

The Rehabilitative Effects of Criminal Sanctions: Evidence from a Juvenile Punishment Experiment

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Abstract

This paper uses data on Finnish juvenile punishment experiment to identify the effect of sanctions on recidivism, education and employment of convicted adolescents. The experiment conducted in certain municipalities sent adolescents, who - on the basis of their criminal record, were considered unsuitable to be sentenced in prison, yet no longer eligible for parole - to a rehabilitative program that aimed to improve their social skills and attachment to labor markets. We use unique data on sentences and punishments in the years 1990-2004. The criminal data is merged with the longitudinal population census file which entails detailed information on criminal activities and socio-economic background of individuals with a criminal record. We use a differences-in-differences-in-differences approach where we control for the possibility that the overall effect of punishment is different in the experiment municipalities from that of the control municipalities. We find that juvenile punishment did not have a significant effect on recidivism, but it increased the likelihood to continue school or to be employed.

Key Words: Juvenile crime, punishments, optimal penalty, recidivism, employment

JEL Codes: K14, K42, J29

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1. Introduction

Policies aimed at reducing juvenile crime are critical components in the design of an effective criminal system that minimizes the social costs of crime, because significant share of crimes are committed by adolescents¹. Current social costs of crime can therefore be reduced by focusing on the effectiveness of sanctions on young offenders' recidivism. Effective juvenile criminal system also diminishes the social cost of crime committed by adults, as current juvenile criminal activity tends to make future criminal activity more likely.²

The direct social costs of juvenile crime stem from the harm to the victims and the resources allocated to the criminal system. Indirect costs of juvenile crime emerge, for instance, in the form of lower participation and success in labor markets resulting from bad signals from criminal sanctions. The lost opportunities of the young offenders tend to affect the offenders and their families throughout their life.³ To mitigate these effects, the criminal system applies sanctions and mandatory rehabilitation programs that reduce crime through three main channels: deterrence, incapacitation and rehabilitation.

Economists have chiefly been interested in the study of the deterrence effect since Becker (1968) first introduced the framework in which criminal activities can be seen as the outcome of a relatively simple cost – benefit calculation.⁴ In reality, however, crimes occur even in the presence of most severe punishments. It is therefore equally important to focus on the incapacitation and rehabilitation effects of sanctions on recidivism.⁵

This paper analyzes the effectiveness of sanctions on recidivism and socioeconomic outcomes of a sample of adolescents using a juvenile punishment experiment conducted in seven municipalities in Finland between 1997 and 2003. The experiment introduced an additional sanction that was designed primarily for adolescents, who, on the basis of their

¹ In Finland, for instance, individuals below 18 years old commit approximately 10% of total crimes (Marttunen and Kivivuori 2004).

² See Mocan et al (2000), and Bound and Freeman (1992).

³ Mocan et al (2000), and Bound and Freeman (1992) illustrate that juvenile crime simultaneously reduces the participation in the labor market and increasing the 'criminal human capital' in the society relative to 'legal human capital'.

⁴ Additions to the theoretical analysis of crime are discussed in Kaplow and Shavell (2002) and Polinsky and Shavell (2006).

⁵ Shavell (1987) entails a model of optimal incapacitation. In the basic model where the dangerousness (the harm he will cause to society when free) of an individual is constant, regardless of the sanction or his age, Shavell derives a certain threshold level of dangerousness above which all criminals should be imprisoned for life, while criminals with lower levels are released. An extension of the basic model shows that if the dangerousness of criminals decreases with age, they should be released earlier. Furthermore, when sanctions entail rehabilitative effects on inmates, criminals should be imprisoned younger.

criminal record, were considered to be unsuitable to be sentenced in prison, yet no longer eligible for parole.⁶ The criminal data include juvenile offenders living in municipalities affected by the experiment and those not affected by the program. We also obtained data for criminals that would have been slightly too old to participate in the program in both types of municipalities.

Importantly for identification purposes, the juvenile punishment created a situation where otherwise similar criminals were not given the juvenile punishment if they were living in municipalities that were not affected by the experiment. We use a differences-in-differences-in-differences approach where the juvenile offenders in the experiment municipalities are considered the treatment group and the juvenile offenders with similar background in other municipalities as the control group. Moreover, using data on other age groups we control for the possibility that the overall deterrence effect of punishment is different in the experiment municipalities from that of the control municipalities. As such this is one of the first attempts to disentangle a causal effect of the punishment experiment on the subsequent criminal and other behavior of adolescents.

We obtained micro-level data on the criminal punishments and criminal history of adolescents who were sentenced during 1990-2004. The criminal data was merged with the longitudinal population census file including several socioeconomic variables on the adolescents and their parents, including the criminal history of the parents. Such data have previously been unavailable to researchers. The data can help in identifying the effects of sanctions by controlling for rich variety of factors that shape the criminal behavior of adolescents. The data is rich in terms of information on the municipality of residence and various family background characteristics of these individuals. The data also includes information on the individuals' education, earlier and later criminal activities and job market outcomes.

