

Public Economics II: Public Expenditures

Lecture 7: Criminal Justice

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The Rational Model of Crime (Becker 1968)

- In response to sociological, criminological and psychological theories Becker (1968) proposed the “rational” model of crime.
- His goal was to build a more general theory of which previous non-economic theories could be incorporated as special cases.
- Chicago view: all individuals are rational utility maximizers and so the decision to commit crime can be framed as a utility maximization problem

The Rational Model of Crime (Becker 1968)

- Becker assumes that an individual will commit a crime if:

$$EU = (1 - p)U(Y) + pU(Y - F) \geq \bar{U}_L$$

- where:

- ▶ p - is the probability of being caught and punished for a crime
 - ▶ Y - is the monetary gain from committing a crime
 - ▶ F - is the monetary cost of the imposed punishment if caught
 - ▶ \bar{U}_L - is the utility of instead choosing legitimate activities
- Here crime is a fully extensive margin choice: either you commit crime or you don't and work/partake in legitimate activities.

The Rational Model of Crime (Becker 1968)

- Based on these preferences Becker posited the supply of offences:

$$O = O(F, p, u)$$

- where: u is a portmanteau variable representing all other influences on crime
- Becker's analysis heavily focused on **deterrence** he assumed that:

$$\frac{\partial O}{\partial F}, \frac{\partial O}{\partial p} < 0$$

i.e. if you increase the probability of punishment for crime or the punishment itself crime will decrease.

- In public economics we might also be concerned about factors in \bar{U}_L/u , such as wages w or transfers T would we have:

$$\frac{\partial O}{\partial w}, \frac{\partial O}{\partial T} < 0$$

- In reality the choice between criminal activity and legal work is not always dichotomous
- People engage in both at the same time regularly
- Ehrlich (1973) expands upon Becker and models the intensive margin choice of splitting one's time between the two activities

The Rational Model of Crime (Ehrlich 1973)

- Individual splits time t between illegal activity t_i and legitimate work $t - t_i$
- Define income if caught X_a and if not caught X_b :

$$X_a = W_0 + W_i(t_i) + W_L(t - t_i) - F_i(t_i)$$

$$X_b = W_0 + W_i(t_i) + W_L(t - t_i)$$

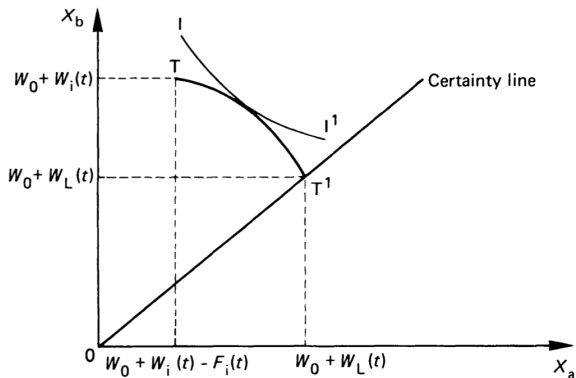
- Individuals choose t_i to maximize expected utility:

$$pU(X_a) + (1 - p)U(X_b)$$

- where:

- ▶ W_0 - is initial wealth
- ▶ $W_i(t_i)$ - is income gained from illegal activity (increasing in t_i)
- ▶ $W_L(t - t_i)$ - is income gained from legitimate activity (decreasing in t_i)
- ▶ $F_i(t_i)$ - is the penalty if caught (increasing in t_i)
- ▶ p - is the probability of being caught and punished for a crime

Optimality Condition (Ehrlich 1973)



$$\frac{-pU'(X_a)}{(1-p)U'(X_b)} = \frac{W'_i(t_i) - W'_L(t - t_i)}{W'_i(t_i) - W'_L(t - t_i) - F'(t_i)}$$

The Rational Model of Crime (Ehrlich 1973)

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- At the extensive margin $U'(X_a) = U'(X_b)$ and therefore rearranging the FOCs we find that individuals will only commit crime if:

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- If $F'(t_i)$ increases crime is reduced
- If the marginal return to crime $W'_i(t_i) - W'_L(t - t_i)$ decreases (i.e. the return to work $W'_L(t - t_i)$ increases) crime will decrease

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- If the marginal return to crime $W'(t_i) - W'(t - t_i)$ decreases (i.e. the return to work $W'(t - t_i)$ increases) crime will decrease
- What about transfers?

The rational model of crime suggests 3 policy levers with which to reduce crime in two broad categories:

① Deterrence

- p : increase monitoring (police)
- f : increase the penalty if convicted. Could be a fine or incarceration

② Improved outside option:

- Improve wages and/or employment opportunities
- Transfers?

Prediction 2 - Employment and Wages

Channels through which loss of employment can affect criminal involvement

- - 1 Lowers the opportunity cost of crime

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 - ④ Emotional distress of job loss and low income
- } Becker outside option

Many studies explore the effect of cross regional differences in employment on crime using an IV approach e.g.:

- Dix et al. (2018) use national trade liberalization in Brazil to explore it's impact on crime across differently impacted regions

Trade Liberalization and Crime in Brazil (Dix et al., 2019)

TABLE 2—REGIONAL TARIFF CHANGES AND LOG CHANGES IN LOCAL CRIME RATES: 1991–2000

Dep. var.: $\Delta_{91-00} \log(CR_r)$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
RTC_r	-1.976 (0.822)	-2.444 (0.723)	-3.838 (1.426)	-3.769 (1.365)	-3.853 (1.403)
$\Delta_{80-91} \log(CR_r)$				-0.303 (0.0749)	0.0683 (0.129)
State fixed effects	No	No	Yes	Yes	Yes
Kleibergen-Paap Wald rk F -statistic					54.2
Observations	411	411	411	411	411
R^2	0.013	0.052	0.346	0.406	–

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- Dell et al. (2019) instruments the unemployment rate in Mexico using the inflow of Chinese imports into the US to explore the impact of labour market condition on the homicide rate in Mexico:

Job Market Conditions and Violence in Mexico (Dell et al. 2019)

TABLE 3—VIOLENCE AND DRUG SEIZURES

Sample:	All (1)	No DTO (2)	Any DTO (3)	Major DTO (4)
<i>Panel A. ΔTotal homicide rate</i>				
% Δ Jobs 2007–2010	–6.88 (4.38)	0.06 (0.70)	–8.59 (5.16)	–41.27 (19.34)
Observations	520	144	376	293
F-stat	73.40	16.56	55.49	7.22
Mean of dependent variable	20.86	10.04	25.05	25.71
<i>Panel B. ΔDrug-related homicide rate</i>				
% Δ Jobs 2007–2010	–5.44 (3.23)	0.39 (1.06)	–7.17 (3.87)	–30.11 (13.99)
Observations	520	144	376	293
F-stat	73.40	16.56	55.49	7.22
Mean of dependent variable	15.14	5.67	18.81	19.24
<i>Panel C. Δlog cocaine seizures</i>				
% Δ Jobs 2007–2010	–1.19 (0.29)	0.21 (0.33)	–1.42 (0.38)	–4.11 (1.88)
Observations	520	144	376	293
F-stat	73.40	16.56	55.49	7.22
Mean of dependent variable	3.35	1.28	4.15	4.29
<i>Panel D. Δlog non-cocaine seizures</i>				
% Δ Jobs 2007–2010	0.85 (0.28)	–0.15 (0.32)	0.99 (0.29)	–0.42 (1.26)
Observations	520	144	376	293
F-stat	73.40	16.56	55.49	7.22
Mean of dependent variable	3.90	0.88	5.07	5.16

Many studies explore the effect of cross regional differences in employment on crime using an IV approach e.g.:

- Dix et al. (2018) use national trade liberalization in Brazil to explore its impact on crime across differently impacted regions
 - Finds crime increases in areas most impacted by trade liberalization
 - Argue the bulk of the effect is due to the impact of trade liberalization on economic conditions
- Dell et al. (2019) instruments the unemployment rate in Mexico using the inflow of Chinese imports into the US to explore the impact of labour market condition on the homicide rate in Mexico:
 - Finds Violence \uparrow when job opportunities \downarrow
 - Strongest effects in areas with known drug trafficking organizations
 - Consistent with Becker: more criminal employment when opportunity cost goes down

Studies which explore the impact of local labour market conditions on those who are newly released from prison

- Yang (2017) explores the impact of wages in local labour markets individuals are released into on likelihood of reoffending

Wages and Recidivism (Yang, 2019)

Table 5
Results by industry.

