Spillover Effects and Social Interactions in crime: Evidence from a Natural Experiment

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Objective of the paper

To identify spillover (indirect effects) of a crime control policy and to estimate endogenous social interactions between former inmates interested by the policy

In other words: suppose you increase expected sentence for a group of individuals (the treated) and that this policy reduces individuals' criminal activity. We ask whether this policy decreases the criminal activity of non-treated individuals, i.e. if there are indirect effects.

Motivation

Crime still imposes high cost on society and needless to say we need to understand how to control crime

Recent research has shown the effectiveness of approaches to reduce crime based on increasing individuals' human capital and/or *manipulation of incentives* to engage into criminal activities (poverty reduction, deterrence, police control). (Di Tella and Schargrodsky, 2004 and Drago, Galbiati and Vertova, 2009).

In a related paper (Drago, Galbiati and Vertova, forthcoming JPE), we show that *a policy commuting for former inmates actual sentences in expected sentences significantly reduces recidivism*.

A step forward in this research is to understand if these approaches have *indirect effects on non treated individuals*.

Answering this question is crucial in evaluating crime control policies. In the presence of spillover effects, "naïve" estimates of the effect of the policy on the treated underestimate the true causal effect of the policy.

Problems with identification

It is very difficult to identify spillover effects of a crime control policy in crime. The ideal situation is to have a policy that *randomizes incentives within given groups of individuals* (e.g. friends, family members, more generally individuals who are likely to interact with each other).

In this case, we could estimate the effect of the policy accounting for potential spillover effects of such a policy.

Obviously, *it is not possible to have a controlled experiment* that approximates this situation.

How do we solve these problems?

Three "ingredients":

1) We argue that Italian Collective Clemency Bill is a *natural experiment* that solves the crucial issue of randomization and reproduces the ideal setting described above.
2) We exploit former inmates characteristics to define reference groups

⇨ With these two elements, we will ask if a policy commuting actual sentences in expected sentences has significant *within group spillover effects* (for former inmates).

3) By adding a further exclusion restriction

⇨ We estimate endogenous social interactions in recidivism (the effect of average group behaviour on individuals' behaviour)

NOTE => *if the exlusion restriction is not valid we show that even accounting for within group effects we may produce biased estimates of the overall effect of the randomization in expected future sentences.*

Preview of the main findings

1) A policy that manipulates prison sentences at the individual level has large indirect effects.

2) These indirect effects can be explained by *endogenous social interactions*.

Structure of talk

1) Related literature
2) Description of the Collective Clemency Bill.
3) Data and description of the source of variation.
4) Identification strategy and Results

Literature

Our paper is related to two strands of literature.

1) *Externalities in crime decisions*: Sah (1991, JPE), Glaeser et al. (1996, QJE), Kling and Ludwig (2007, JLE), Ludwig et al. (2005). All these papers focus on whether crime is contagious and how the average behavior in a social group influences individual behavior.

2) *Program evaluation literature on indirect effects of policies*: (e.g. Kremer and Miguel (2004, Econometrica) and Angelucci and De Giorgi (2009, AER), Duflo and Saez (2004, QJE)).

The collective clemency bill: the case for a natural experiment

The Italian prison system has been characterized by harsh conditions of overcrowding in the last years.