The results show that the experiment did not have a significant impact on crime rates. For example, the effect of juvenile punishment on recidivism during the first post-release year seems to be positive. This may be explained by the fact that the criminal population in the comparison group that is most likely to offend spends some more time in prison in the first year after the conviction. The incapacitation effect of prison sanctions may therefore explain

⁶ Marttunen and Takala (2002) examine the propensity for future criminal activity of adolescents, who were subject to the experiment. They did not, however, use control groups to examine the differences between the behavior of individuals in and out of experiment.

why we see a nonnegative effect on reoffending. As for the employment outcomes, we find that in the long run the juvenile punishment significantly increased likelihood of employment. This may indicate that the rehabilitative effect of the experiment increased the social and work related skills of the members of the experimental group and consequently improved their labor market situation.

2. Previous Literature

The predictions of the model by Becker (1968) have been refined multiple times and tested empirically.⁷ The empirical research has focused on wide range of issues related to crime: peer effects and social interactions among criminals (Glaeser, Sacerdote and Scheinkman, 2004; Kling, Ludwig and Katz, 2005), education (Lochner and Moretti, 2004), family structure and background effects (Donohue and Levitt, 2001), the effect of policing and incarcerations (Levitt, 1996, 1997, 1998), age discontinuities in the structure of punishments (Lee and McCrary, 2005) and the relationship between physical attractiveness and crime (Mocan and Tekin 2008).

In general, studies focusing on the link between prison conditions and recidivism (Chen and Shapiro 2007; and Drago et al 2008) find that harsher prison conditions are associated with significantly increased post release crime. These results support the argument that when inmates are exposed to inmates with more severe criminal tendencies there might be a peer effect that increases the risk of future arrests.⁸

Previous work on punishments has analyzed both the ex-ante crime prevention effects as well as the ex-post effects on recidivism. A typical problem in these studies is the measurement error of reported crimes (see e.g. Levitt 1997). Moreover, it is usually difficult to fully control for the criminal history and the previous punishments for the older criminals, making it more difficult to evaluate the effect of a specific sanction on their future outcomes. An advantage of studying young criminals is that one can eliminate the effect of their previous criminal experiences concentrating on the initial convictions. A few studies have followed the criminal careers of young offenders who were differentially punished after their early crimes. Those

⁷ Additions to the theoretical analysis of crime are discussed in Kaplow and Shavell (2002) and Polisky and Shavell (2006).

⁸ Drago et al (2008) fail to establish causal link between recidivism and prison conditions when using overcrowding and prison deaths as proxies of prison conditions. Drago et al, however, find that isolation of the prison, measured by the distance between the prison and the closest town, contributes to higher increased recidivism.

receiving harsher penalties earlier in their criminal career were less likely to commit further crimes in future.⁹ While hardly any studies have been able to utilize a treatment – control group approach, meta analyses of a large selection of different programs have shown that employment programs have been most effective in treating juvenile criminals and vocational programs have been least effective (Lipsey, 1992).

Earlier studies have found adverse effects of incarceration on other outcomes, including future earnings and employment (Bushway, 1996; Fagan and Freeman, 1997; Grogger, 1995; Waldfogel, 1992). The problem with many of these studies is the lack of detailed information on personal characteristics of the offenders that may simultaneously affect their criminal behavior and later labor market outcomes. The Finnish data can help in identifying the effect by controlling for a rich variety of such characteristics.

A number studies indicate that a vast majority of crimes are committed by young, male offenders (Freeman, 1999b). Crime is also related to poverty and disadvantaged family backgrounds (Freeman, 1999b; Kaufman and Widom 1999). These observation combined with the fact that previous offenders are likely to recidivate (NUMBER – USA, Finland) implies that the prevention of criminal activity should focus on the early criminal experiences. This idea resembles the prediction derived by Shavel (1987), who claims that when a sanction entails a rehabilitation effect, the sanctions should be applied to offenders in earlier stages of life.

The estimates for average number of crimes per criminal vary widely, from just a few crimes to as many as 180 crimes per year (Freeman, 1999b; Marvel and Moody, 1994), suggest that the rehabilitative effect of sanctions may differ between individuals. From a social policy perspective, it is therefore important to understand whether some traits of the criminal system can help young offenders with different socioeconomic backgrounds to achieve better outcomes in future. Since the data used in this study include many family characteristics and other background variables, the analysis gives credible estimates on the risk that an individual recidivates after a given sanction. These findings help understand how sanctions reduce crime and the related social costs, and may offer some guidelines as to the optimal design of an efficient criminal system.

3. Juvenile punishment experiment - description

⁹ Wilson (1998) summarizes these studies.

