweeten (2006), who look at high school graduation. The results show lower schooling outcomes for 14-year-old offenders processed in the criminal justice system, and the study thereby demonstrates the influence of one of the potential mechanisms behind the higher recidivism rates in this group as pointed out by labelling theory.

Third, the research in this PhD project also contributes by providing another empirical example of how a criminal record can influence conventional opportunities. In Essay 4, I analyse transitions in upper secondary education and look at the effects of a criminal record (among a range of other factors) on completing upper secondary education. The analyses utilise a dynamic selection model to address potential selection bias and unobserved heterogeneity, and thereby complement prior research with more sophisticated methods to address methodological difficulties in estimating effects of different factors on transitions in the education system. Despite the fact that the theoretical framework included in Essay 4 is sociological, the results also have importance for discussions of labelling theory. Even taking into account the unobserved differences between students upon entry to upper secondary education and controlling for a wide range of other individual factors linked to adverse

contingencies[5], a prior criminal record still has significantly and relatively large effects on students' dropout rates from both vocational and general education. One circumstance that can contribute to explain these differences in educational outcome between students with and without criminal records (before enrolment) is that vocational students in the Danish education system typically have to obtain an apprenticeship contract with a private firm in order to complete their education programme. This means that the discrimination against ex-offenders that previous international studies documented in the labour market (e.g., Davies and Tanner, 2003; Pager, 2003; Uggen et al., 2014) may already be established in the education system, as Danish employers' hiring preferences affect young ex-offenders' probability of obtaining an apprenticeship and completing a vocational education.

2.3. PEER THEORIES: 'BIRDS OF A FEATHER FLOCK TOGETHER'

When researching crime among adolescents, peer influence is an important aspect to include, as the correlation between peer delinquency and criminal behaviour is one of the most consistent findings in criminology (Akers, 2001). Some scholars even argue that peer influence is the strongest risk factor in explaining adolescents' delinquent behaviour (e.g., Agnew, 2001; Akers, 2001; Warr, 2002). Many different theoretical perspectives on peer influence exist (examples include subculture theory by Elijah Anderson (1999), prisonization theory by Donald Clemmer (1940), and Thornberry's integrated theory), and although social learning theories have their origin back in the 1950s, they are still among the leading explanations of crime (Agnew, 2001).

The theories of social learning argue that exposure to deviant peers prompts higher levels of delinquency as the individual learns the definitions that approve of, justify, or excuse crime as well as the techniques of committing crime from others (Burgess and Akers, 1966; Sutherland and Cressey, 1960). This understanding of crime derives from a socialisation perspective, as criminal behaviour, like every other human behaviour, is learned through social interactions. The social learning theories have their point of departure in Sutherland's theory of differential association, which explains how people's different associations with conventional or criminal norms and behaviours leads to different behaviours. Depending on the group of intimate others, the individual may learn definitions in favour of violating the law and techniques to commit crimes (Sutherland and Cressey, 1960). This implies that a person becomes delinquent by interacting with delinquent peers (i.e., friends or family) and

[5] Control variables and indicators of social problems during upbringing: gender, ethnicity, socioeconomic background (mother's/father's income and education level), single parent, teenage parents, parents with a prison sentence, parents' alcohol or drug abuse, parents with mental illness, preventive interventions in the family or child placed in care, and child using psychopharmacological drugs.

experiencing criminal behaviour as well as attitudes, rationalizations, and motives in favour of delinquent behaviour (Sutherland and Cressey, 1960).

The social learning perspective is elaborated and extended by Akers, who includes the concepts of imitation and differential reinforcement in order to explain mechanisms of learning of criminal behaviour (Akers, 2001). The imitation of behaviour from others implies that people also learn deviant behaviour by direct modelling. Adolescents engage in criminal behaviour after observing similar behaviour among friends, for example, and imitation is especially important to the process of learning initial or novel deviant behaviour (Akers, 1998). Differential reinforcement refers to the balance between anticipated and actual rewards or punishments of a behaviour. The probability that an individual commits a criminal act or repeats it is increased if the behaviour is positively reinforced (e.g., social status, money, thrills) or negatively reinforced (e.g., avoid disapproval, loss of privilege) by the social group (Burgess and Akers, 1966). A final point to note is that the influence of the group depends on frequency, duration, priority, and intensity of the associations (Sutherland and Cressey, 1960; Akers, 2001).

Empirical evidence of peer effects in crime

The theoretical understanding of peer effects has been tested and refined in numerous empirical studies applying many different methodological approaches (e.g., Akers et al., 1979; Elliott and Menard, 1996; Haynie, 2001; Matsueda and Anderson, 1998; Thornberry et al., 1994; Warr, 2002). A recent meta-analysis of the empirical evidence of social learning theory identified 133 empirical studies published in the most prominent sociological and criminological peer-reviewed journals between 1966 and 2003 (Pratt et al., 2010), and many more papers have appeared since then (e.g., Haynie and Osgood, 2005; Mcgloin, 2009; McGloin, Sullivan, and Thomas, 2014; Payne and Cornwell, 2007; Rees and Pogarsky, 2011; Rees and Zimmerman, 2016; Weerman, 2011; Young and Weerman, 2013; Young et al., 2014).

The ‘classic’ criminological studies typically use (repeated) cross-sectional data with self-report measures of delinquency and rely on respondents’ reports of peer delinquency or nomination of friends. Both older and more recent studies of peer effects typically focus on friendship relations in lower and upper secondary education. This focus may well reflect the theoretical weight to the importance of intimate others, but the restriction to analyse friends in the school context could possibly also reflect the extensive use of datasets collected in this setting (e.g., the Add Health data and the Dutch School Study). The use of survey data has also resulted in methodological discussions about the ‘right’ way to measure exposure to deviant peers, in particular whether to rely on perceptual or self-reported measures of peer attitudes and behaviours (e.g., Haynie, 2002; Haynie and Osgood, 2005; Young and Weerman, 2013; Zang and Messner, 2000). Recent reviews of the literature conclude that there is evidence of peer influence related to differential associations, definitions, reinforcements, and imitation, and effect sizes vary depending on model

specifications and research designs (Hoeben et al., 2016; Pratt et al., 2010). Although the criminological debate about peer effects for many years has included methodological (and theoretical)[6] concerns about causality (Warr, 2002), multivariate statistical models are still the standard methods in criminological studies of peer influence (Paternoster et al., 2013). Over the years, different methodological strategies have been employed to address potential selection bias and causality issues; these include covariate adjustment for delinquency propensity (e.g., Matsueda and Anderson, 1998; McGloin, 2009), the use of longitudinal data to sort out the casual ordering (e.g., Thornberry et al., 1994; Weerman, 2011; Young and Weerman, 2013), and social network analysis (e.g., Haynie, 2001; Haynie, 2002; Haynie and Osgood, 2005; Young, Rebellon, Barnes, and Weerman, 2014). However, the identification of causal peer effects is complicated when analysing observational social network data (Shalizi and Thomas, 2011), and prior studies that do not account for individuals' self-selection into homophilic friendships may therefore have overestimated the relationship between individual and peer deviance (Young et al., 2014). (See Chapter 3 for more detailed methodological discussions about the identification of peer effects.) All in all, the number of studies that address the selection issues with more rigorous methods to identify causal peer effects in non-experimental settings is very limited.[7]

In this regard, the economic literature has significant contributions, which to the best of my knowledge are not referenced in the criminological literature on peer influence. With specific relevance to the work in this PhD project are three studies that exploit the different timing in admittance and release of young offenders to investigate causal peer effects in prisons and correctional facilities (Bayer, Hjalmarsson, and Pozen, 2009; Damm and Gorinas, 2016; Stevenson, 2014).[8] The studies show that young offenders (juveniles and first-time prisoners) who serve short-term prison sentences (averaging 43 to 169 days in a facility), together with peers who committed the same type of criminal offence, are more likely to recidivate within the same type of crime after release. Furthermore, the social interaction effects do not seem to a result of young offenders building criminal networks behind bars, as the co-offending rates in reported offences among prior fellow inmates are rather low (2 per cent in the Danish

[6] The control theorists Gottfredson and Hirschi (1990) argue that peer effects are only spuriously related to delinquency due to measurement errors and selection effects.