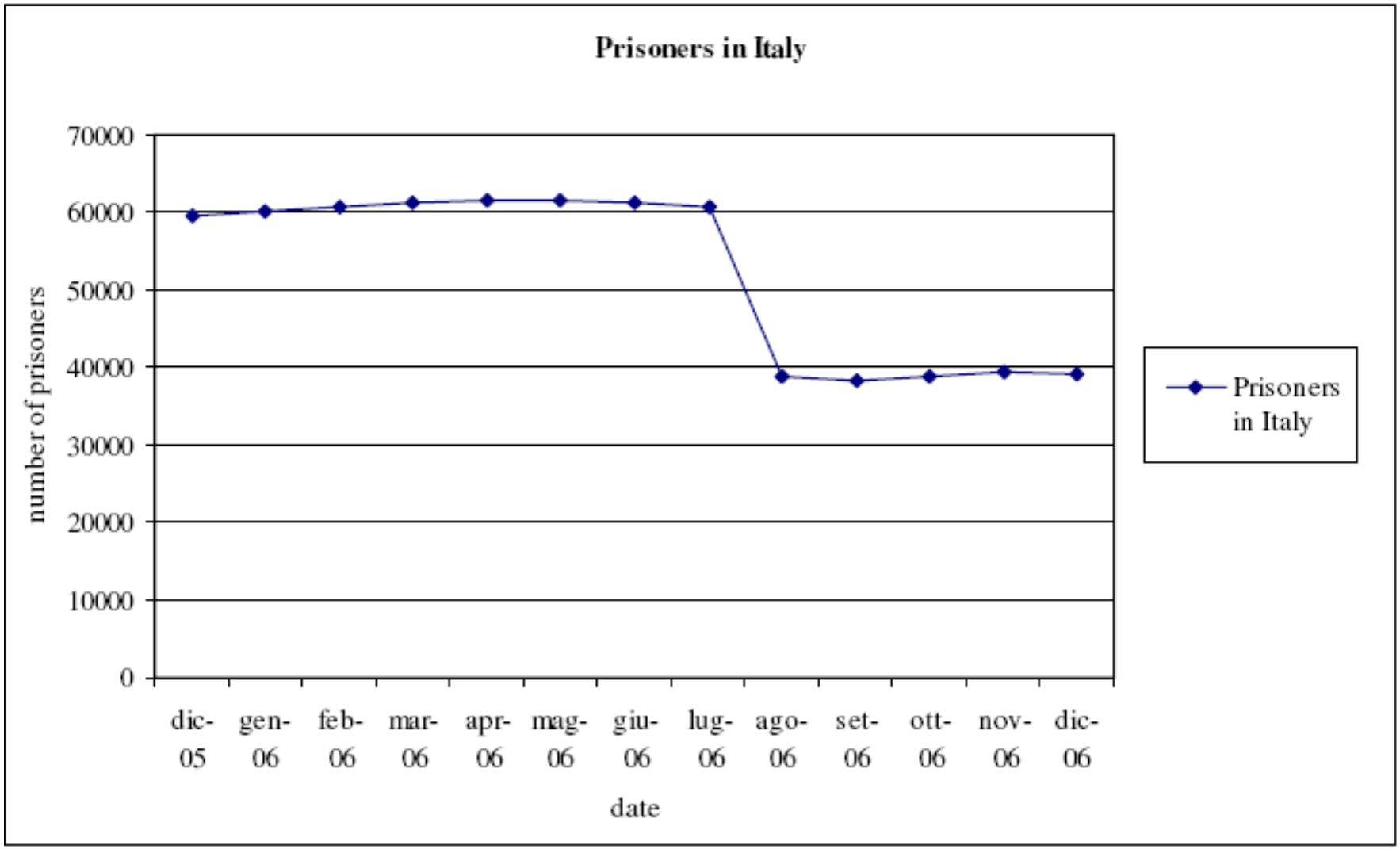
This is the main reason leading the Italian Parliament to pass the collective clemency bill on July 30, 2006.

This is an exceptional law that, according to the Italian Constitution, must be approved with at least two thirds of the votes by both Chambers of the Parliament.

Provisions of the bill:

A *reduction in detention* for those inmates having committed a crime by May, 2nd 2006. The bill reduces the penalties of *3 years*.

As a consequence, on August 1st 2006 *all those having to serve in prison a residual sentence of less than three years* were immediately released from residential facilities. Only a few crime categories such as terrorism, mafia and paedophilia were excluded.


Prisoners in Italy
70000
60000
50000
40000
30000
20000
10000
0
number of prisoners
dic-05
gen-06
feb-06
mar-06
apr-06
mag-06
giu-06
lug-06
ago-06
set-06
ott-06
nov-06
dic-06
date
Prisoners in Italy

A second provision of the law is crucial for our study:

"...those former inmates re-committing a crime will have to serve the residual sentence at the date of release in addition to the sentence given for the new crime" (Art. 3 of the Collective Pardon Law).