	(1)	(2)	(3)	(4)	(5)	(6)
Construction log low-skill wage	−0.164*** (0.040)					
Manufacturing log low-skill wage		−0.231*** (0.060)				
Transportation log low-skill wage			0.007 (0.040)			
Finance log low-skill wage				0.089*** (0.035)		
Prof. services log low-skill wage					−0.064 (0.048)	
Management log low-skill wage						0.018 (0.026)
Other log low-skill wage	−0.308*** (0.080)	−0.291*** (0.067)	−0.470*** (0.069)	−0.584*** (0.069)	−0.422*** (0.079)	−0.585*** (0.086)
Observations	34,823,482	34,713,772	34,574,189	31,979,852	32,710,100	28,660,000
Defendant controls	Yes	Yes	Yes	Yes	Yes	Yes
Crime controls	Yes	Yes	Yes	Yes	Yes	Yes

Studies which explore the impact of local labour market conditions on those who are newly released from prison

- Yang (2017) explores the impact of wages in local labour markets individuals are released into on likelihood of reoffending
 - Increased wages in industries that are known to hire prison releasees reduces recidivism
- Schnepel (2018) looks at the impact of the number of jobs available (proxied for by new hires) in local labour markets on the likelihood of reoffending

Good Jobs and Recidivism (Schnepel, 2018)

New Hires and Recidivism

	(1)	(2)	(3)
New hires	-0.0000 (0.0001)	0.0001 (0.0001)	-0.0000 (0.0001)
Total hires by skill level			
Low-skill new hires	-0.0000 (0.0002)	0.0001 (0.0002)	0.0000 (0.0004)
High-skill new hires	0.0001 (0.0004)	0.0004 (0.0003)	0.0004 (0.0006)
Total new hires by skill level and industry			
Construction low-skill new hires	-0.0153** (0.0053)	-0.0133*** (0.0042)	-0.0176*** (0.0033)
Manufacturing low-skill new hires	-0.0036 (0.0031)	-0.0059* (0.0029)	-0.0105** (0.0043)
Food services low-skill new hires	0.0058 (0.0050)	0.0023 (0.0056)	0.0045 (0.0092)
Retail low-skill new hires	0.0036 (0.0050)	0.0019 (0.0047)	0.0002 (0.0056)
Admin/waste low-skill new hires	0.0012 (0.0019)	0.0002 (0.0018)	-0.0005 (0.0014)
Other services low-skill new hires	0.0032 (0.0018)	0.0023 (0.0021)	-0.0000 (0.0024)
All other low-skill new hires	0.0003 (0.0003)	-0.0000 (0.0003)	0.0006 (0.0006)
High-skill new hires	0.0002 (0.0005)	0.0013* (0.0006)	0.0015* (0.0008)
Observations (cohorts)	2,944	2,944	2,944
Number of individuals	1,714,664	1,714,664	1,714,664
Average return rate	0.573	0.573	0.573
County and year-quarter FE	Y	Y	Y
County linear trend	Y	Y	Y
County quadratic trend	N	Y	Y
County-quarter FE	N	N	Y

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 - More jobs in industries that are known to hire prison releasees reduces recidivism
- Both are consistent with Becker outside option prediction

Prediction 2 - Outside Option: Government Transfers

Government transfers can affect crime through:

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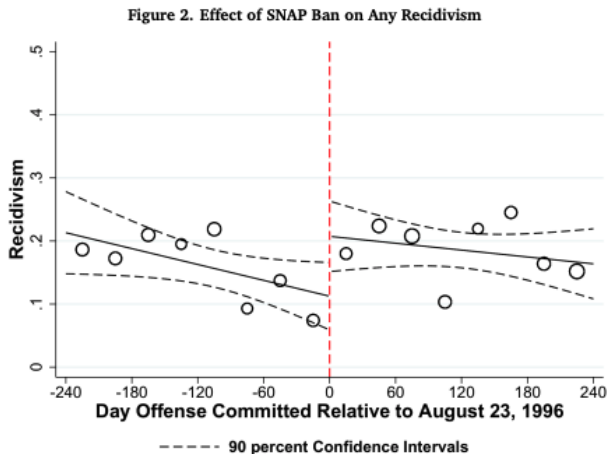
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A growing literature looks at the impact of transfer programs on the reoffending of offenders after release from prison

- In the US there are many laws which aim to restrict transfers to those with a felony conviction
- Tuttle (2019) explores the ban of SNAP benefits (food stamps) to those convicted of drug offences
- Ban was implemented for those with offence dates \geq August 23, 1996 \rightarrow RD design

Food stamps and Recidivism (Tuttle, 2019)



Food stamps and Recidivism (Tuttle, 2019)

Figure 3a. Effect of SNAP Ban on Financial Recidivism

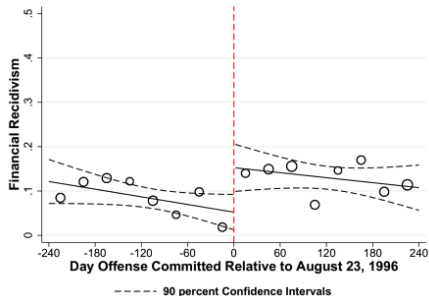
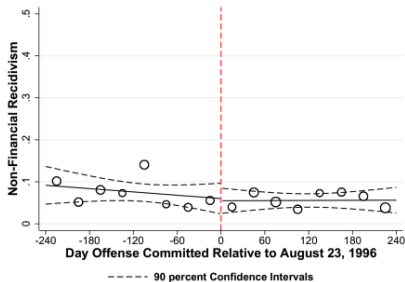


Figure 3b. Effect of SNAP Ban on Non-Financial Recidivism



- In the US there are many laws which aim to restrict transfers to those with a felony conviction
- Tuttle (2019) explores the ban of SNAP benefits (food stamps) to those convicted of drug offences
- Ban was implemented for those with offence dates \geq August 23, 1996 \rightarrow RD design
- Ban lead to increase in financially motivated recidivism
 \rightarrow strongly suggestive of the liquidity constraint and financial distress pathways

- Yang (2017) finds access to cash welfare reduces reoffending
- Aslim et al. (2019) finds providing access to public health care reduces recidivism → through access to mental health and addiction treatment.
- Several papers find that increased access to health care through the affordable care act (Obamacare) decreased crime (e.g. Fone et al., 2020; He & Barkowski, 2020; Vogler, 2020)
- Agan and Makowsky (2018) find that increasing the generosity of the EITC decreased recidivism among women
- Deshpande and Mueller-Smith (2022) find economically motivated crime increased for youth removed from DI

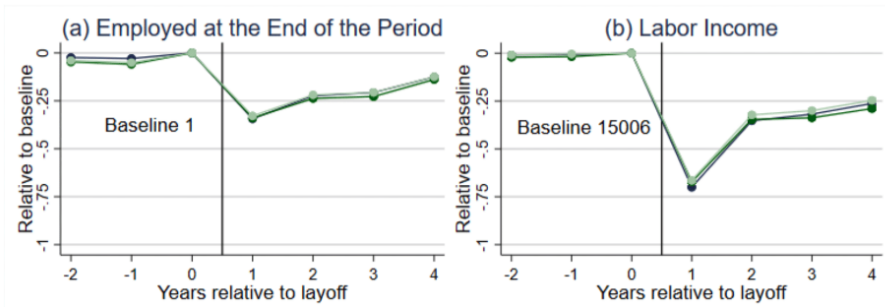
Tying it Together

- To identify the impact of job loss on crime use job layoffs
- Matched event study design:

$$Y_{it} = \gamma Treat_i + \sum_{t=-P}^T \delta_t (Treat_i \times Time_t) + \sum_{t=-P}^T \lambda_t Time_t + \epsilon_{it}$$

- Where $Treat_i$ is a dummy for if i is laid off and $Time_t$ are dummies indicating years relative to a layoff event.
- Identification concern: firms may be more likely to layoff employees who are prone to crime which would lead to selection in the estimation of δ
- Solution: use firms with ≥ 15 employees who lay off at least 33% of their workforce
→ mass layoffs driven by external shock rather than characteristics of the displaced worker.