3.1 Experiment and adoption

The juvenile punishment was introduced in 1997 as an experimental punishment scheme in seven urban municipalities, containing about a third of the Finnish population and almost exactly the same proportion of youth criminal activity. Originally, the experiment was scheduled to run for three years. However, it was eventually continued twice, first for two additional years (2000-2001), and then for three more years. The experiment lasted until 2004, and in 2005 the Juvenile Punishment Act was passed, extending the juvenile punishment scheme to the entire country.

The experiment was initially adopted very slowly, and only applied to cases where the young offender already had a previous criminal record containing at least one probationary sentence. The slow adoption pace of the new punishment led to an amendment of the Law on Juvenile Punishment in 1998. The objective of the 1998 Amendment was to extend the application of juvenile punishment to other cases including those offences before the first probationary sentence of imprisonment.

According to Marttunen and Takala (2002), around 60 young offenders had been sentenced to juvenile punishment each year by the end of 2001. This corresponds to 20 percent of probationary prison sentences for the young offenders in the experimental municipalities. The 1998 Amendment of the Act triggered a significant increase in the use of the juvenile punishment.

3.2 Target group, objectives and implementation

Criminals aged 15-17 can be sentenced with the juvenile punishment if imprisonment is considered to be too severe and a fine too lenient a punishment. In severity, the juvenile punishment is comparable to a probationary prison sentence.

The length of juvenile punishment can vary from 4 months to a year. The punishment program consists of supervisory meetings, various programs aimed at improving social interactions and social capabilities, various counselling and support activities, and work internships. The aim of the juvenile punishment is to assist the young person to survive better in the society and to prevent involvement in further criminal activity. In many cases the counselling also involves themes such as anger management and the abuse of alcohol or drugs.

The Act contains provisions for cases where the offender neglects to adhere to the conditions of the enforcement plan. If the person sentenced to juvenile punishment violates the enforcement plan, the Probation Service would first serve him a written warning. In the case of more serious violations, such as interrupting the punishment, a report is prepared for the prosecutor in the matter who may take it to court. A typical sanction for a serious violation would usually be a probationary imprisonment, supplemented (in about one half of the cases) with a fine.

3.3 Offences and recidivism

The typical offences sentenced with the juvenile punishment are assaults and thefts, which are very common among young offenders. The average number of service hours ordered was 33, and the average length of supervision was eight months. [UPDATE THIS FOR 2002-2004].

About two thirds of the young offenders receiving a juvenile punishment had at least one probationary sentence of imprisonment (Marttunen and Takala, 2002). A typical offender had two or three prior sentences. These offenders tended to also have prior child welfare issues, mental health problems and problems of alcohol or drug abuse. To summarize, the offenders sentenced with juvenile punishment came from harsh backgrounds and had already been the focus of various welfare measures and programs.

The young offenders had a difficult time adhering to the program. More than a third interrupted the sentence at some point. A significant portion of the offenders committed further offences during the juvenile punishment period.

3.4 Effectiveness of the juvenile punishment

The initial analyses of the juvenile punishment gave a pessimistic view of its effectiveness in preventing recidivism. For example, Marttunen and Takala (2002) concluded that during a twelve-month follow-up period, at least 57 percent of the youth sentenced to a juvenile punishment committed a new offence for which they received at least a probationary prison sentence. On average, the young offenders committed 7.7 new registered offences for each 12 months after their first juvenile punishment. The authors do admit that their study did not have a proper comparison group, nor did it control for the background factors affecting criminal activity and recidivism.

4. Data and Crime Statistics

To estimate the effect of juvenile punishment experiment on recidivism, educational attainment and probability of employment, we use longitudinal data on individual criminal activities between 1990 and 2004 collected by Statistics Finland. The data on criminal activities and punishments have been merged with the longitudinal population census file, which contains information on the offenders' family background, pre-conviction activities and their post-release activities. In comparison to the aggregate level data used in previous studies in economic literature, the Finnish micro-data constitutes a unique source of information on the criminal history and socio-economic background of individuals with a criminal record.

The population census file consist of information on the persons' age (aged 15-20 years), gender, residential area (municipality), education and labor market status, and indicators of their family background. These data have been merged with the criminal data. The criminal data includes aggregate data on crime rates divided into subcategories on the basis of the type of crime and location. The micro level data on the criminal history of the individuals involve detailed information on dates and locations where the crimes took place, convictions and the nature of the punishments. The aggregate criminal data also entail the information on the criminal activity reported in the region as well as the percentage of crimes solved by the police. As for the parents of the young offenders, the data include information on whether either parent has ever served time in prison or on parole.

The data covers approximately 90% of all male offenders subject to the juvenile crime experiment in Finland and about 25% of all 15-20 year old male offenders. For each offender we observe the entire criminal history, including all past crimes and the corresponding crimes. In the case of most offenders, we observe several crimes resulting in sanctions. Therefore, the crimes are categorized as 1) the principal crime resulting in punishment and 2) additional crimes that were secondary reasons for punishment.