[7] It is important to note that quasi- and experimental studies of cognitive-behavioral programmes aimed at changing offenders' antisocial attitudes and associations have documented significant effects on offending, which provides support to the empirical evidence of social learning theories (Pratt et al., 2010).

[8] In addition, neighborhood effects in youth crime and delinquency have been documented with social experiments, e.g., the housing programme 'Moving to Opportunity' (Kling, Ludwig, and Katz, 2005) and the random allocation of refugee immigrants in Denmark (Damm and Dustmann, 2014).

study). The finding of crime-specific peer effects in these studies contributes to more recent debates within the criminological tradition about heterogeneous peer effects. In different ways, scholars show that the notion of a general or universal peer influence may overlook the role of important moderating factors. The peer influence varies within groups, for example, with the number of delinquent friends (Rees and Pogarsky, 2011; Rees and Zimmerman, 2016) and depending on the characteristics of the friendships (e.g., Haynie, 2001; Haynie, 2002). Furthermore, heterogeneous peer effects are also linked to individual characteristics like gender (Haynie, Doogan, and Soller, 2014) and prior delinquency (McGloin, 2009; Rees and Zimmerman, 2016). Other examples of moderators of peer influence are parental relationship (i.e., closeness, support, and control) and individual traits (i.e., self-control, impulsivity, maturity, genes). (See Hoeben et al., 2016, for a review of this literature.)

Contributions to the literature

In light of this brief outline of the literature, the dissertation contributes to the discussions of peer influence on criminal behaviour along four lines. First, the social learning theories are included in Essay 1 and Essay 3 and in both cases to describe potential peer influences in wider (and less intimate) peer groups than what has usually been explored within the criminological tradition. By broadening the peer group definition from friends to classmates (or prison inmates), I investigate the influence of the 'naturally' occurring peer groups that individuals do not choose themselves, but spend many hours with on a daily basis. This focus corresponds with social learning theories, which argue that:

> 'The groups with which one has differential association provide major social contexts in which all social learning operate. They not only expose one to definitions, they also represent them with models to imitate and with differential reinforcement (source, schedule, value and amount) for criminal and conforming behavior. The most important of these groups are the primary ones of family and friends, though they may also be secondary and reference groups.' (Akers, 2001: 195).

The empirical analyses of the influence of classmates have the potential to see whether theories about peer influence also can be extended to broader social networks in schools where the associations have long durations and high frequency, but low priority and intensity. In addition to the fact that the investigation of a wider peer group than friends (or family) in itself is of theoretical interest, it also provides me with the opportunity to make a quasi-experimental design in order to analyse causal peer effects. Therefore, the second contribution to the literature is to see whether the theoretical understanding of peer effects, as described by social learning theories, holds when applying a new approach to address the methodological challenges of identifying causal peer effects. Third, the dissertation adds to the debates about heterogeneous peer effects by investigating a range of different moderating factors and exploring the possibilities of both positive and negative peer influence. This is in

line with the theoretical understanding that both criminal and conforming behaviour is learned in social interactions with peer groups (as described in the citation above), which opens the possibility of (new) classmate peers to influence delinquent students in a positive way. Fourth, studies of peer effects on criminal behaviour in the Danish context are to the best of my knowledge limited to a few publications (Damm and Dustmann, 2014; Damm and Gorinas, 2016; Sorensen, 2009). These publications investigate peer effects in neighbourhoods and among first-time prisoners and describe characteristics of co-offending networks. Thus, Essay 3 contributes to a very limited national literature by investigating peer effects in upper secondary education, which is an important transition for Danish adolescents.

2.4. AN EMPRICAL QUESTION

The descriptions of the three different theoretical perspectives in Chapter 2 are in no way exhaustive; many other theories could have contributed to the understanding of criminal behaviour, sanctions, and education. The outline of theories in the dissertation reflects an empirical interest in testing some of the 'classic' theories with new and more rigorous methods and using large population-based register datasets from Denmark. The selection of theories may seem 'old-fashioned', with their micro-level focus on 'one-factor' explanations. However, it is the ambition of this PhD project to contribute to the criminological literature with state-of-the-art empirical studies that have the potential to identify causal mechanisms and explore theoretical perspectives that are commonly referenced within the specific subfields. In the end, it is an empirical question to determine which theoretical perspectives can contribute to enhancing our understanding of criminal behaviour among young people.

CHAPTER 3. METHODOLOGY AND DATA

In Chapter 3, I discuss the methodology of this dissertation. This includes, first, a brief description of the selection of research designs and methods in the four essays. Second, I give two more detailed descriptions and discussions of the methods used in Essay 1 (electronic monitoring) and Essay 3 (peer effects), as instrumental variable (IV) models and fixed effects models in studies of peer effects are new to the criminological tradition. Third, I describe the four datasets that I constructed specifically for this PhD project and discuss the use of population-based administrative register data.

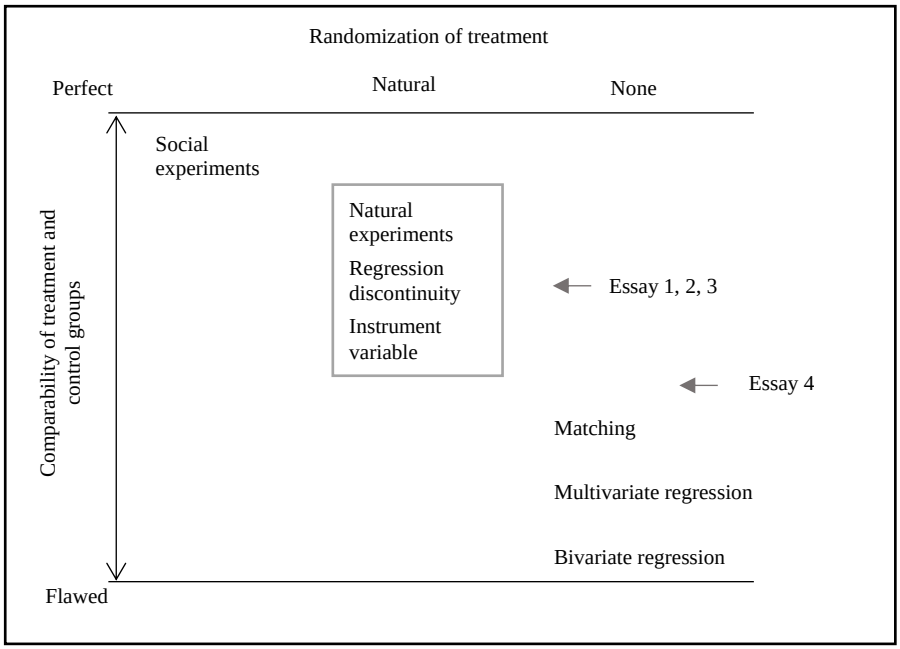
3.1. DESCRIPTION, CORRELATION, OR CAUSALITY?

The project consist of four quantitative empirical analyses, and the ambition is to contribute to the criminological literature by applying micro-econometric methods and using comprehensive Danish population-based register data. The purpose in Essays 1, 2, and 3 is to identify causal effects, and I use different quasi-experimental designs to address the methodological challenges. This methodology is in some respects new to the subfields of the criminological literature to which my research relates, as the standard methods in studies of peer influence and labelling effects, for example, are more simple designs with multivariate regression models (Barrick, 2014; Paternoster et al., 2013). Recently, methods like propensity score matching have been applied to address selection bias (e.g., Liberman, Kirk, and Kim, 2014; Murray et al., 2014; Swisher and Dennison, 2016; Wiley, Slocum, and Esbensen, 2013). Even though these types of matching methods can ensure comparable groups on observable characteristics (which are often extensive in longitudinal survey data), there is still a risk of having incomparable groups on unobservable characteristics, and therefore regression estimates being inflated by omitted variable bias (Berk, 2010). In other lines of the criminological literature, the methodological debates concerning the choice of research designs to ensure high internal validity and address selection and omitted variable bias are more prominent. For example, within experimental criminology where debates on how to evaluate crime-prevention interventions include the Maryland Scientific Method Scale, for example, rating randomised controlled trials as ‘the golden standard’ (Farrington et al., 2002). In the research areas to which my dissertation contributes, social experiments are rare (for many good reasons), and the use of quasi-experiments can play an important role in strengthening the methodology in studies of causal effects.