The Effect of Job Loss and UI on Crime (Britto, Pinotti & Sampaio, 2022)



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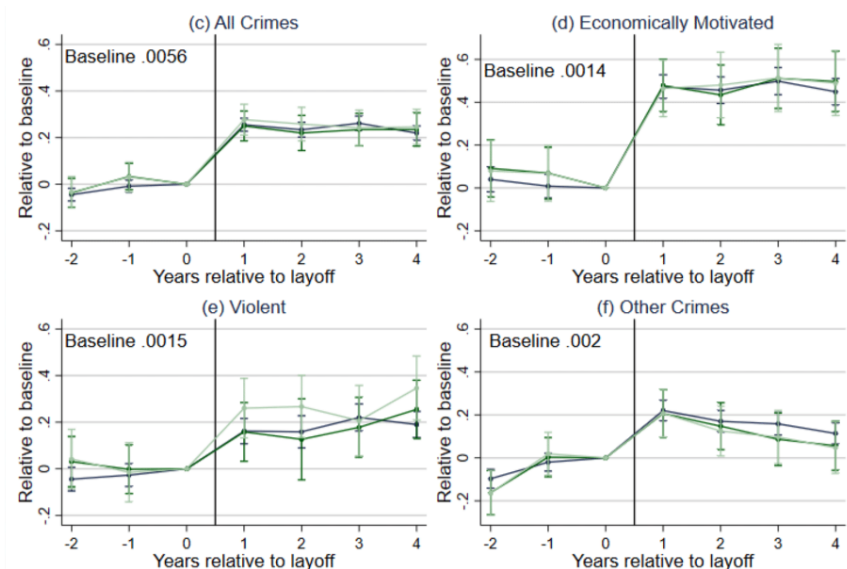


Table 1: Effect of job loss on labor market outcomes and criminal behavior, workers displaced in mass layoffs

	(1)	(2)	(3)	(4)	(5)	(6)
	Labor market effects		Probability of criminal prosecution			
Dependent variable:	Employment	Earnings	Any crime	Economic	Violent	Others
$Treat_i \times Post_t$	-0.20*** (0.002)	-5710.0*** (53.3)	0.0012*** (0.0001)	0.00060*** (0.00006)	0.00025*** (0.00006)	0.00032*** (0.00006)
Mean outcome, treated at $t=0$	1	14,340	0.0052	0.0014	0.0015	0.0018
Effect relative to the mean	-20%	-40%	23%	43%	17%	18%
Implied elasticity to earnings			-0.58	-1.08	-0.42	-0.45
Observations	16,349,844	16,349,844	16,349,844	16,349,844	16,349,844	16,349,844

Takeaways:

- Strong effect on economically motivated crimes → liquidity constraints are important

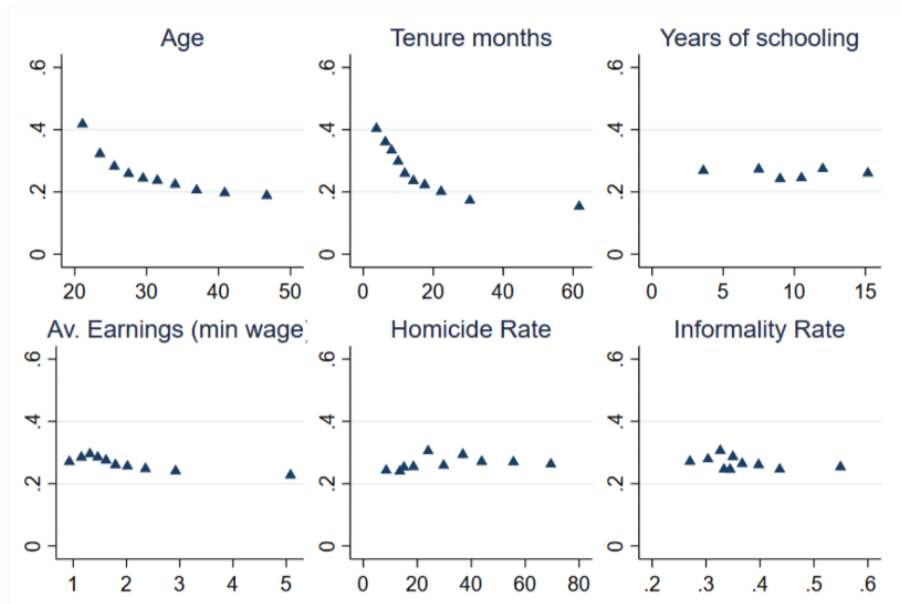
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 - Some violent crime may be tied to economically-motivated crime

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The Effect of Job Loss and UI on Crime (Britto, Pinotti & Sampaio, 2022)



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- Use causal forest algorithm (Athey and Imbens, 2016) to explore heterogeneity in treatment effects to understand mechanisms better...
- Young age and low job tenure only predictors of larger treatment effects → liquidity effects
- A thought: Incapacitation effect of work likely larger for young if it exists

- Next: Can government intervention mitigate the crime effects of job loss?
- Explore the impact of unemployment insurance on crime after layoffs
- In Brazil you are only eligible for UI if there has been a minimum 16 month period between the current layoff date and the previous layoff resulting in a UI claim

⇒ Regression discontinuity design

$$Y_i = \alpha + \beta D_i + f(X_i) + \epsilon_i$$

- where Y_i is an indicator variable for the committing a crime after job loss; X_i is time elapsed since the previous layoff with $X = 0$ at 16 months; and $D_i = 1(X_i \geq 0)$

The Effect of Job Loss and UI on Crime (Britto, Pinotti & Sampaio, 222)

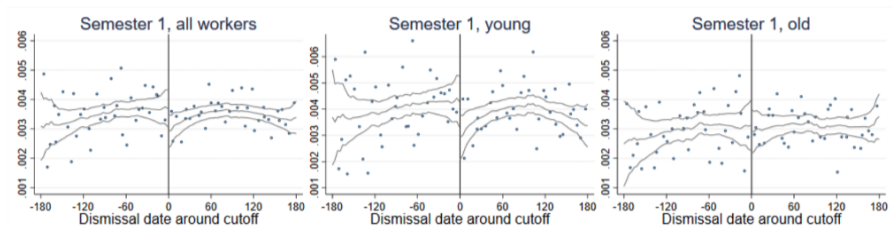
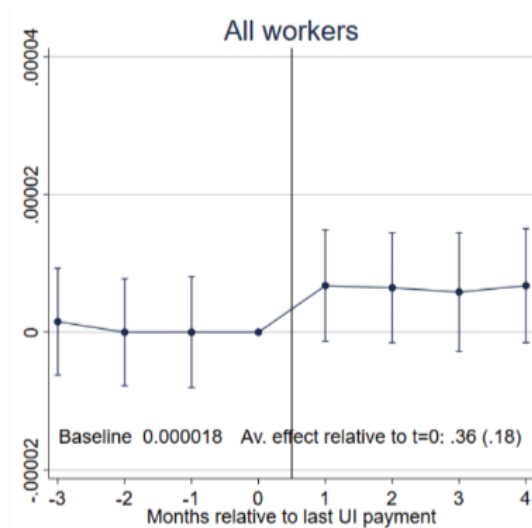