We construct the samples for the empirical analysis as follows. We focus on two age groups. The first group includes offenders eligible for juvenile punishment. These individuals were 15-17 years old at the time when they committed a crime. The offenders in the second group are slightly older. They were 18-20 years old at the time of the crime. The older offenders were therefore no longer subject to the juvenile criminal system.

We further divide data to individuals who received a sanction in a municipal court which belonged to the group of the experiment municipalities and to individuals who were received their sanction in a non-experimental municipal court. Our treatment group includes offenders who were 15-17 years old at the time of the crime and who received a sanction in experimental municipal courts. We focus on individuals who were sentenced in the years 1994-1999 and follow their criminal activities and socioeconomic outcomes for 4 years after the sentence.

The experiment was designed for young offenders who were considered unsuitable to be sentenced in prison, yet no longer eligible for parole. On the basis of this initial target group for the actual experiment, we believe that a plausible comparison group consists of those offenders whose sanction was imprisonment or probation.

In our data, fines are clearly the largest category of all sanctions, and the offenders who were subject to the juvenile experiment are the smallest category (see table 1). The crimes subject to a fine tend to be petty crimes, and not comparable to those resulting in a juvenile punishment. Therefore, we exclude fines from the data, meaning that our control and treatment groups include individuals sentenced to other punishments than a mere fine. Table 2 reports the means of background characteristics for our treatment and control group of individuals before and after the Juvenile Punishment Act came into effect in 1997¹⁰. We see that property crime is the dominant offense in all punishment groups and that probation is the sanction applied to most offenders.

Table 1 here

5. Differences-in-Differences-in-Differences Model

Table 3 illustrates DDD estimation on the effect of juvenile punishment experiment on crime rates in the second year after sentence. The top panel compares the change in crime rates for the treatment group before and after the introduction of the experiment to change 15-17-year-old-criminals sentenced in other municipalities. The before years are 1994, 1995, and 1996. After years are 1997, 1998, 1997. The law of Juvenile Punishment came into effect in February 1997. Each cell contains the crime rate for the group labelled on the axes, along with standard errors and the number of observations. There is an increase in crime rates for

¹⁰ When looking outcomes in different years after the first sentence we calculate also crimes for which the individual was sentenced to fines.

young individuals in both groups during this period. The difference-in-differences estimate, i.e. the difference in the changes of the crime rate between the young sentenced in experimental municipalities and young sentenced in nonexperimental municipalities is -1.1 per cent. If there was a shock that affected all criminals in experimental locations over this period, this estimate would not correctly identify the impact of the juvenile punishment experiment. In the bottom panel we perform the same exercise for older individuals. The difference between the change in crime rates for those in experimental municipalities and other municipalities is positive, 3.6 per cent. Taking the difference between these two panels, we get the DDD estimate, which is negative but not statistically significant.

We obtain exactly same results using the regression framework. Moreover, in regression framework we can control for observational characteristics that may differ between our treatment and control groups. The regression equation has the following form:

$$Y_{ijt+k} = \alpha + \beta_1 X_{ijt} + \beta_2 AFTER_t + \beta_3 Exp_j + \beta_4 Young_i + \beta_5 (Exp_j * Young_j) + \beta_6 (Exp_j * AFTER_t) + \beta_7 (AFTER_t * Young_i) + \beta_8 (Exp_j * AFTER_t * Young_i)$$

Where subscript i refers to individual, j to the municipality of court where individual was sentenced, and t to the year of sentence. Y_{ijt+k} is outcome: indicator variable which takes the value one if individual committed a crime in the k^{th} post sentence year. We also use other outcome measures: whether individual is at school, has more than compulsory education or is employed in *year t+k*. $AFTER_t$ is a dummy for post experience periods controls for common period shocks, $Young_i$ is a age group dummy for 15-17-year-old criminals, which controls for permanent differences between older and younger individuals. Exp_j is a dummy for being sentenced in experimental municipality (controls for permanent differences between experimental and nonexperimental municipalities), $Exp_j * Young_i$ controls for time-invariant characteristics of the treatment group, $Exp_j * AFTER_t$ controls for the time-specific shocks that affect the outcome of individuals sentenced in experimental courts, and $AFTER_t * Young_i$ captures the common time-specific shocks to young individuals. The third level interaction term (β_8) captures all variation in outcome specific to young criminals sentenced in experimental locations after the introduction of juvenile punishment. This coefficient gives us the “difference-in-difference-in-differences” (DDD) estimator. Its identifying assumption is that there is no contemporaneous shock that affects the relative outcomes of the treatment group differently than other young criminals or other criminals in experimental locations. We

also include a vector of control variables X_{ijt} in order to take into account the systematic differences between our control and treatment groups.

6. Results

We examine the effect of juvenile punishment on various outcomes. We begin by looking the effect on crime rates in different post sentence years. Then we distinguish between violent crime and property crime. And finally we look whether juvenile punishment experiment affected education or employability of the criminals.