Figure 2 illustrates a ranking of different research designs by their ability to identify causal effects and the choice of methodology in the four essays. In Essays 1-3 I exploit

a natural variation in the 'treatment' caused by legal reforms, for example, and argue that the variation is nearly equivalent with random assignment. In Essay 4, the focus is somewhat different as the study explores effects of social problems (including criminality) on transitions in the education system The aim of this study is not to identify causal effects, but to compare effects estimates between different educational transitions and use a dynamic selection model to account for unobserved heterogeneity.

Figure 2. Research design in the four essays



Note: Figure 2 is inspired by an illustration in *Designing Research in the Social Sciences* (2013) by Magetti, Gilardi and Radaelli.

It is essential to stress that 'simple' regression analyses and more refined matching regression models are, in my view, equally important research methods in the social sciences. Description, correlation and causality are all essential to understand sanctions, education and crime, for me the restrictions only relate to formulations of the research questions and discussions of the limitations that are in line with the choice of methodology.

The designs and statistical models that are used in the four essays are all described and discussed in detail in the four articles, respectively. Therefore, I limit the further methodological discussions in this chapter to instrument variable models (Essay 1)

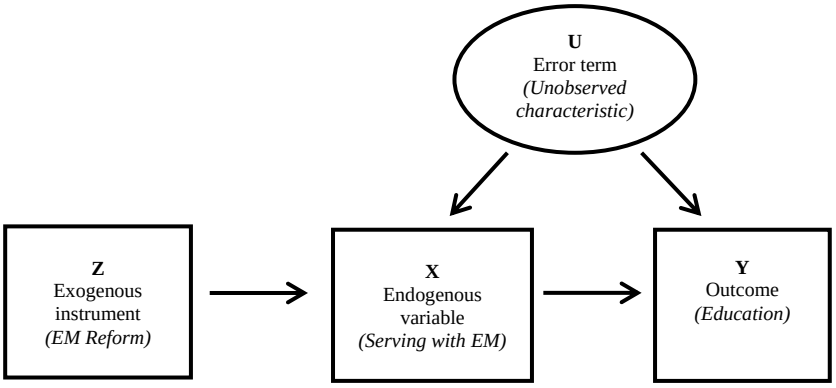
and fixed effects models in studies of peer effects (Essay 3). These methods are relatively new within the criminological tradition, and the estimation methods used in Essays 1, and 3 do not hold the same potential to contribute to more general methodological discussions within the criminological literature.

3.2. INSTRUMENTAL VARIABLE MODELS

In Essay 1, I investigate the effects of young offenders' serving with electronic monitoring on educational outcome. The study has a quasi-experimental design, as I exploit the 2006 reform in Denmark that introduced electronic monitoring to all offenders under the age of 25, with a maximum prison sentence of three months. This design is combined with the use of an instrumental variable model to take into account the non-random assignment of programme participation in order to assess the causal effects of electronic monitoring compared with imprisonment. The IV strategy has been a standard method in economics for years to address, for example, selection and omitted variable bias (Angrist, 2006). However, the use of this methodology in criminology is still relatively rare (Bushway and Apel, 2010). In the following, I describe the IV method and highlight its advantages for criminological studies, exemplified by the application to the study of electronic monitoring in Essay 1.

The basic setup in IV methods is illustrated in Figure 3. We want to estimate the effect of X on Y, in this example the effects of serving with electronic monitoring (EM) on offenders' educational outcome. We know that the (self) selection to the EM programme entails that treatment X (serving with EM) is not randomly assigned but expected to be determined by (unobservable) characteristics of the offender, like drug abuse, motivation, etc., which is correlated with recidivism and educational outcomes. In other words, treatment X is expected to be endogenous, as offenders serving with electronic monitoring are a selected group of the source population and most likely to be offenders with the lowest risk of recidivism and highest chance of completing their education, even if they were not in the EM programme. Thus, X is listed as the endogenous variable in Figure 3, and it is affected by unobserved characteristics of the offender, illustrated by U in the circle. These unobserved characteristics are also expected to have effects on outcome Y, and a 'simple' OLS regression of X on Y would therefore be biased by confounding, as the effect of X will include the (indirect) effect of U as well. All in all, this implies that the fundamental assumption of exogeneity in the linear model is violated, as X is correlated with the unobserved determinants of Y and causal inference will not be possible in a simple regression analysis.

Figure 3. Illustration of an IV model



In order to address the methodological issues with omitted variables and selection bias, I use an exogenous instrument variable Z to estimate the causal effect of X on Y. The instrumental variable Z is correlated with X, but not with Y or U, thus it is exogenous. In this case, I use the EM reform as an instrument, which introduced electronic monitoring for young offenders from one day to the next, and the reform is therefore unrelated to the offender's individual characteristics and educational outcomes. The requirements for an instrumental variable (as illustrated in Figure 3) are:

- Z is correlated with X.
- Z is exogenous—only affects Y through X (the exclusion criteria).
- Z is randomly assigned (or equivalent to random assignment), and therefore not correlated with unobserved determinants of Y.

IV methods in experimental or quasi-experimental research

Many experimental studies, in spite of the random allocation treatment, are challenged by noncompliance to treatment (or non-treatment), which raises the issues of selection and omitted variable bias (Angrist, 2006). There will often be participants in the treatment group who never turn up or quit the programme, causing *treatment dilution*, and in some cases deviation from the protocol results in treatment to some participants in the control group, causing treatment *migration* (Angrist, 2006). In most cases, it is not possible to argue that noncompliance with the assigned treatment is random, as for example offenders with the worst records are more likely to never show up or leave the programme. This means that often in experimental studies the *intended* treatment is randomly assigned, whereas the actual *delivered* treatment is not randomly distributed across programme participants. Previous studies in criminology

have addressed this methodological challenge by for example estimating intend-to-treat (ITT) models, which compare outcomes of the control group to the intended treatment group. This allows for a conservative evaluation of the programme effects based on comparison of the outcomes of a non-treated control group with the outcomes of a mixed group of treated and non-treated. For example, in a study with a compliance rate of 80 per cent in the treatment group, the programme effects would be evident only if they are large enough to affect the average treatment effect of the total treatment group. Hence, the ITT analysis will by design underestimate the effects of treatment due to noncompliance (Angrist, 2006; Bushway and Apel, 2010). In order to evaluate the actual programme effects, it is possible to apply the IV estimation model and use the randomized intended treatment as the instrument of delivered treatment (Angrist, 2006). The IV strategy allows the exploitation of the random assignment of the intended treatment to estimate the causal effects of the treatment delivered.

In Essay 1, I estimate a two-stage least square (2SLS) regression model to evaluate the causal effects of electronic monitoring on offenders' subsequent educational outcome using the reform of inducing random allocation to the EM programme (intended treatment) as an instrument of serving with EM (delivered treatment). The 2SLS regression model can be written as follows:

First stage: $X_i = \alpha_0 + \alpha_1 Z_i + \omega_i$

Second stage: $Y_i = \beta_0 + \beta_1 \hat{X}_i + \varepsilon_i$

ITT model (reduced form): $Y_i = \delta_0 + \delta_1 Z_i + \mu_i$

Where:

- X_i is the delivered treatment variable (served with EM or not) for individual *i*.
- Z_i is the instrumental variable (convicted before or after reform) for individual *i*.
- Y_i is the educational outcome for individual *i*.
- ω_i, ε_i, and μ_i are the error terms in the respective models.