Table 4: Effect of UI eligibility on crime

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.:	UI			Prob. criminal prosecution after:			
	Take-up	Payments	Amount	6 months	6 months	3 years	3 years
PANEL A. FULL SAMPLE							
Eligibility for UI benefits	0.57*** (0.0029)	2.58*** (0.012)	2086.0*** (10.5)	-0.00077* (0.00044)	-0.00085* (0.00045)	-0.00062 (0.0011)	-0.0013 (0.0011)
Mean outcome at the cutoff	0.07	0.1	130	0.0037	0.0037	0.0213	0.0213
Effect relative to the mean				-21.0%	-23.1%	-2.9%	-6.1%
Observations	270,880	270,880	270,880	270,880	268,458	270,880	268,458
PANEL B. YOUNGER WORKERS, AGE ≤ 29							
Eligibility for UI benefits	0.58*** (0.0041)	2.60*** (0.017)	2018.9*** (14.1)	-0.0013* (0.00067)	-0.0015** (0.00068)	-0.0025 (0.0017)	-0.0037** (0.0017)
Mean outcome at the cutoff	0.07	0.1	112	0.0043	0.0043	0.0246	0.0246
Effect relative to the mean				-30.2%	-34.9%	-10.2%	-15.1%
Observations	134,558	134,558	134,558	134,558	132,920	134,558	132,920

The Effect of Job Loss and UI on Crime (Britto, Pinotti & Sampaio, 2022)



Takeaways:

- UI benefits almost totally offset the increase in crime on average
- Impact of UI larger on young workers
- Together these are highly suggestive that:
 - Economic crime is caused by binding liquidity constraints
 - Incapacitation effects are an important factor (those on UI are out of the workforce longer)
- In such a context, lack of social insurance leads people to engage in self-insurance in forms that may be costly for society (crime)

Prediction 2 - Deterrence

The end of punishment, therefore, is no other, than to prevent others from committing the like offence. Such punishments, therefore, and such a mode of inflicting them, ought to be chosen, as will make strongest and most lasting impressions on the minds of others, with the least torment to the body of the criminal.

...

If an equal punishment be ordained for two crimes that injure society in different degrees, there is nothing to deter men from committing the greater, as often as it is attended with greater advantage.

- Cesare Beccaria, Essay on Crimes and Punishments 1764

Three Core Components of Deterrence

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Three Core Components of Deterrence

- ❶ **Certainty:** There must be a non-negligible chance of being caught when committing an offence for the threat of punishment to be salient
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 - ▶ General deterrence as in the Becker/Ehrlich model may only be effective if individuals have proper information on p and F

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- Cameron (1988) in a survey of the literature found that 18 out of 22 papers surveyed found either a positive relationship or no relationship between police and crime

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- Variation in police exogenous of crime is needed to properly assess this question

Early example of a natural experiment:

- Andenaes (1974) explores an event in WWII where the occupying Germans arrested and deported most of the Danish police force in 1944
- Finds that street crimes like robbery, theft, break and enter etc. rose dramatically
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- Does this support the Becker model?
- Issues: No control group; WWII is a pretty substantial confounder.

Di Tella & Schargrodsky (2004) propose a novel natural experiment:

- In 1994 there was a terrorist attack on a Jewish center in Buenos Aires, Argentina
- The next week the government assigned police protection on every Jewish and Muslim place of worship in the city
- The authors argue this creates exogenous assignment of police presence to different points in the city
- They explore the impact of this police presence on car theft

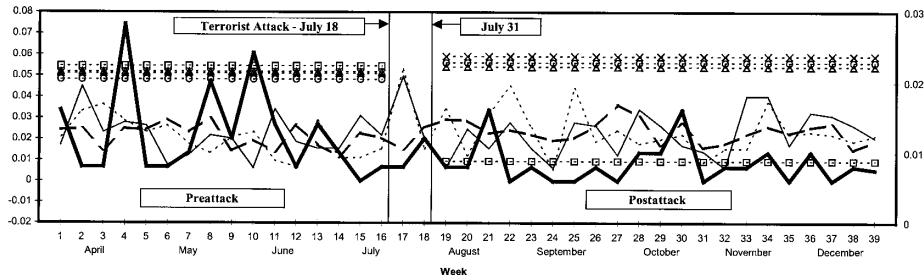
- Difference-in-differences design:

$$\begin{aligned} \text{Car Theft}_{it} = & \alpha_0 \text{Same_Block_Police}_{it} + \alpha_1 \text{One_Block_Police}_{it} \\ & + \alpha_2 \text{Two_Blocks_Police}_{it} + M_i + F_i + \epsilon_{it} \end{aligned}$$

where:

- ▶ $\text{Same_Block_Police}_{it}$: is a dummy var that equals 1 for the months after the terrorist attacks and if there is a protected institution on that block
- ▶ $x_Block_Police_{it}$, $x \in \{\text{One}, \text{Two}\}$: is a dummy var that equals 1 for the months after the terrorist attacks and if there is a protected institution x block(s) away
- ▶ M_i is a month fixed effect
- ▶ F_i is a block fixed effect

Terrorist Attacks, Police and Crime (Di Tella and Schargrotsky, 2004)



By Week (Left Axis)

- Jewish Institution in the Block
- One Block from Nearest Jewish Institution
- - - Two Blocks from Nearest Jewish Institution
- More than Two Blocks from Nearest Jewish Institution

Means (Right Axis)

- - □ - - Pre and Post Means for Jewish Institution in the Block
- - ☆ - - Pre and Post Means for One Block from Nearest Jewish Institution
- - ○ - - Pre and Post Means for Two Blocks from Nearest Jewish Institution
- - ✕ - - Pre and Post Means for More than Two Blocks from Nearest Jewish Institution

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TABLE 3—THE EFFECT OF POLICE PRESENCE ON CAR THEFT

	Difference-in-difference			Cross section	Time series
	(A)	(B)	(C)	(D)	(E)
<i>Same-Block Police</i>	−0.07752*** (0.022)	−0.08007*** (0.022)	−0.08080*** (0.022)	−0.07271*** (0.011)	−0.05843*** (0.022)
<i>One-Block Police</i>		−0.01325 (0.013)	−0.01398 (0.014)	−0.01158 (0.010)	−0.00004 (0.013)
<i>Two-Blocks Police</i>			−0.00218 (0.012)	−0.00342 (0.009)	0.01701 (0.010)
Block fixed effect	Yes	Yes	Yes	No	Yes
Month fixed effect	Yes	Yes	Yes	Yes	No
Number of observations	7,884	7,884	7,884	4,380	3,816
R^2	0.1983	0.1984	0.1984	0.0036	0.1891

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 - ▶ e.g. Chang & Jacobson (2017) find that visible crime increases on blocks after the closure of medical marijuana dispensaries and restaurants.
- Concern: was crime decreased or merely displaced?
 - ▶ Displacement to control blocks/areas would downward bias estimates, temporal displacement would upwards bias estimates.