Table 4 reports the results on crime rates in different post sentence years $t+1$ to $t+4$. The first column reports the coefficient on variable ($Exp_j * Young * AFTER_t$) from equation (1). We focus on individuals who were sentenced in years 1994-1999, and follow their outcomes 4 years after the first sentence (using data for years 1997-2003).

The results show that the juvenile punishment experiment did not have a significant impact on crime rates in the post sentence years. The effect of the experiment seems to be positive although insignificant in the year immediately following the first sentence ($t+1$). This may be explained by the fact that the comparison group individuals that are most likely to commit crime may be more likely to be sentenced to prison in year t . Thus the incapacitation effect of other punishments may explain why we may see nonnegative effect on reoffending. In the second column we report the coefficients of the same variable, but now include additional control variables X_{ijt} . These include: dummy if father has no more than compulsory schooling, mother has no more than comp. schooling, father employed, mother employed, urban region, employed, parent sentenced 1977-2004, mother dead when sentenced, father dead, Finnish mother tongue, and dummies for categories of the share of crimes that are solved of all reported crimes in the municipality. The inclusion of control variables changes our results very little. It seems that juvenile punishment experiment had no effect on reoffending of young criminals.

In table 5 we look the effect on the probability to commit a violent crime after the first sentence. Violent crime includes murder, assaults, and rape. In the first year after the initial sentence the effect is positive, but becomes negative in later years. However the effect is not significant at any time. In table 6 we report the results of model, where the dependent variable is an indicator that describes whether person who was sentenced in year t committed

a property crime in years $t+1$ to $t+4$. The effect on property crime is negative in three first years after the initial sentence, and negative in the last. However, the effect is statistically insignificant in all years.

In table 8 we report the results of regression, where we look whether juvenile punishment experiment affected probability to commit a crime for which the person is sentenced to prison. Now we interestingly see a positive and significant effect on the first year after the initial sentence. This may be that for individuals that are most likely to commit these types of crimes, the control groups individuals were sentenced to prison in year t , and thus the incapacitation effect explains why for the treatment group the effect is positive. After the first post sentence year, we find no difference in the probability to commit a crime that leads to imprisonment.

We next move on to study the effect of juvenile punishment on other outcomes. Because our treatment group individuals were relatively young when they committed a crime, we are interested in knowing whether the juvenile punishment increased the likelihood to continue school. In table 9 we report the effect on probability to be a student in a given post sentenced year. It seems that juvenile punishment did have a positive effect on probability to be a student, but the effect is insignificant in all years. In table 10 we report the results of model where we look the effect on probability to have more than compulsory education. The effect on schooling is again positive, but insignificant.

Finally, in table 11 we report the results on how juvenile punishment affects employment. We find no effects on the years immediately after the first sentence, which could be due to the fact that the treatment group individuals are relatively young and still likely to be at school. However, the results show a strong positive and significant effect on employability in the third and the fourth post sentence years.

7. Discussion

This study examines how Juvenile punishment experiment affects crime, education and employment of young criminals. The Juvenile punishment experiment allows the juvenile criminals be sent to a program which aims at improving their social skills and increasing their attachment to labor markets. We find that the experiment did not have a significant effect on probability to commit a crime in the future. This may be partly due to incapacitation effect of other punishments.

The experiment seems to clearly increase the employability of young individuals. One explanation for this effect is the rehabilitation component of the experiment. This argument may indicate that experiment appears successful. This interpretation can be challenged, because it is equally plausible to assume that other sanctions, especially imprisonment, leave a stronger negative signal on young offenders who enter the labor market after the release. This means that positive effect of the experiment is driven by the negative effect of other sanctions. The positive effects on the education, however, support the explanation of a positive rehabilitation effect, because criminal records do not have an effect on whether an individual can enter a school.

The results obtained thus far are preliminary. The next steps of the analysis entail, for example, analyzing how different sanctions affect outcomes (juvenile punishment vs. prison vs. parole), following the post release crimes cumulatively, examining whether the nature of the crimes change after the juvenile punishment (i.e. those offenders who find work may engage in different harmful activities than those who served time in prison and are unemployed), and including even a richer set of control variables (Parents' income, unemployment rates, etc).