In a setup like the EM study with a dummy variable for delivered treatment (1 for serving with EM and 0 for serving in prison), the first-stage model estimates the compliance rate, in this case the proportion of the population that serves with electronic monitoring. In general, the first-stage model tests the correlation between the instrument and the endogenous variable, and the fitted values from the first-stage model ($\hat{X}_i$) are used in the second-stage model as an instrument and put in place of the endogenous variable. The results from the second-stage model reflect the average causal effect to the treated (ATET) in models with one-sided noncompliance (Angrist, 2006). In this example, for offenders between 18 and 25 years of age who fulfil the formal requirements to serve with EM, participation in the EM programme increases

the probability of completing upper secondary education by 18 percentage points three years after release, compared to imprisonment. It is worth noting that the treatment effect is the ratio of the ITT effect to the results from the first stage (compliance rate). Thus, in models with one endogenous variable and one instrumental variable, the second-stage estimate is a rescaling of ITT effects by the compliance rate. This feature highlights the advantages of the IV model, supplying a simple way to estimate causal treatment effects in experimental or quasi-experimental studies with noncompliance. Moreover, the IV models are included in the standard software packages for statistical analyses in for example STATA.

3.3. FIXED EFFECTS MODELS TO IDENTIFY PEER EFFECTS IN CRIME

In Essay 3, I explore the effects of delinquent classmates in upper secondary education on future offending. Social interaction effects at colleges in relation to criminal behaviour is interesting, as classmates constitute a natural peer group to young people at the time in their life when offending rates are highest. Furthermore, sound knowledge on peer effects in upper secondary education is important, as probation officers often 'prescribe' enrolment in education as part of the release programmes for young ex-offenders. In the following section, I discuss the methodological challenges in identifying causal peer effects and describe how the use of fixed effects models combined with random allocation of students across cohorts can contribute to the study of causal peer effects in non-experimental settings.

The identification of peer effects in empirical research is complicated by the fact that individuals sort themselves into groups with similar characteristics. This process works at many different levels—from which neighbourhood you live in, to which schools you go to, and who you become best friends with.[9] The self-sorting of individuals into homophilic social networks makes it difficult to disentangle the actual peer influence from the selection effect in non-experimental settings. The identification of causal peer effect can be confounded by the so-called correlated effect, when individuals in the same group behave the same way because of similar individual characteristics or similar institutional settings (Manski, 1993). For example, students in the same school will have similar propensities (high or low) to engage in criminal activities even before they interact with each other, because they have similar socioeconomic backgrounds. If we do not address the non-random 'matching' of individuals to their peers, we pose the risk of identifying spurious peer effects solely attributable to the selection effect (Shalizi and Thomas, 2011). As social researchers, we are not interested in the selection (correlated) effect caused by

[9] This point is also present in criminological theories as for example Sutherland highlights the importance of the theory of differential association to explain both individual criminal behavior and the variations in crime rates across neighborhoods (Sutherland and Cressey, 1960).

individuals self-sorting into groups; we are interested in the effects of the social interactions within these groups.

Traditionally, the focus in criminological studies of peer influence has been on friendship relations in primary or secondary schools. However, friendship formations among adolescents per definition lack random assignment, as adolescents are more likely to form homophilic networks based on similarities in age, gender, ethnicity, and delinquency (e.g., Weerman, 2011; Young, Rebellon, Barnes, and Weerman, 2014), which complicates the identification of causal peer effects. In Essay 3, I employ a methodological strategy that is new to the criminological tradition to identify peer influence on criminal behaviour in school settings by analysing the effects of the composition of classmate peers. Instead of trying to solve the difficult task of identifying peer influence in friendship relations, I contribute to the existing literature by broadening the peer group definition from friends to classmates, which in itself has a theoretical interest, and at the same time provides the opportunity to utilise a quasi-experimental design in order to analyse causal peer effects.

When analysing peer effects in school contexts, it is important to address the fact that students with similar socioeconomic backgrounds and abilities are more likely to live in the same geographical area and attend the same school or college. This non-random allocation of students across schools and colleges makes it difficult to separate the peer influence from the selection effect. Hence, the peer effects could be confounded by unobserved individual characteristics (such as self-control, motivation, and cognitive skills) that influence both criminal activity and school selection. In Essay 3, I use the exogenous variation in classmates with a criminal charge within the same college in adjunct cohorts as a possible source of identification. The panel dataset including the full population of all Danish 9th and 10th graders who enrolled in upper secondary education over the years 2008 to 2011 allows the use of the natural variation in the composition of students within the same college across different cohorts. In this way, the analyses have the potential to separate the peer effects from the correlated (selection) effect based on the assumption that the variation in classmates is random across different cohorts within the same college.

I use the fixed effect methodology and include three levels of fixed effects: programme, college, and college-specific time trends[10]. First, I include college fixed effects to address the fact that the composition of students in upper secondary education varies systematically between different colleges. Thus, I only use the within-college variation in classmates with prior charges between cohorts to identify peer effects. The inclusion of college fixed effects controls for the non-random

[10] The analyses were estimated in STATA with the 'reghdfe' procedure that allows different levels of fixed effects and a high number of units. All models were estimated with clustered standard errors at the college level to adjust for the fact that the students were 'nested' in colleges; if that aspect were ignored, the standard errors would be biased downwards.

allocation of students to colleges and any unobserved differences between all students within the colleges. This means that the method can account for students choosing between 'good' and 'bad' colleges and potential institutional factors influencing students' criminal behaviour (or the number of reported crimes). For example, this would encompass colleges with 'zero-tolerance policies', which imply that any suspicion of students' committing criminal acts is reported to the police by the school, or 'good' colleges with good teachers who enhance students' educational motivation and thereby lower the risk of criminal involvement.[11] Second, I include college-specific linear time trends in the estimations, as one concern with the cohort design is that the results can be influenced by time trends if, for example, local crime rates go up or down during the observation period due to police efforts. Third, because the study analyse peer effects in upper secondary vocational education, where students choose among 10 different programmes[12], programme fixed effects is included. The programme fixed effects control for self-selection into these different programmes, which are correlated with students' socioeconomic characteristics and criminal history and thereby most likely linked to students' propensity for committing criminal acts. All in all, the basic idea is to compare offending rates of students who have similar characteristics and are enrolled within the same programme at the same college, but the proportion of classmates with prior charges varies because they come from different cohorts.

The empirical setup is designed to separate peer effects from potential selection effects, but it does not imply that the setup can separate the so-called endogenous and exogenous peer effects (Manski, 1933). The endogenous peer effect is due to students' risks of engaging in criminal activities varying with the prevalence of delinquent classmates, whereas the exogenous (or contextual) effect occurs as the risk of engaging in criminal activities varies with the characteristic of the peer group. In the scope of this study, this means that it is not possible to distinguish between whether

[11] The administrative register data on students' enrolment in colleges did not contain information on teachers, which means that I do not have the opportunity to include teachers' fixed effects. Studies of peer effects on academic achievements have shown that teachers' fixed effects influence the peer estimates (e.g., Burke and Sass, 2013); however, the individual teacher effect is likely to be more important in studies of educational outcomes than in studies of criminal behaviour.

[12] (1) Building and construction: bricklayer, plumber, glazier, woodworker.
(2) Transport and logistics: truck driver, driver.
(3) Mechanics: motor mechanic, bicycle mechanic.
(4) Building and citizen services: building caretaker, security guard, receptionist.
(5) Media production: media graphic designer, photographer.
(6) Food production and catering: baker, cook, butcher, miller, waiter.
(7) Production and developments: blacksmith, tool maker, industrial operator.
(8) Electric and IT: electrician, IT supporter.
(9) Styling: hairdresser, cosmetician, nail technician.
(10) Animal and plants: farmer, gardener.

potential classmate effects are endogenous—and the individual is more likely to engage in criminal activities because of classmates' criminal behaviours—or whether the peer effects are exogenous, as the individual is affected by the socioeconomic composition of classmates. This issue is common in studies of peer effects and to minimize the influence from exogenous characteristics we include a range of different peer group measures.