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 - Estimate that a 10% increase in police in a given area results in a 3% decline in crime

Evidence on Hot-Spot Policing

- Hot-spot policing identifies areas that have particularly high crime and then focuses police deployment to those areas
- Many RCTs have been conducted randomly assigning increased police presence to hot spots
- Braga et al. (2014) provides a meta-analysis of these studies and conclude:
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 - ▶ This type of policing may be paired with “task forces” meant to target drug/gun/gang related crime which have been associated with police misconduct and violence

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 - Those who receive harsher sanctions may be more likely to offend/reoffend
- Quasi-experimental research designs, including the Judge IV Design, have been fruitful in overcoming these issues in recent years

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- Kaila (2023) provides very interesting evidence on the impact of fines on speeding in Finland

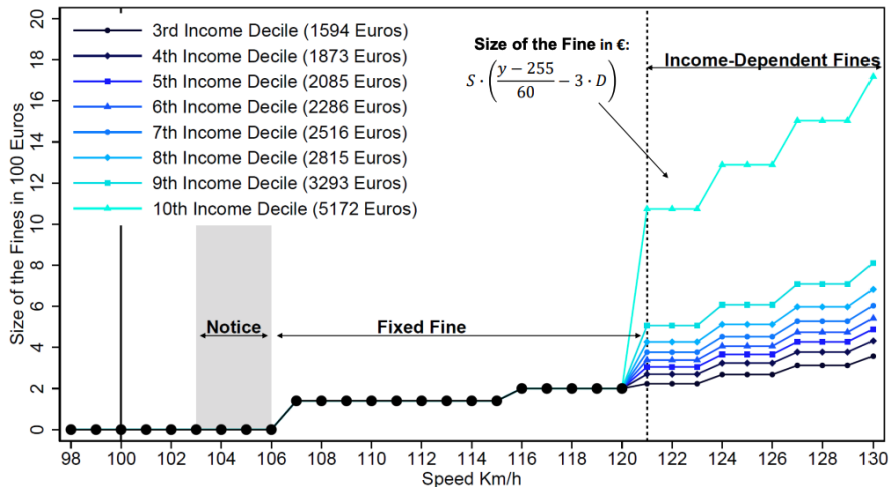
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- e.g. NHL player Rasmus Ristolainen received a speeding ticket of near 120,000 euros in 2019

Income Based Fine Schedule (Kaila, 2023)

(a) Theoretical example when the speeding limit is 100 Km/H



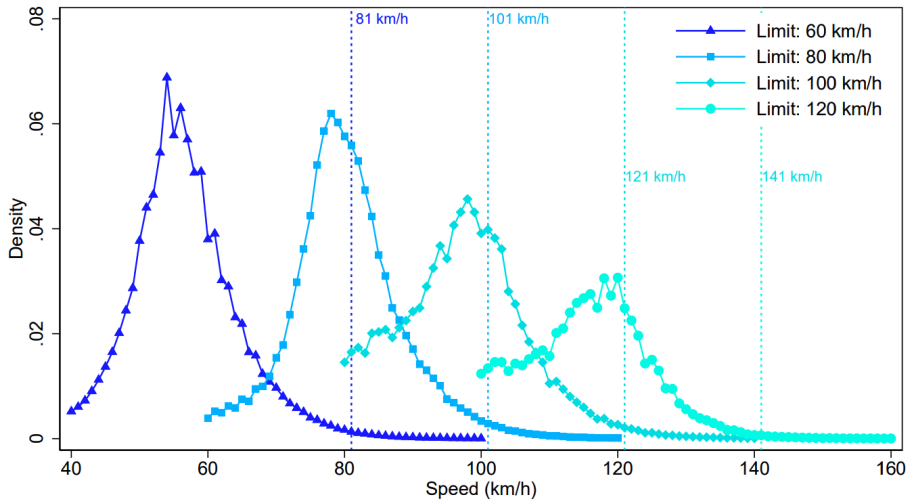
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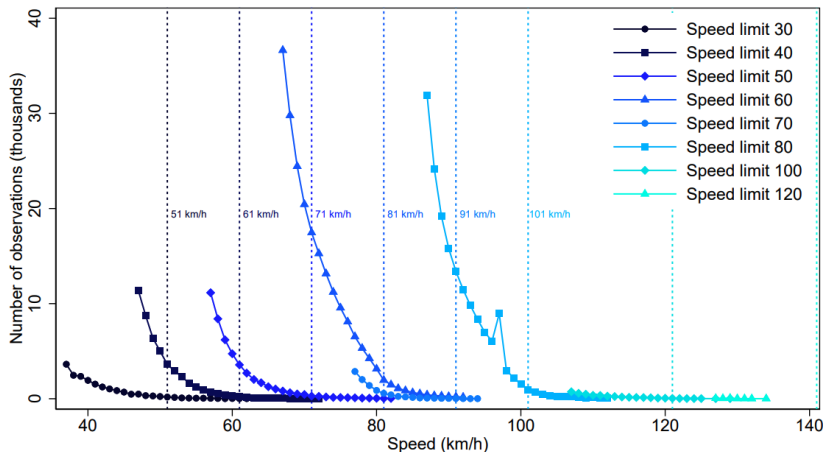
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(a) Raw Speed Distributions



Speed Distribution (Kaila, 2023)

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- If this were the case we should see significant “bunching” below the income fine cutoff
- Kaila explores this by plotting speed distributions using data from traffic monitoring cameras and speeding distributions on those who received a speeding ticket:
- No bunching!... why?
- Is the Becker model wrong? Do people not understand the speeding punishment schedule?

- Kaila (2023) next explores if the income based fine exerts a specific deterrent effect on individuals
- The speeding schedule sets up a regression discontinuity design: individuals who were caught speeding at speeds $> 20\text{km/h}$ receive substantially larger fines, depending on their income.
- Estimates whether individuals who received the income based fine are less likely to get another speeding ticket in the months directly afterwards

(a) Speeding Distribution and Size of the Fine

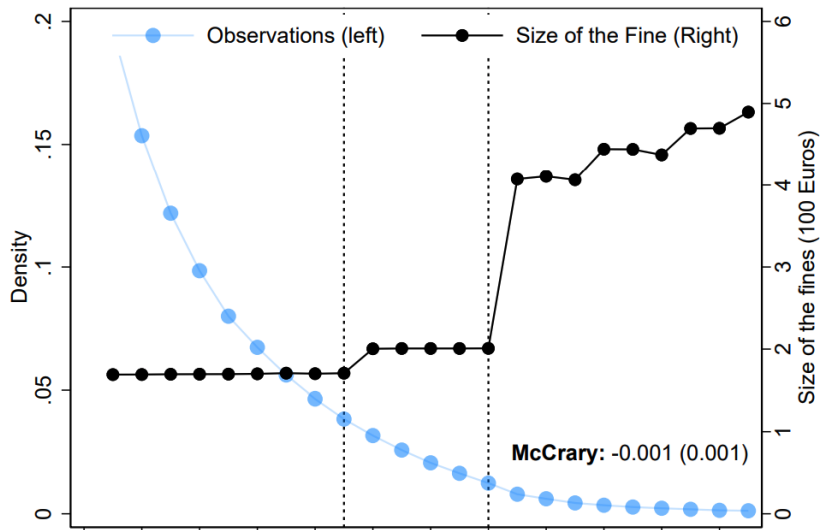
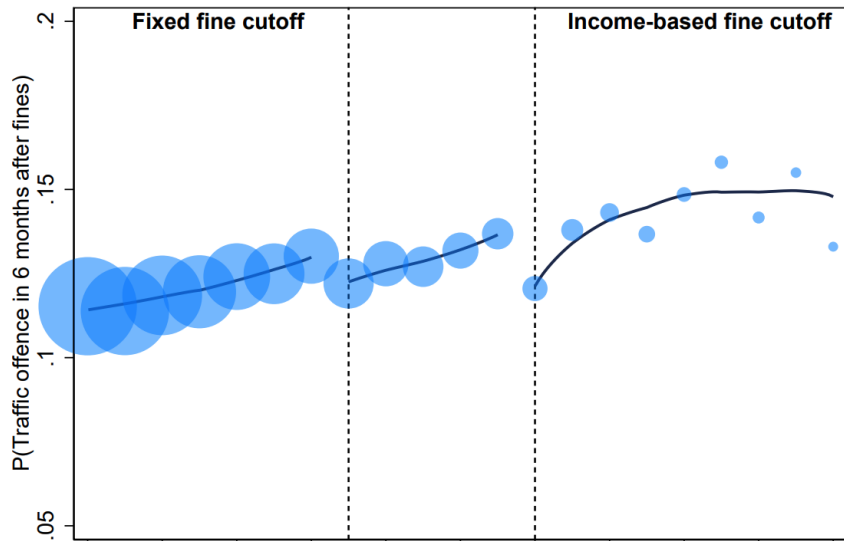
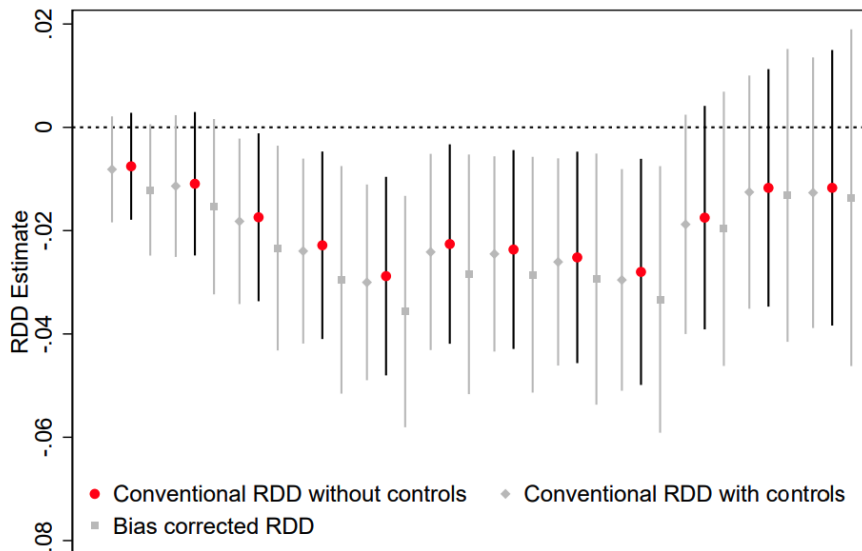