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TABLES AND RESULTS

Table 1 Punishments by Crime types 15-17-year-old sentenced in years 1997-2004

Punishment	Crime						Total
	1. Property	2. Violent (not rape)	3. Rape	4. Crime against justice or police	5. Traffic	6. Other (incl. alcohol, drugs)	
1. Imprisonment	154	37	4	3	31	22	251
%	(61.35)	(14.74)	(1.59)	(1.20)	(12.35)	(8.76)	(100.00)
2. Community service	53	25	0	1	23	7	109
%	(48.62)	(22.94)	(0.00)	(0.92)	(21.10)	(6.42)	(100.00)
3. Probation+fine	51	25	0	4	154	6	240
%	(21.25)	(10.42)	(0.00)	(1.67)	(64.17)	(2.50)	(100.00)
4. Probation	850	372	15	18	210	124	1,589
%	(53.49)	(23.41)	(0.94)	(1.13)	(13.22)	(7.80)	(100.00)
5. Fine	2,265	1,125	3	114	1,835	774	6,116
%	(37.03)	(18.39)	(0.05)	(1.86)	(30.00)	(12.66)	(100.00)
6. Juvenile punishment	169	74	0	7	47	31	328
%	(51.52)	(22.56)	(0.00)	(2.13)	(14.33)	(9.45)	(100.00)
7. No sentence	169	66	3	13	58	109	418
%	(40.43)	(15.79)	(0.72)	(3.11)	(13.88)	(26.08)	(100.00)
8. Other	3	0	0	0	0	2	5
%	(60.00)	(0.00)	(0.00)	(0.00)	(0.00)	(40.00)	(100.00)
Total	3,714	1,724	25	160	2,358	1,075	9,056
%	(41.01)	(19.04)	(0.28)	(1.77)	(26.04)	(11.87)	(100.00)

Table 2 Means of background characteristics before and after experiment by treatment status (age and location)

Variable	Treatment group: 15-17 year-old-sentenced in <i>experimental</i> municipalities		15-17 year-old-sentenced in <i>nonexperimental</i> municipalities		18-20 year-old-sentenced in <i>experimental</i> municipalities		18-20 year-old-sentenced in <i>nonexperimental</i> municipalities	
	Before Mean	After Mean	Before Mean	After Mean	Before Mean	After Mean	Before Mean	After Mean
Finnish	0,94	0,95	0,92	0,95	0,93	0,96	0,93	0,96
Not more than compulsory schooling*	0,98	0,98	0,94	0,96	0,82	0,84	0,77	0,75
Employed*	0,08	0,13	0,08	0,11	0,11	0,14	0,13	0,19
Student*	0,41	0,37	0,44	0,43	0,14	0,19	0,15	0,21
Mother has no education*	0,51	0,54	0,48	0,49	0,52	0,53	0,47	0,43
Father has no education*	0,48	0,50	0,52	0,52	0,58	0,48	0,55	0,52
Mothers income**	2,06	1,92	1,89	1,81	1,90	1,99	1,80	1,89
Father employed*	0,41	0,43	0,45	0,47	0,45	0,45	0,44	0,47
Mother employed*	0,59	0,56	0,55	0,58	0,56	0,58	0,52	0,58
Share of crimes solved*	0,04	0,05	0,23	0,21	0,07	0,06	0,26	0,23
mother dead*	0,02	0,02	0,01	0,01	0,04	0,03	0,03	0,03
father dead*	0,06	0,11	0,06	0,09	0,09	0,09	0,09	0,09
Parent committed crime between 1977-2004	0,06	0,11	0,08	0,12	0,10	0,10	0,05	0,07
Observations	563	611	744	612	701	675	1511	1405

*when convicted. ** 0=0 income, 1 is lowest quantile, 5=largest. Before years: 1994, 1995 and 1996. After years: 1997, 1998, 1999. Law of juvenile punishment came force in February 1997.

TABLE 3 DDD Estimates of the Impact of Juvenile Punishment Law on Crime Rate at t+2

Crime in t+2				
Location/year				
Young 15-17	before	after	difference	diff-in-diff
Experimental locations	.551 (.498) [563]	.610 (.488) [397]	.060 (.029)	
Nonexperimental locations	.497 (.500) [744]	.567 (.496) [612]	.071 (.027)	-.011 (.040)
Older 18-20	before	after	difference	diff-in-diff
Experimental locations	.492 (.500) [701]	.484 (.500) [675]	-.008 (.027)	
Nonexperimental locations	.491 (.500) [1511]	.447 (.497) [1405]	-.044 (.018)	.036 (.033)
			DDD:	-.047

Cell contains mean crime rate for the group identified (i.e. share of individuals that were sentenced in t, who committed crime in t+2). Standard errors (clustered by individuals) are given in parenthesis; sample sizes are given in square brackets. *Crime=1, individual has committed a crime in a given year (can be a minor crime, and not be used as the principal reason for punishment)*. Before years: 1994, 1995 and 1996. After years: 1997, 1998, 1999. Law of juvenile punishment came into force February 1997.