Another important methodological issue to discuss when analysing peer effects is *simultaneity* (often referred to as the reflection problem). This problem occurs in studies of peer influence, as we want to identify the effects of social interactions in which the behaviour of the individual and members of the peer group are interrelated. Therefore, it is difficult to separate the effect that the group has on the individual from the effect that the individual has on the group. In this study, I employ the standard approach in economic studies of peer effects (Feld and Zölitzt, 2017) and construct the peer measure on leave-out proportions of classmates with charges prior to enrolment in upper secondary education. This way I exploit our rich panel dataset with information on enrolment dates and offence dates to measure peers' criminal behaviour *prior* to the peer group formation (date of entering upper secondary education). By including time-lagged peer information and leave-out proportions in the construction of the measures of the criminal behaviour among classmates, I ensure the temporal order of peer group characteristics and outcome and separate the individuals' behaviour from that of the peer group. When employing this empirical strategy, in which the information about the peer group is time-lagged, one inevitably adds measurement error to the estimations. The individuals' engagement in criminal behaviour can change over time, and in this particular case some of the classmates with prior criminal charges may desist from crime during enrolment in education. To limit the issue of measurement error, I only include prior criminal charges in the peer measure if the offence date does not exceed two years prior to enrolment. As I rely on public records of criminal charges (and not self-report data on criminal behaviour), I refrain from limiting the observation window further. I recognize the potential measurement error in the peer measure, but find the importance of ensuring the causal ordering in the empirical analyses to outweigh this problem.

The empirical strategy can be denoted in the following way:

$$Y_{ipct} = \alpha_p + \beta_c + \gamma_t + \partial_{ct} + \delta_1 X_{ipct} + \delta_2 X_{(-i)pct} + \pi P_{(-i)pct} + \varepsilon_{ipct}$$

Where:

- Y_{ipct} is criminal charges of individual *i* in programme *p* at college *c* at time *t*.
- α_p is a fixed effect for programme *p*.
- β_c is a fixed effect for college *c*.
- γ_t is a cohort fixed effect for time *t*.
- $\partial_{ct}$is a college-specific linear time trend.

- X_{ipct} are control variables (student characteristics including crime history).
- $X_{(-i)pct}$ are peer group characteristics in programme *p* in college *c* at time *t* excluding individual *i*.
- $\pi P_{(-i)pct}$ is the proportion of students with a prior charge in programme *p*, college *c*, and time *t*, excluding individual *i*.
- ε_{ipct} is the error term.

Similar identification strategies exploiting within-school variation have previously been applied in studies of peer effects in non-experimental settings.[13] The fixed effect approach is novel within the criminological literature on peer effects, but it has been applied in many economic studies of peer effects in schools, in different variations (e.g., Hoxby, 2000; Hanushek, Kain, Markham, and Rivkin, 2003; Bifulco, Fletcher, and Ross, 2011; Lavy and Schlosser, 2011). In my opinion, this methodology has the potential to contribute to the criminological debate on peer effects in several ways. First, it will be interesting to see results from studies that use this method to address the methodological challenges in peer studies and explore effects of this broader peer group in other contexts and education levels. Second, a general awareness of applying new and different design strategies to overcome the challenges caused by self-sorting of individuals into homophilic networks may be fruitful. Finally, the practical implementation of the method is not complicated for analysts who are familiar with estimating regression models in STATA.

[13] Fixed effects strategies have also been applied to studies of peer effects in juvenile correctional facilities and prisons, where researchers have used the facility and prior-offence-facility fixed effects to take account of the non-random placement of individuals across facilities (Bayer, Hjalmarsson, and Pozen, 2009; Damm and Gorinas, 2016; Stevenson, 2014). The correctional facilities and prisons contain a group of offenders that changes through continuous admissions and releases, and the studies have exploited this feature to construct individual peer measures and identify causal peer effects.

3.4. ADMINISTRATIVE REGISTER DATA

The four empirical essays all use administrative register data provided by Statistics Denmark, the Danish Police, and the Danish Department of Prison and Probation Services. The unique personal identifier that in Denmark is used in all contacts with the official systems - from school enrolment to tax payments, police contacts, and medical prescriptions - makes it possible to combine information from a wide range of different official administrative sources. The access to population-based register data and possibility to combine them into original datasets for research is an opportunity that Danish researchers share with scholars from the other Nordic countries. However, as pointed out by Lyngstad and Skardhamar (2011), the use of Nordic register data in criminology was rather limited until the early 2000s. This PhD project contributes to a new trend in Denmark, in which the number of scholars from sociology, criminology, and economics who publish journal articles based on the official crime register has risen significantly over the last few years (e.g., Andersen and Andersen, 2014; Andersen, Andersen and Skov, 2015; Dustman and Damm, 2014; Damm and Gorinas, 2016; Klement, 2015; Landersø, 2015; Landersø, Nielsen and Simonsen, 2016; Soothill et al., 2010; Wildeman and Andersen, 2017). In the following sections I briefly describe the datasets that I constructed for this PhD project and discuss the advantages and limitations of the choice of data.

The four studies analyse datasets that I constructed for each project specifically from multiple official administrative sources. I use registry data for the years 1980-2015 to compile longitudinal datasets that follow young people from birth to adulthood and link them to information about their parents and classmates in 9th and 10th grade as well as in upper secondary education. All four datasets are compiled in SAS and STATA and construction of the datasets, typically, entails the following steps: first, the population is defined and identified, second the unique identifier for each individual in the sample is used to extract the relevant information from each of the different registers and for each year. Third the unique identifier of the individual's mother, father, and classmates are found and step two is repeated for these populations as well. Fourth, the information from the registers is recoded and variables for the analyses constructed. Fifth, all the different datasets are combined into one longitudinal dataset and the statistical models are estimated in STATA. The four following tables give a brief outline of the essential information of the four datasets that I constructed for the essays.

Table 1. Dataset constructed for Essay 1: Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment.	
Data access:	Provided by RockwoolFoundation, server placed at Statistics Denmark.
Population:	Danish offenders 15-25 years old, sentenced to a prison sentence of a maximum of three months from April 21st 2006 to April 21st 2009 (n=8,741).
Data period:	1980-2013.
Data sources:	Registers from Statistics Denmark and Registrations of offenders offered to serve in the EM-programme provided by the Danish Prison and Probation Service (DPPS).
Registers:	▪ Information about the EM-programme from DPPS. ▪ Population Register (BEF). ▪ The Crime Statistics Register (Charges, KRSI). ▪ The Crime Statistics Register (Dispositions, KRAF). ▪ The Crime Statistics Register (Confinements, KRIN). ▪ Education Register – yearly classifications (BUE). ▪ Education Register – all entries (KOET).
Description:	The dataset covers the period 1980-2013 and includes information for young offenders sentenced a short prison sentence from April 2006 to April 2009. The dataset contains information on the offenders demography: age, gender and ethnicity, whether they lived at home with their parents at the time of conviction, age at conviction, type of offense, sentence length, history of reported offending (number of prior convictions and prior prison convictions), primary schooling and upper secondary education at conviction (type and years enrolled). The use of register data makes it possible to follow offenders 3 years after release and analyse information on whether they completed upper secondary education 3, 6, 12, 18, 24, 30 and 36 months after.

Table 2. Datasets constructed for Essay 2: Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education.	
Data access:	Provided TrygFonden's Centre of Child Research, Aarhus University, ECONAU-server placed at Statistics Denmark.
Population:	Danish birth cohorts 1993-1999 (N=512,369) and their parents.
Data period:	1980-2014.
Data sources:	Registers from Statistics Denmark and The Central Police Register, which includes registrations of children under the minimum age of criminal responsibility by the Danish Police.
Registers:	▪ Population Register (BEF). ▪ Medical Birth Register. ▪ Central Police Register. ▪ Crime Statistics Register (Charges, KRSI). ▪ Crime Statistics Register (Dispositions, KRAF). ▪ Education Register – yearly classifications (BUE). ▪ Education Register – all entries (KOET). ▪ Education Register – grades lower secondary educ. (UDFK). ▪ Income Register (INDK). ▪ Integrated Database for Labour Market Research (IDA-person). ▪ Register of Prescriptions of Medicinal Products. ▪ Psychiatric Central Register (Psychiatric hospital admissions). ▪ Psychiatric Central Register (Psychiatric diagnoses). ▪ National Patient Register (Somatic hospital admissions) ▪ National Patient Register (Somatic diagnoses).
Description:	The datasets are based on the cohorts of Danish children born in 1993-1999 and include information on children's demography, birth weight, ADHD diagnosis, use of Ritalin or other psychotropic drugs (age 0-9). Family characteristics (child age 9): parents' income, occupation and education, and family type (nuclear, single parent, new partner, child not living at home) and parents' criminal history. Child criminal history (age 10-13): number of prior suspects, offence type and registered criminal debut age. Furthermore, information from the Central Police Register is used to compile a longitudinal dataset with monthly records of 'charges' among the population of 13-,14- and 15-year-olds.