Figure 6: Graphical Evidence: Recidivism Within 6 Months



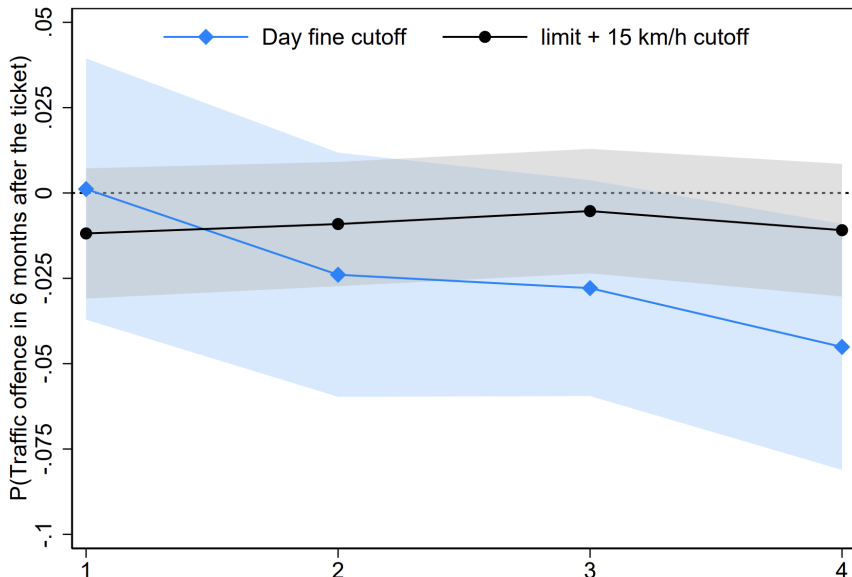
(a) RDD Point Estimates



Effect of Receiving an Income Based Fine (Kaila, 2023)

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- Estimates whether individuals who received the income based fine are less likely to get another speeding ticket in the months directly afterwards
- Key finding: Those who receive an income based fine are 20% less likely to receive another fine within 6 months
- Effect begins to fade after 9 months
- Further, the effect is most pronounced on those with higher incomes

(b) RDD Estimates by Income Groups



Specific Deterrence (Kaila, 2023)

- Kaila (2023) results suggest that large income based fines exert a specific deterrent effect on crime
- Suggests that people do not know, or do not understand the system of fines that they face
- Highlights that for Becker style deterrence to be effective, individuals need to have proper information about the punishments they face (and the probability of receiving them)
- Kaila (2023) shows that the results in his paper can be rationalized by a model where people perceive the fine system as linear and adjust their beliefs based on the fine they receive.

Does Incarceration Reduce Crime?

Early (Causal) Research on the Impact of Prison on Crime

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- Effects are large: data used is from the 1980/1990s when crime rates were much higher and prison populations much lower.
- The marginal prisoner was therefore probably more prolific than the marginal offender would be today.

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- A key issue is that individuals need to understand the consequences of these law changes for deterrence to work

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Deterrent Effect of *Known* Sentence Enhancements (Drago et al., 2009)

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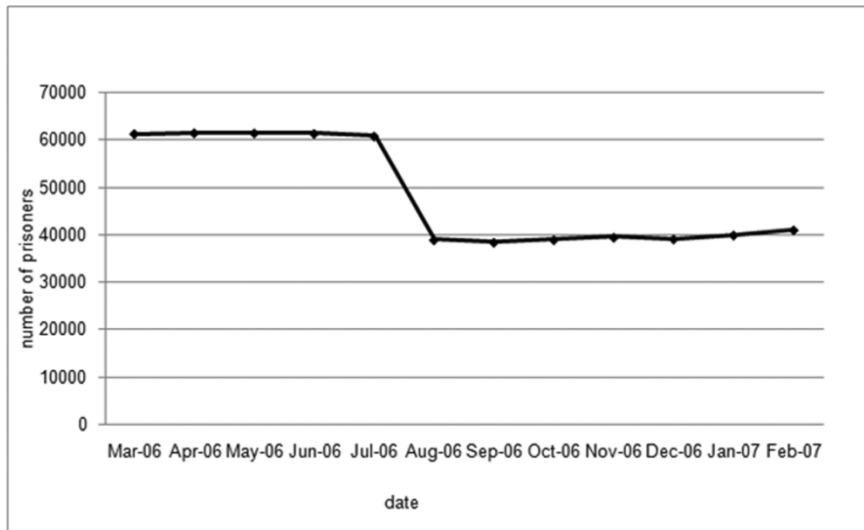


TABLE 2
BASELINE RESULTS

	(1)	(2)	(3)
Residual sentence	−.0016 (−6.54)	−.0017 (−6.87)	−.0017 (−7.02)
Original sentence	−.0001 (−1.93)	.0002 (2.22)	.0002 (2.61)
Individual characteristics	No	Yes	Yes
Type of crime	No	No	Yes
Pseudo R^2	.005	.028	.032
Observations	20,950	19,316	19,316

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- Clear evidence that when the consequences are known, sentencing enhancements can deter crime

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- Mechanisms through which prison could increase reoffending:
 - ① **Criminal Capital Formation:** Individuals may create criminal networks and gain criminal knowledge within prison.
 - ② **Loss of Human Capital:** Labour force attachment/skills and education may diminish/fail to accumulate for those in prison

Judge IV Evidence: Juvenile Incarceration (Aizer & Doyle, 2015)