TABLE 4 The effect of juvenile punishment experiment on crime rates in post sentence years

Outcome: commits crime during the year		
Time (after sentence year t):	(1)	(2)
t+1	DDD	DDD+controls
After*TREATMENT	0.022 (0.051)	0.033 (0.050)
t+2	DDD	DDD+controls
After*TREATMENT	-0.047 (0.051)	-0.034 (0.050)
t+3	DDD	DDD+controls
After*TREATMENT	-0.041 (0.051)	-0.030 (0.050)
t+3	DDD	DDD+controls
After*TREATMENT	0.005 (0.051)	0.014 (0.050)
Observations	6823	6823

Table reports the coefficients on variable treatment*after interaction of separate regressions for each post sentence year, where the outcome is a dummy variable that describes whether individual committed a crime in a given post sentence year. Treatment group is 15-17 year olds who were convicted in experimental municipalities. Data consists of 15-20 year old people, who were sentenced during 1994-1999. DDD specification includes, dummy for after years (1994, 1995, 1996), after*experimental municipality interaction, dummy for experimental municipalities, dummy for age group 15-17, after*15-17 age group interaction, and after*treatment (15-20 in exp.munic) interaction. Additional controls include: dummy for father has no more than compulsory schooling, mother has no more than comp. schooling, father employed, mother employed, urban region, employed, parent sentenced 1977-2004, mother dead when sentenced, father dead, finnish mother tongue, and dummies for categories how many crimes solved from reported crimes in municipality. Table A2 reports the results with controls.

TABLE 5 The effect of juvenile punishment experiment on violent crime

Outcome: commits a violent crime during the year		
	(1)	(2)
t+1	DDD	DDD+controls
After*TREATMENT	0.027 (0.035)	0.027 (0.035)
t+2	DDD	DDD+controls
After*TREATMENT	-0.005 (0.035)	-0.005 (0.034)
t+3	DDD	DDD+controls
After*TREATMENT	-0.056 (0.032)	-0.053 (0.032)
t+3	DDD	DDD+controls
After*TREATMENT	-0.007 (0.031)	-0.002 (0.031)
Observations	6823	6823

Violent crime include murder, assaults and rape. Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

TABLE 6 The effect of juvenile punishment experiment on property crime

Outcome: commits a property crime during the year		
	(1)	(2)
t+1	DDD	DDD+controls
After*TREATMENT	-0.012 (0.050)	-0.003 (0.050)
t+2	DDD	DDD+controls
After*TREATMENT	-0.034 (0.049)	-0.024 (0.048)
t+3	DDD	DDD+controls
After*TREATMENT	-0.066 (0.047)	-0.055 (0.046)
t+3	DDD	DDD+controls
After*TREATMENT	0.072 (0.045)	0.078 (0.044)
Observations	6823	6823

Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

Table 7 Effect of juvenile punishment on other crime (traffic, alcohol, drug)

Outcome: commits a other crime (traffic, alcohol, drug) during the year		
	(1)	(2)
t+1	DDD	DDD+controls
After*TREATMENT	0.038 (0.050)	0.049 (0.050)
After*TREATMENT	DDD -0.063 (0.050)	DDD+controls -0.054 (0.049)
After*TREATMENT	DDD 0.005 (0.048)	DDD+controls 0.011 (0.048)
After*TREATMENT	DDD 0.037 (0.048)	DDD+controls 0.043 (0.047)
Observations	6823	6823

Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

Table 8 Effect on crime for which person is sentenced to prison

Outcome: commits a other crime during the year, for which person is sentenced to prison		
	(1)	(2)
After*TREATMENT	DDD 0.092 (0.045)*	DDD+controls 0.099 (0.044)*
After*TREATMENT	DDD -0.034 (0.045)	DDD+controls -0.024 (0.045)
After*TREATMENT	DDD 0.018 (0.043)	DDD+controls 0.024 (0.042)
After*TREATMENT	DDD 0.019 (0.043)	DDD+controls 0.025 (0.042)
Observations	6823	6823

Commits a crime which is used as a principal reason for imprisonment. Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

Table 9 Effect on probability to be at school

Outcome: person is a student		
	(1)	(2)
	DDD	DDD+controls
After*TREATMENT	0.019 (0.042)	0.028 (0.041)
	DDD	DDD+controls
After*TREATMENT	0.046 (0.039)	0.054 (0.038)
	DDD	DDD+controls
After*TREATMENT	0.032 (0.035)	0.039 (0.035)
	DDD	DDD+controls
After*TREATMENT	0.018 (0.032)	0.022 (0.032)
Observations	6823	6823

Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

Table 10 Effect on the propability to have more than compulsory schooling

Outcome: Has more than compulsory education		
	(1)	(2)
	DDD	DDD+controls
After*TREATMENT	0.061 (0.039)	0.058 (0.038)
	DDD	DDD+controls
After*TREATMENT	0.059 (0.041)	0.057 (0.040)
	DDD	DDD+controls
After*TREATMENT	0.051 (0.043)	0.048 (0.041)
	DDD	DDD+controls
After*TREATMENT	0.043 (0.044)	0.041 (0.042)
Observations	6823	6823

Standard errors in parentheses. * significant at 5%; ** significant at 1%

Table 11 Effect on probability to be employed

Outcome: person is employed

	(1)	(2)
	DDD	DDD+controls
After*TREATMENT	-0.010 (0.039)	-0.031 (0.037)
	DDD	DDD+controls
After*TREATMENT	-0.017 (0.043)	-0.039 (0.041)
	DDD	DDD+controls
After*TREATMENT	0.114 (0.046)*	0.093 (0.044)*
	DDD	DDD+controls
After*TREATMENT	0.186 (0.047)**	0.165 (0.045)**
Observations	6823	6823

Standard errors in parentheses. * significant at 5%; ** significant at 1%. See text under table 4.