Table 3. Datasets constructed for Essay 3: Building Human or Criminal Capital? Classmate Peer Effects on Future Offending.	
Data access:	Provided by KORA, the Danish Institute for Local and Regional Government Research. Project database placed on Statistics Denmark's server and the update of the database was financed by Aalborg University
Population:	Danish students enrolled in 9th and 10th grade from 2007-2011 (N=333,508) and their parents and Danish students enrolled in vocational education from 2008-2012 (N=195.977) and their parents.
Data period:	1980-2014.
Data sources:	Registers from Statistics Denmark.
Registers:	▪ Population Register (BEF). ▪ Housing Register (BBR). ▪ The Crime Statistics Register (Charges, KRSI). ▪ The Crime Statistics Register (Dispositions, KRAF). ▪ Education Register – yearly classifications (BUE). ▪ Education Register – all entries (KOET). ▪ Education Register – grades lower secondary educ. (UDFK). ▪ Income Register (INDK). ▪ Integrated Database for Labour Market Research (IDA-person). ▪ Register of Prescriptions of Medicinal Products. ▪ Register of Social Assistance, children (preventive interventions). ▪ Register of Social Assistance, children (out of home placements).
Description:	The dataset covers the period 1980-2014 and includes information for Danish students enrolled in 9th and 10th grade from 2007-2011 and Danish students enrolled in vocational education from 2008-2012. The dataset includes information on child background (gender, ethnicity, family status), child crime history (age at conviction, type of offense, number of prior convictions), family background (parents' employment status, income and education level), indicators of social problems (teenage parents, parents with convictions, parents' use of psychotropic medication, child use of ADHD medicine, preventive interventions in the family and child place in care). Furthermore, the detailed information on students' entries in the education system with school and college identifiers is used to follow students from lower secondary education to upper secondary education and construct detailed information about their classmate peer groups in both 9th and 10th grade and upper secondary vocational education.

Table 4. Datasets constructed for Essay 4: Transitions in Secondary Education: Exploring Effects of Social Problems.	
Data access:	Provided by KORA, the Danish Institute for Local and Regional Government Research. Project database placed on Statistics Denmark's server.
Population:	Danish children born in 1983 and 1984 (N=105,412) and their parents.
Data period:	1983-2008.
Data sources:	Registers from Statistics Denmark.
Registers:	▪ Population Register (BEF). ▪ Housing Register (BBR). ▪ The Crime Statistic Register (Dispositions, KRAF). ▪ Education Register – yearly classifications (BUE). ▪ Education Register – all entries (KOET). ▪ Income Register (INDK). ▪ Integrated Database for Labour Market Research (IDA-person). ▪ Register of Prescriptions of Medicinal Products. ▪ Psychiatric Central Register (Psychiatric hospital admissions). ▪ Psychiatric Central Register (Psychiatric diagnoses). ▪ National Patient Register (Somatic hospital admissions) ▪ National Patient Register (Somatic diagnoses). ▪ Register of Social Assistance, children (preventive interventions). ▪ Register of Social Assistance, children (out of home placements).
Description:	The dataset covers the period 1983-2008 and includes two Danish birth cohorts born in 1983 and 1984. The administrative data is compiled to a longitudinal dataset following the two birth cohorts and their parents during the upbringing from the age of 0–15 and the children's educational enrolment and attainment from 15 up to the age of 25. The construction of indicators of social problems combines information from several different data sources. For example, the indicator of mother's or father's alcohol abuse is based on somatic and psychiatric ICD-8 and ICD-10 diagnoses codes related to alcoholism (such a cirrhosis of the liver, admissions to emergency rooms due to alcohol poisoning, mental disorders associated with long-term alcohol abuse) as well as prescriptive drugs used in treatment of alcohol dependence.

The use of register data to study youth crime, sanctions and education

In the following, I discuss advantages and limitations using register data in the empirical essays and to answer the research questions in this dissertation. First of all, it is important to note that the use of register data in this PhD project is a perquisite to utilising the quasi-experimental designs in Essay 1-3 and investigate the effects of social problems in Essay 4. Hence, in Essay 1 and Essay 2 two different policy reforms are used to identify causal effects with quasi-experimental designs that include historical controls groups. Essay 3 is based on a different quasi-experimental design, which relies on data from consecutive cohorts of students to identify causal peer effects and the identification strategy is further refined by exploiting the possibilities in the Danish register data to link students across transitions from lower secondary to upper secondary education. In Essay 4, the possibility to combine a very wide variety of administrative sources and follow total cohorts from birth to adulthood is used to investigate the effects of a range of different indicators of social problems during the upbringing on educational transitions. Thus, the use of register data has been essential in order to apply advanced methods to answer the research questions of this dissertation. The use of administrative registers as a data source also have several other advantages that are discussed in more details in the following.

First, the registry data covers the total population of Danish residents who have an address listed in the national register and a valid Danish CPR-number (Central Person Registration Number). The access to information about the entire Danish population implies that all the empirical analyses use population samples, for instance birth cohorts in Essays 2, and 4 and total students populations in Essay 3. Additionally, the use of population data makes it possible to include all individuals affected by the legal reforms introducing electronic monitoring to young offenders (Essay 1) and lowering of the minimum age of criminal responsibility (Essay 2). Second, the use of register data also has the advantage that sample attrition only occurs ‘naturally’ upon death or migration and there are no measurement errors or bias due to systematic nonresponse to survey questions (Lyngstad and Skardhamar, 2011). These characteristics of the data enable longitudinal research that follows adolescents over longer time periods after the ‘treatment’, for example, without increasing potential attrition bias and allows us to ‘turn back time’ and collect detailed information about their childhood without recall bias or self-representation concerns. In the two studies evaluating legal reforms (Essay 1 and Essay 2) the time lag between the policy change and end date of the available register data was still relatively short (given the timeframe of the Phd project). Therefore, it will be interesting to make us of the registers to extend follow-up period in the future and analyse long-term reform effects.

Third, the use of register data also provides the opportunity to construct (historical) control groups from the total population and with the same sample restrictions that apply to the ‘treatment’ group. For example in Essay 1, I include all Danish offenders age 18–25 who are sentenced to a prison sentence of a maximum of three months 3 years prior to and 3 years after the reform. The detailed register data makes it possible

to select individuals to the control group by the same formal criteria that apply to the treatment group in order for them to be eligible for the EM programme. This way I can identify a historical control group that would have received the offer to serve their sentence with electronic monitoring had they been convicted after the reform. Finally, the CPR-number that uniquely identifies each Danish resident in every contact with the official system provides the opportunity to combine many different data sources and construct variables with information on e.g. children, parents and classmates for the years 1980-2015. Thus, the empirical analyses in the four essays include a wide range of control variables to minimize omitted variable bias as well as different fixed effects specifications e.g. police districts (Essay 2) and colleges (Essay 3). The use of register data also makes it possible to test the comparability of control and treatment groups with a very high number of observables.