- Uses random assignment of juvenile offenders to judges (US) to explore the impacts of juvenile incarceration on high school completion and future crime.
- Design reminder, we want to estimate the impact of juvenile incarceration Jl_i on outcomes Y_i using the model"

$$Y_i = \beta_0 + \beta_1 Jl_i + \beta_2 X_i + \delta_{c(i)} + \epsilon_i$$

- In the first stage we instrument Jl_i using the strictness of the judge i is randomly assigned to:

$$Jl_i = \alpha_0 + \alpha_1 Z_{j(i)} + \alpha_2 X_i + \delta_{c(i)} + v_i$$

- Where $Z_{j(i)}$ is the leave-one-out incarceration propensity of judge j assigned to i :

$$Z_{j(i)} = \frac{1}{n_{ji} - 1} \sum_{k \neq i} \tilde{Jl}_k$$

- 1 Juveniles sentenced to prison on the margin are more likely to reoffend as adults

Results: Adult Reoffending (Aizer & Doyle, 2015)

TABLE VI
JUVENILE INCARCERATION AND ADULT CRIME TYPE

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: entered adult prison by age 25 for crime type					
	Homicide			Violent		
	OLS	OLS	2SLS	OLS	OLS	2SLS
Juvenile incarceration	0.051 (0.0031)	0.021 (0.0030)	0.035 (0.030)	0.138 (0.0046)	0.061 (0.0050)	0.149 (0.041)
Sample	Full CPS	Juvenile court	Juvenile court	Full CPS	Juvenile court	Juvenile court
Mean of dep. var.: JI=0	0.008	0.043	0.043	0.024	0.121	0.121
Observations	440,797	37,692	37,692	440,797	37,692	37,692
	Property			Drug		
Juvenile incarceration	0.079 (0.0040)	0.047 (0.0038)	0.142 (0.044)	0.183 (0.011)	0.078 (0.0068)	0.097 (0.052)
Sample	Full CPS	Juvenile Court	Juvenile Court	Full CPS	Juvenile Court	Juvenile Court
Mean of dep. var.	0.013	0.060	0.060	0.034	0.176	0.176
Observations	440,797	37,692	37,692	440,797	37,692	37,692

Results (Aizer & Doyle, 2015)

- ① Juveniles sentenced to prison are more likely to reoffend as adults
- ② Juveniles sentenced to prison are less likely to complete high school

Results: High School Completion (Aizer & Doyle, 2015)

TABLE IV
JUVENILE INCARCERATION AND HIGH SCHOOL GRADUATION

	Dependent variable: graduated high school						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Full CPS sample			Juvenile court sample			
	OLS	OLS	Inverse propensity score weighting	OLS	OLS	2SLS	2SLS
Juvenile incarceration	-0.389 (0.0066)	-0.292 (0.0065)	-0.391 (0.0055)	-0.088 (0.0043)	-0.073 (0.0041)	-0.108 (0.044)	-0.125 (0.043)
Demographic controls	No	Yes	Yes	No	Yes	No	Yes
Court controls	N/A	N/A	N/A	No	Yes	No	Yes
Observations	440,797	440,797	420,033	37,692			
Mean of dependent variable	0.428	0.428	0.433	0.099			

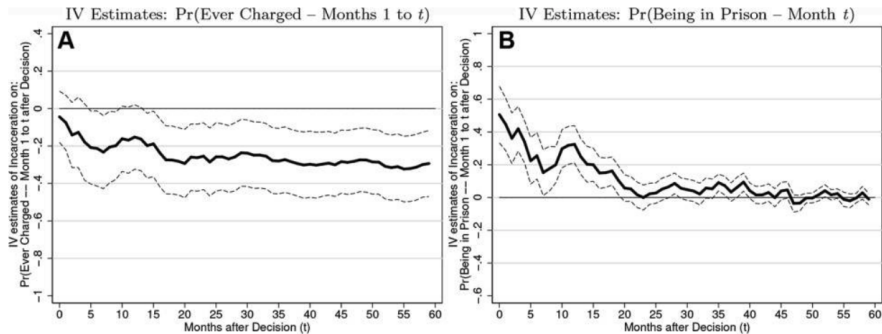
- ① Juveniles sentenced to prison are more likely to reoffend as adults
- ② Juveniles sentenced to prison are less likely to complete high school
 - suggests that loss of human capital due may be an important mechanism.
- ③ High school effect appears to result from those who enter prison being far less likely to re-enroll after release (declines by 31%)
- ④ Those who return to school are more likely to be classified as having an emotional or behavioral disorder (13 p.p. increase)

- Results 3 and 4 suggest that prison may lead juveniles to be less able to regulate their emotions/cope with normal activities
- Stevenson (2017) finds a similar result: youth in prisons with more chaotic/aggressive individuals are more likely to reoffend due to worsening of aggression and impulsivity
- Also related: Heller et al. (2017) find that CBT helps prevent youth from reoffending by improving their ability to control impulsivity.
- These impacts might be particular to youth whose brain function is still developing...

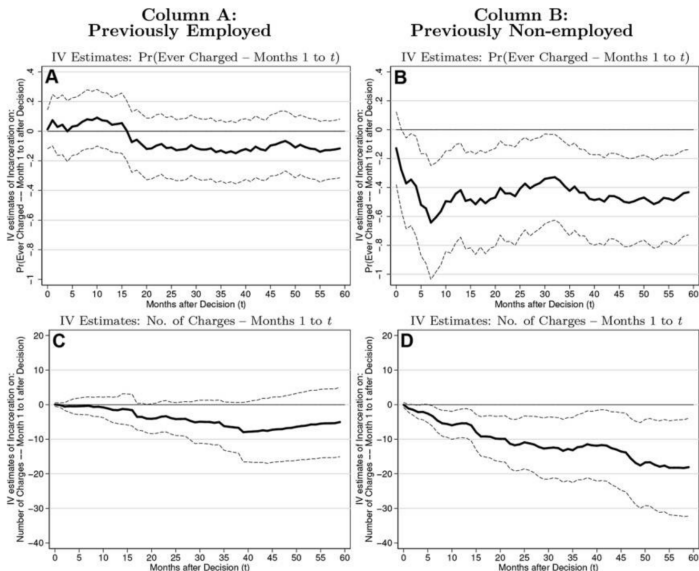
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- Main finding: Reoffending falls by $\approx 25p.p.$ due to incarceration for those on the margin.
- These judge IV estimates potentially include the impact of:
 - ① incapacitation (clock starts at sentencing)
 - ② specific deterrence
 - ③ rehabilitation

Judge IVs in Norway (Bhuller et al., 2020)

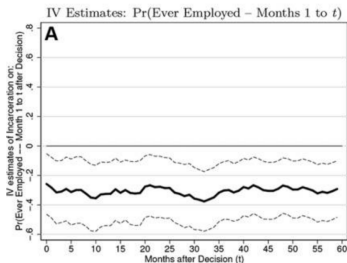


Judge IVs in Norway (Bhuller et al., 2020)



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**Column A:
Previously Employed**



**Column B:
Previously Non-employed**

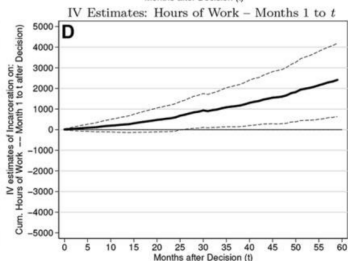
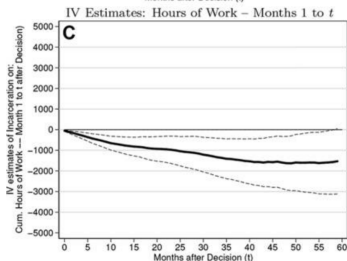
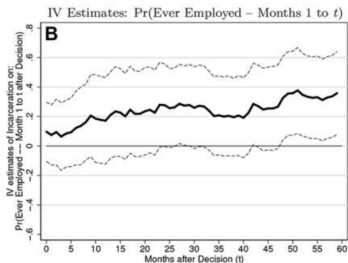


TABLE 7
EFFECT OF INCARCERATION ON PARTICIPATION IN JOB TRAINING PROGRAMS AND CLASSROOM
TRAINING PROGRAMS (Months 1–24 after Decision)