Table A1. Punishment types for sentences in years 1990-2004 by location of municipal court and age.

<i>Experiment mun.</i>	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2001	2003	2004
<i>young 15-17</i>															
1. Imprisonment	24	37	22	28	17	12	16	21	37	23	17	18	25	2	12
2. Community serv.					1	2	6	5	9	1	3	9	4	1	1
3. Probation+fine	6	11	5	10	2	9	3	5	6	6	9	8	4	5	10
4. Probation	162	133	149	133	114	103	136	122	64	91	111	97	60	45	53
5. Fine	335	363	304	285	195	197	208	233	218	227	304	288	198	182	200
6. Juvenile punish.								39	36	59	86	36	21	24	27
7. No sentence	152	102	89	64	63	45	57	43	34	28	31	32	14	10	19
8. Other	1									3			1		
Total	680	646	569	520	392	368	426	468	404	438	561	488	327	269	322
<i>Older 18-20</i>															
1. Imprisonment	113	106	142	117	97	94	92	65	85	147	168	150	133	101	91
2. Community serv.			2	4	9	18	26	39	41	31	28	39	34	27	23
3. Probation+fine	24	25	19	14	16	36	21	29	28	30	29	44	59	43	61
4. Probation	145	97	157	136	104	92	84	62	78	75	130	92	114	95	76
5. Fine	550	516	428	379	343	340	338	326	331	360	430	473	411	380	357
6. Juvenile punish.															
7. No sentence	15	10	10	6	5	6	10	8	8	4	2	14	13	2	6
8. Other	8	3	2		2		1			1	7				1
Total	855	757	760	656	576	586	572	529	571	648	794	812	764	648	615
<i>Non-Exp. munic.</i>															
<i>Young 15-17</i>															
1. Imprisonment	54	73	62	34	16	16	14	15	21	7	14	9	9	7	14
2. Community serv.					7	10	3	12	10	11	13	6	12	5	7
3. Probation+fine	40	26	27	32	23	25	22	26	29	23	19	23	17	22	28
4. Probation	351	251	229	238	175	186	144	153	130	101	129	128	106	106	93
5. Fine	879	840	802	649	618	638	504	567	475	543	616	620	477	467	501
6. Juvenile punish.															
7. No sentence	81	54	45	47	40	37	32	35	24	26	22	34	18	27	21
8. Other				1											1
Total	1,405	1,244	1,165	1,001	879	912	719	808	689	711	813	820	639	634	665
<i>Older 18-20</i>															
1. Imprisonment	262	252	253	231	212	127	110	95	106	116	139	142	151	146	142
2. Community serv.			4	9	32	56	73	61	77	90	98	72	74	73	62
3. Probation+fine	149	140	118	95	91	117	113	118	119	118	140	153	145	171	211

4. Probation	277	271	223	231	199	193	161	175	152	145	175	178	226	191	175
5. Fine	1,241	1,183	1,055	823	792	710	703	722	745	752	863	954	869	863	958
6. Juvenile punish.															
7. No sentence	7	15	13	9	16	7	12	17	6	9	13	11	10	7	7
8. Other	9	7	9	7	6	5	5	7	5	5	2	3	2	1	
Total	1,945	1,868	1,675	1,405	1,348	1,215	1,177	1,195	1,210	1,235	1,430	1,513	1,477	1,452	1,555

A2. Table with additional control variables reported

Outcome: Commits crime in year t+1 (one year after sentenced)

	DDD	DDD+controls
After*TREATMENT	0.022 (0.051)	0.033 (0.050)
father no education		-0.002 (0.013)
mother no education		0.026 (0.012)*
father employed		-0.096 (0.013)**
mother employed		-0.053 (0.012)**
Urban region		0.053 (0.016)**
Employed		-0.143 (0.018)**
Parent sentenced		0.090 (0.022)**
Mother dead		-0.015 (0.040)
Father dead		-0.010 (0.023)
Finnish mother tongue		0.005 (0.025)
Observations	6823	6823
R-squared	0.01	0.05

Treatment include 15-17 year old sentenced in experimental municipalities. Standard errors in parentheses. * significant at 5%; ** significant at 1%. variables that are not reported include after, young (15-17), after*young, after*experimental, young*experimental (in both columns), and categories for crimes solved from reported crimes (column 2).