There are also important limitations that are relevant to discuss when using administrative register data in research. First, the information in the administrative registers are not constructed for research, and in most cases, the researcher have no influence on the data collection, for example what or how the information is registered. Therefore, it is important to keep the origin of the datasets in mind when using them for research. One example with relevance for this projects is the registration of entries and exits in the Danish education system (from the KOET register). A validation of the dataset showed that the exact exit dates most likely reflect registration practices at the schools rather than an approximate date of when students drop out. Hence, when you look at exit dates of students who do not finish the first year in upper secondary education, for example, the records typically contain end dates in the spring when the student body is assessed before first year exams. Second, although the quality of the Danish register data in general is very high and missing information are rare, there are exceptions. Thus, like in any other research process, it is important to validate the data carefully also when working with administrative data sources. An example is missing end dates in the confinement data delivered by Statistics Denmark and retrieved from the police registers. As noted by Kyvsgaard (2002) the missing end dates in the confinement data are more common in records of arrests or transfers from one place of confinement to another and therefore only a minor issue when constructing the dataset for Essay 1.

Third, the use of official records from administrative registers will notoriously lead to underestimates of the distribution of for example criminality and social problems (such as parental alcoholism, drug abuse or mental illness). Only ‘the tip of the iceberg’ is registered in official records. For example in Essay 4 the indicators of social problems during the upbringing rely on data on hospital admissions and records of medicine prescriptions to for example identify children raised by parents with an alcohol abuse. This implies that only the most severe cases with long-term alcohol abuse are recorded in the register data. This concern is also an important to note in relation to use of official records on criminal behaviour as the criminal register only includes records of the offences that are reported to or otherwise known by the police.

Thus, the official records of charges and dispositions are influenced by the discretions of the police officers, victims' inclinations to report[14], discretions of the prosecuting authority and judges' sentencing practices (Kyvsgaard, 2004). This is a fundamental condition to all research using official crime data, but especially important to consider in evaluations of policy reforms where the system responses to changes in the legal framework can bias the results. For example in Essay 2 one concern was that, the legal reform lowing the age limit of criminal responsibility could influence police efforts, if the police officers were either more or less likely to book the 14-year-olds during the reform period. In worst case, the discretions of the police could confound the estimated reform effects as the analyses rely on the reported charges of juveniles by the police. In the essay, I address this concern by evaluating the descriptive data and include police districts fixed effects in the statistical models to account for possible different practices from district to district.

Overall, the use of administrative register data (with its pros and cons) has made it possible to answer the research question of the dissertation by application of micro-econometric methods. The four empirical essays illustrate the strong potential in the Danish register data to evaluate effects of policy reforms and follow adolescents across transitions in the education system.

[14] Based on victim surveys the report rates in Denmark are (listed by offence type): 84% for burglary, 60% for theft, 42% for vandalism, 39% for violence, and 27% for forced intercourse (Pedersen, Kyvsgaard and Balvig, 2015).

CHAPTER 4. CONCLUSION AND DISCUSSION

The dissertation investigates the interrelationships between sanctions, education, and criminal behaviour among adolescents. The aim with this PhD project was to contribute to the criminological literature with four empirical studies that investigate classic criminological theories with micro-econometric methods to identify causal effects and answer research questions with relevance to practitioners and policy makers. The results from the dissertation contribute with novel insights to the discussions about youth crime, education and sanctions and complement the existing literature by applying new and more rigorous methods and using population-based register datasets from Denmark.

4.1. CONCLUSIONS OF THE FOUR ESSAYS

The dissertation consists of four empirical studies that shed light on four different angles of the interrelationship between education, sanctions, and crime for young people. The conclusions from each of these studies are described in the following.

Essay 1: *Educational Outcomes After Serving with Electronic Monitoring: Results from a Natural Experiment.* The study evaluates a reform in Denmark in 2006 introducing electronic monitoring (EM) to all offenders under the age of 25 with a maximum prison sentence of three months and examines the following research question: Do young offenders serving with an electronic monitor have higher completion rates from upper secondary education compared to offenders serving their sentence in prison? The reform constitutes a natural experiment that creates exogenous variation in the type of sanctions offered to young offenders with a prison sentence and I use information on participation in the EM-programme to identify the causal effects with instrumental variable models. The empirical analyses show that young offenders in the EM-programme increased their probability of completing upper secondary education by 11 percentage points after 1.5 years and by 18 percentage points 3 years after release, compared to imprisonment. The results are robust to different sample specifications and alternative calculations of the outcome measure giving offenders serving in prison extra time to finish the education programme. Thus, the study documents positive effects of the Danish EM programme on educational outcomes, when given to young offenders (18-25) with short-term prison sanctions who are enrolled in education at the time of conviction.

Essay 2: *Lowering the Minimum Age of Criminal Responsibility: Consequences for Juvenile Crime and Education*. This study evaluates a legal reform in Denmark and examines the following research question: Does lowering the minimum age of criminal responsibility deter young people from committing crimes? And is there a specific deterrent, null or labelling effect, of processing juvenile offenders in the criminal justice system? The policy change makes it possible to study both general and specific deterrence effects of introducing a more severe punishment to juveniles in a quasi-experimental design. The empirical analyses find no general deterrent effects of the reform to the population of 14-year-olds. The rates of reported charges for the 14-year-olds do not decline during the reform period; in fact the results point to higher rates of reported traffic offences for this group. The study also focuses on the14-year-olds who were charged with a criminal offence during the reform period and had their case processed in the criminal justice system (instead of in the social system). Here, the analyses show that 14-year-olds who committed a penal code offence during the reform and were processed in the criminal justice system have 6-7 percentage points higher recidivism rates 9 to 18 months after. Furthermore, compared to 14-year-olds who committed a penal code offence prior to the reform, the 14-year-olds who experienced formal sanctions in the criminal justice system during the reform are less likely to enrol in 9th grade, more likely to attend boarding schools and have lower exam grades. These findings point to labelling effects for juvenile offenders who were processed in the criminal justice system at the age of 14.

Essay 3: *Building Human or Criminal Capital? Classmate Peer Effects on Future Offending*. The study investigates peer influence among classmates in upper secondary vocational education and examines the research question: Do classmate peers in upper secondary vocational education influence young adults' criminal behaviour? The study uses a quasi-experimental design with fixed effects models to identify causal peer effects and explore how the transition from lower to upper secondary education, which includes a change of school and classmates, influences young adults' offending. The empirical analyses investigate both linear and nonlinear peer effects as well as a range of different heterogeneous peer effects. The findings from the analyses reveal that classmate peers in upper secondary vocational education can be both a risk and a protective factor. Hence, students who enter vocational programmes with a high level of classmates with prior crime (more than 22 percent of the students with a prior charge) increase the risk of offending within the first 12 months after enrolment with 1.8 percentage points. At the same time, the analyses also find positive peer influence as students with a history of offending reduce their risk of re-offending from 31.5 percentage points to 18.3 percentage points when they change schools and enter programmes with all new classmates with a low crime level.

Essay 4: *Transitions in Secondary Education: Exploring Effects of Social Problems*. The study examines the research question: Do social problems (including crime) during upbringing affect children's educational outcome? And do educational transitions of young offenders differ from adolescents with no interactions with the criminal justice system? The study uses the extensive Danish register data to explore the effects of different social problems during the upbringing (such as experiencing a parent with alcoholism, psychiatric illness, or a prison sentence) to students' educational choices and attainments. To control for educational selection and unobserved heterogeneity the analyses are estimated with a dynamic selection model. The results from the empirical analyses show that social problems in the family have significant and independent effects on adolescents' educational transitions. Even taking a range of different indicators for socioeconomic factors into account, children who experience social problems from age 0 to 15 have lower entry rates to and higher dropout rates from upper secondary education. Furthermore, the analyses also show that students with a prior criminal record are more likely to leave the school system after 9th or 10th grade, and if they continue to upper secondary education they are more likely to enrol in the vocational track than in general education. Moreover, students convicted of a criminal offence have about 10 percentage points higher dropout rates from upper secondary education after controlling for socioeconomic factors, other indicators of social problems during the upbringing and unobserved heterogeneity. Finally, the results from a formal decomposition analysis show the indicators of social problems explain 20-30 percent of the gap in entry- and dropout rates from upper secondary education between students with different socioeconomic background.