	SUBSAMPLE			
	Previously Employed (<i>N</i> = 16,547)		Previously Nonemployed (<i>N</i> = 14,881)	
	(1)	(2)	(3)	(4)
Dependent variable	Pr(participated in job training programs)	Pr(participated in classroom training programs)	Pr(participated in job training programs)	Pr(participated in classroom training programs)
RF: judge stringency, all controls	.056 (.063)	.073 (.065)	.147** (.063)	.054 (.067)
IV: incarcerated, all controls	.106 (.118)	.138 (.122)	.348** (.168)	.127 (.164)
Dependent mean	.17	.19	.22	.17
Complier mean if not incarcerated	.16	.18	.00	.04

- Prison results in a decrease in reoffending that is sustained after individuals are released from prison
 - Not just incapacitation
- The effect is mostly due to those who were unemployed before committing their crime
- Previously unemployed individuals are more likely to be employed and have higher hours worked after incarceration
- Mechanism: Rehabilitation, previously unemployed are more likely to participate in job training programs
 - Question: Does specific deterrence result in rehabilitative effort?
- This is likely facilitated by Norway's prison system being rehabilitation focused

- Explores the impact of incarceration on defendants future crime and labor market outcomes

TABLE 4. Impact of incarceration on criminal activity

Criminal Caseload	Felony		Misdemeanor	
	OLS	IV	OLS	IV
<i>Panel A: Booked in county jail for new arrest</i>				
In jail or prison	-0.023*** (0.00032)	-0.033*** (0.0080)	-0.035*** (0.00048)	0.22*** (0.024)
Released from incarceration	0.023*** (0.00024)	0.0038 (0.0074)	0.033*** (0.00018)	0.020*** (0.0046)
[Released × Duration]	0.025*** (0.00021)	0.067*** (0.0058)		
<i>Panel B: Charged in Harris County criminal court with new offense</i>				
In jail or prison	-0.023*** (0.00028)	-0.060*** (0.0068)	-0.031*** (0.00044)	0.11*** (0.021)
Released from incarceration	0.018*** (0.00020)	0.00092 (0.0066)	0.028*** (0.00016)	0.015*** (0.0041)
[Released × Duration]	0.020*** (0.00020)	0.056*** (0.0053)		
<i>Panel C: Convicted of criminal offense in Texas</i>				
In jail or prison	-0.0025*** (0.00029)	-0.028*** (0.0074)	-0.016*** (0.00034)	-0.025 (0.020)
Released from incarceration	0.015*** (0.00020)	-0.00071 (0.0058)	0.015*** (0.00013)	-0.0060* (0.0036)
[Released × Duration]	0.012*** (0.00019)	0.036*** (0.0047)		
Kleibergen-Paap rk LM stat.		536.3		610.5
Kleibergen-Paap rk Wald F stat.		181.1		307.5
Unique defendants	462,377	431,422	897,934	887,019
Total observations	15,425,207	13,744,324	29,976,888	29,222,981

- Explores the impact of incarceration on defendants future crime and labor market outcomes
- Results:
 - Incapacitation effect: measures of reoffending fall by 3 to 6 p.p. while individuals are incarcerated
 - Reoffending increases after prison: 6 p.p. increase in arrests and charges and 3.6 p.p. increase in conviction for each additional year incarcerated

TABLE 7. Impact of incarceration on labor market outcomes

Criminal Caseload	Felony		Misdemeanor	
	OLS	IV	OLS	IV
<i>Panel A: Quarterly employment</i>				
In jail or prison	-0.40*** (0.0019)	-0.32*** (0.037)	-0.41*** (0.0016)	-0.40*** (0.12)
Released from incarceration	-0.088*** (0.0018)	-0.054 (0.043)	-0.082*** (0.0012)	-0.045 (0.031)
[Released × Duration]	-0.019*** (0.00053)	-0.036* (0.019)		
<i>Panel B: Quarterly log(earnings+1)</i>				
In jail or prison	-3.30*** (0.016)	-2.59*** (0.30)	-3.30*** (0.013)	-3.25*** (0.98)
Released from incarceration	-0.90*** (0.015)	-0.55 (0.35)	-0.86*** (0.010)	-0.42 (0.27)
[Released × Duration]	-0.17*** (0.0042)	-0.34** (0.16)		
<i>Panel C: Total quarterly earnings</i>				
In jail or prison	-2247.1*** (16.8)	-1632.1*** (293.0)	-2265.0*** (13.2)	-1641.0* (951.3)
Released from incarceration	-1119.3*** (16.3)	-683.5** (345.3)	-1244.0*** (11.4)	-466.0 (298.8)
[Released × Duration]	-140.5*** (3.55)	-246.5 (150.3)		
Kleibergen-Paap rk LM stat.		327.6		148.4
Kleibergen-Paap rk Wald F stat.		110.5		74.4
Unique defendants	259,698	243,491	424,306	419,432
Total observations	8,035,049	7,263,800	13,401,574	13,098,771

*** p<0.01, ** p<0.05, * p<0.1.

Notes: See notes in Table 4.

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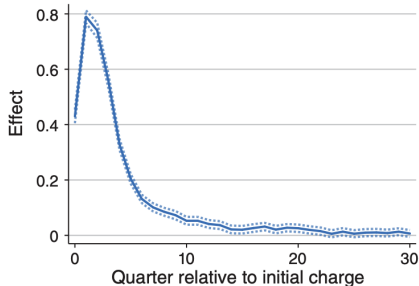
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- Texas less rehabilitation focused than Norway?

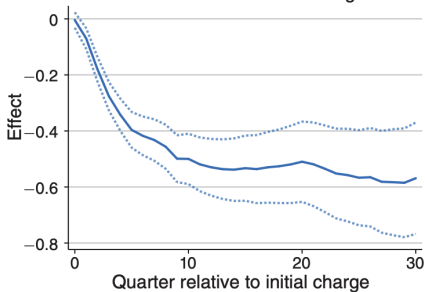
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Judge IVs in Ohio (Norris, Pencenco and Weaver, 2021)

Panel A. Incarcerated (=1)



Panel C. Cumulative number of new charges



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 - Effect is mostly incapacitation with little indication of a specific deterrent or rehabilitation effect

TABLE 4—EFFECT OF PARENTAL INCARCERATION ON CHILD CRIMINAL ACTIVITY

	Extensive margin (=1)			Intensive margin (IHS)		
	Charged (1)	Convicted (2)	Incarcerated (3)	Charged (4)	Convicted (5)	Incarcerated (6)
<i>Panel A. Criminal activity before age 25 (OLS with no controls)</i>						
Parent incarcerated (=1)	0.024 (0.005)	0.024 (0.005)	0.015 (0.004)	0.054 (0.011)	0.042 (0.009)	0.030 (0.007)
Index <i>p</i> -value			0.000			0.000
Dependent mean	0.325	0.247	0.124	0.568	0.375	0.205
Observations	83,532	83,532	83,532	83,532	83,532	83,532
<i>Panel B. Criminal activity before age 25 (IV)</i>						
Parent incarcerated (=1)	−0.066 (0.030)	−0.055 (0.027)	−0.049 (0.020)	−0.156 (0.061)	−0.097 (0.045)	−0.076 (0.035)
Index <i>p</i> -value			0.011			0.013
Dependent mean	0.325	0.247	0.124	0.568	0.375	0.205
Observations	83,532	83,532	83,532	83,532	83,532	83,532

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 - For children: they become **less** likely to be ever charged, convicted and incarcerated for a crime before age 25 when their parent is incarcerated

Interpreting the Parental Incarceration Result (Norris, Pencenco and Weaver, 2021)

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- Remember: the judge IV is a LATE which estimates the impact of incarceration on (the children of) *compliers*
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- Compliers may have a different impact on children and the home environment than never takers.