→ This implies that former inmates face different expected sanctions determined by the residual sentence at the date of release.

Example

Consider two individuals that were convicted to 40 months.

At the date of release one has 10 months of residual sentence, the other 25 months of residual sentence. This is because the first one entered prison 15 months earlier.

In the decision to re-commit a crime associated to a sentence x, the first expects a sentence equal to x+10, the second a sentence equal to x+25.

Data

Source: Internal database that the Italian Department of Prison Administration (DAP) maintains for offenders under its care.

We were granted access to the DAP database records on all individuals released pursuant to the collective clemency law.

For each individual in the sample the data provide demographic characteristics and information on whether or not the individual was re-arrested within the period between the release from prison and February, 28th 2007.

The natural experiment

Conditional on the sentence inmates were convicted to, variation in the residual sentence among released inmates depends on the date of entry into prison.

Hypothesis: The residual sentence which varies between 1 and 36 months is a variable which is as good as random.

TABLE I

INDIVIDUAL CHARACTERISTICS FOR RESIDUAL SENTENCES ABOVE AND BELOW THE MEDIAN

	Whole Sample	Residual Sentence below the Median	Residual Sentence above the Median	
	(1)	(2)	(3)	(4)
	Mean	*Mean*	*Mean*	*Difference*
Original Sentence (In months)	38.982	39.089	38.891	0.198
	(0.225)	(0.306)	(0.325)	(0.447)
Residual Sentence (in months)	14.511	8.475	19.730	-11.255
	(0.070)	(0.063)	(0.093)	(0.113)
Recidivism	0.115	0.129	0.102	0.027
	(0.002)	(0.003)	(0.003)	(0.004)
Age on Exit	38.764	38.762	38.766	-0.004
	(0.069)	(0.104)	(0.102)	(0.146)
Percentage of Males	0.954	0.957	0.951	0.006
	(0.001)	(0.002)	(0.002)	(0.003)
Married	0.284	0.275	0.292	-0.017
	(0.003)	(0.005)	(0.004)	(0.006)
Area of Residence				
North	0.425	0.425	0.425	0.000
	(0.003)	(0.005)	(0.005)	(0.007)
Center	0.185	0.182	0.187	-0.005
	(0.003)	(0.004)	(0.004)	(0.005)
South	0.378	0.380	0.377	0.004
	(0.003)	(0.005)	(0.005)	(0.007)

Education					
	Compulsory	0.901	0.907	0.898	0.008
		(0.003)	(0.004)	(0.004)	(0.005)
	Highschool	0.079	0.076	0.082	-0.006
		(0.002)	(0.003)	(0.003)	(0.005)
	College (Degree or equivalen	0.009	0.008	0.010	-0.002
		(0.001)	(0.001)	(0.001)	(0.002)
Permanently Employed		0.339	0.342	0.337	0.006
		(0.005)	(0.007)	(0.007)	(0.010)
First Judgement Taken		0.998	0.999	0.998	0.001
		(0.001)	(0.001)	(0.001)	(0.001)
Kind of Offence					
	Drugs offences	0.404	0.412	0.398	0.014
		(0.003)	(0.005)	(0.005)	(0.007)
	Crime against property	0.412	0.416	0.408	0.008
		(0.003)	(0.005)	(0.005)	(0.007)
	Crimes against Public Safety	0.005	0.005	0.005	0.000
		(0.000)	(0.001)	(0.001)	(0.000)
	Gun Law	0.012	0.011	0.013	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)
	Immigration bill	0.029	0.030	0.028	0.002
		(0.001)	(0.002)	(0.002)	(0.002)
	Violent crimes	0.094	0.092	0.098	0.006
		(0.002)	(0.003)	(0.003)	(0.004)