Looking across the four essays, the PhD project provides empirical examples of the use of micro-econometric methods to answer criminological research questions and explores some of the classic theoretical perspectives on criminal behaviour. The use of quasi-experimental research designs and advanced statistical methods made it possible to investigate causal effects in the empirical essays. All four studies contribute to the existing literature not only methodologically, but also by investigating new empirical aspects (e.g., effects on educational outcomes, influence of larger peer groups, and sanction effects to younger groups of juveniles). Because the essays study new aspects, it is difficult to make direct comparisons with prior empirical tests of the theoretical perspectives using other methods or designs and this way evaluate the implications of testing the theories with micro-econometric methods. But, each of the studies include both 'simple' estimations and the more advanced statistical models, and these comparisons of estimation methods all highlight the importance of addressing unobserved heterogeneity and selection issues to avoid effect estimates being inflated by confounding and omitted variable bias. Hence, the results from this PhD project provides new evidence to some of the classic criminological theories about labelling and peer effects and addresses the previous critique of the literature for methodological shortcomings (e.g. selection bias) by using new designs and statistical methods.

4.2. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The four essays have come some way in exploring new insights into the relationship between youth crime, sanctions, and education, but the use of register data with quantitative methods also implies limitations that introduce additional questions for future research to answer. Overall, the four essays focus on identifying causal effects in order to answer the 'what if?' questions: *What if we let young offenders serve with electronic monitoring instead of in prison? What if we sanction young offenders in the criminal justice system at a younger age? What if we enrol young offenders in upper secondary education in programmes with new peers without prior charges?* The experimental and quasi-experimental approaches give us strong research designs to answer these questions, but at the same time often leave the researcher with the 'why questions' unanswered. For example, in Essay 1, the study of electronic monitoring, it will be important to supplement the findings with qualitative research in order to understand *why* the Danish EM programme has positive effects on young offenders' educational outcomes. One element of the EM programme that could enhance the chance of completing the education programme is the fixed time schedule and the requirement to attend school. As a young offender said to his probation officer, 'Can I stay in the programme—just till I finish my exams?' The implicit 'help' to structure everyday life and the strict requirements to turn up for school can be very significant for adolescents struggling to find their way in the education system. For us to learn more about *how* alternative sanctions to imprisonment can help young offenders, by not only reducing their risk of recidivism, but also enhancing labour market attachment and education results, there is a need for more qualitative research.

Another example of how the findings from this dissertation would benefit from supplemental future research with a different methodology is found in Essay 3, which evaluates the reform that lowered the minimum age of criminal responsibility. The general notion underlying reforms of the legal system is that the policy change will be known to the public and influence individuals' decision making on whether to commit crimes. However, studies have shown that this might not be the case, as policy changes do not necessarily trickle down and influence individuals' perceptions or behaviour (Nagin, 1998; Apel, 2013). Therefore, it would be interesting to further investigate the implicit notion in crime prevention policies (and deterrence theory), and see whether young people actually know the minimum age of criminal responsibility and the difference in case processing and sanctions under and above this age threshold. It is not possible to turn back time and explore whether juveniles during the reform period were aware of the change in the age limit. But, the results in Essay 2 describing the reported offending rates in the months surrounding the birthday that determines whether the individuals is under or above the threshold, show no indications that this precise demarcation of either the 14th or 15th birthday influences the offending patterns. Therefore, it would be interesting, for example, to carry out a survey among adolescents to learn how well informed they are about the Danish legal system and examine whether it is possible to replicate some of the findings from the

American studies (e.g., Hjalmarsson, 2009b) in a country with a much more lenient criminal justice system.

In the same line, the results from Essay 3 and Essay 4 also raise questions for future research to answer. Both essays find results that can point to labelling effects experienced by young ex-offenders with a criminal record, and new research is needed on *how* criminal justice processing and public criminal records may influence not only recidivism, but also educational outcomes. Qualitative research could improve our understanding of how conventional opportunities like education can be influenced when juveniles' criminal behaviour is marked in the system, and knowledge about the institutional responses will be important to explore. This includes for example the results from Essay 3, documenting that 14-year-olds processed in the criminal justice system and with an official criminal record in the system are less likely to attend ordinary schools and more likely to be enrolled in the 9th grade at a boarding school. These findings can point to 'extra' reactions from caseworkers in the social system to juvenile offenders with an official label from the criminal justice system, as boarding schools are used for both preventive measures and placements by the social authorities. Future research should investigate these system reactions and explore whether offenders who have their criminal case processed by the justice system, instead of the social system, actually risk being double 'treated' if the social system reacts differently to juveniles with an official criminal record.

Furthermore, in Essay 4, which explores transitions in the education system, including vocational education, it would also be relevant with additional qualitative research to examine whether teachers and students experience that a public criminal record can be a hindrance for getting an apprenticeship contract with a private firm. It would be interesting to learn whether young offenders actually know that they have a public criminal record and are aware of the timeline for which it is deleted, and moreover, whether students are aware of employees' hiring preferences and thus change their behaviour accordingly (for example, by no longer applying for apprenticeship positions in private firms). Previous research evaluating a specific amendment to the rules on public criminal records for juveniles also noted that juveniles may not be aware of the law and its consequences to them (Pedersen, 2016).

Finally, I believe that future research could benefit from including the empirical findings from both criminology and economics when reviewing the existing literature (e.g., such as Chalfin and McCrary, 2017, in their review on deterrence). Moreover, as pointed out by Bushway and Reuter (2008), the look to different traditions might also inspire criminologists to apply some of the more refined methods and economists to include some of the more advanced theoretical discussions, e.g., about labelling or the mechanism behind peer effects in crime.

4.3. ONE FINAL NOTE

The dissertation set out to explore how sanctions and education are interrelated with young peoples' criminal behaviour. This empirical interest has driven my work together with an aspiration to make use of the possibilities in the extensive Danish register data. The most important point to take from this dissertation is that the type of sanctioning that the official criminal justice system in Denmark imposes on young offenders can have significant effects on their future life outcomes. In a time when 'tough-on-crime' rhetoric is still commonly used among Danish politicians, it is important to highlight that electronic monitoring as an alternative to imprisonment actually keeps young offenders out of crime (Jørgensen, 2011), enhances their labour market participation (Andersen and Andersen, 2014), and improves their educational outcomes (Larsen, 2017).

In contrast, the lowering of the minimum age of criminal responsibility in Denmark from 15 to 14 did not deter the general population of 14-year-olds from committing crimes, and the formal sanctioning of 14-year-old offenders in the criminal justice system increased their recidivism rates and lowered their educational outcomes. These important examples illustrate that the official reactions and enforcements of the criminal law undertaken in Denmark will have significant effects on the future lives of young (ex-) offenders. As the empirical evidence from Denmark is getting stronger, it is warranted that policy-makers utilise this knowledge in future polices on crime prevention and punishments of juveniles and young adults.

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Appendix A. Outline of the Planned Essay 4

Title: *Educational trajectories of delinquent juveniles: a long descending path to school dropout.*

Author: Britt Østergaard Larsen

Journal (suggestion): British Journal of Criminology

Abstract:

Across different western countries, the same pattern shows up: people with criminal records are less educated than the general population (Hjalmarsson, Holmlund, and Lindquist, 2015). In Denmark, less than 50 per cent of the group with one or more convictions complete upper secondary education by the age of 25, compared to 82 per cent of the rest of the population with no convictions (DST, 2016). Many studies examining the effects of criminal involvement on educational outcomes look at high school dropout or graduation (e.g., Aizer and Doyle, 2015; Hjalmarsson, 2008; Sweeten, 2006). This step is important in order for adolescents to enter the labour market or qualify for higher education. However, juvenile delinquents may leave the school system before entering upper secondary education, and lower high school graduation rates may be the final result of a long descending educational pathway that starts much earlier. This study explores how differences in educational attainments between young people with and without criminal justice interactions take form during adolescence. I use detailed Danish register data to follow young offenders and analyse their pathways and transitions in the education and criminal justice system. The analyses include 11 Danish birth cohorts born 1985-1995 (N=758,607 children) and administrative register data from the years 1980 to 2014 for the individuals and their parents.

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