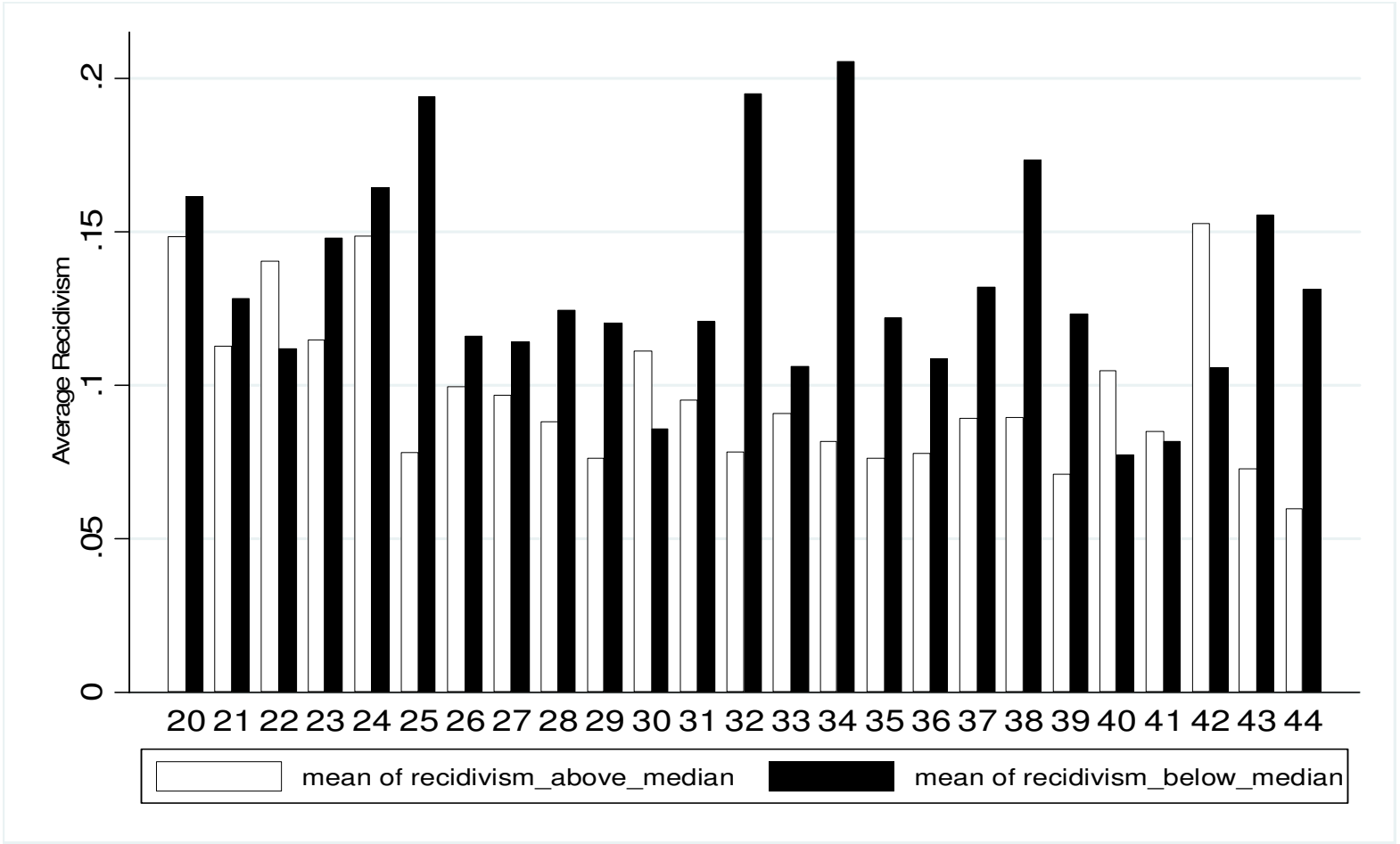
As Table I shows:

- Individual characteristics are balanced.

- A few differences are statistically distinguishable from zero, but all point estimates in column (4) are extremely small and well below the 5 percent of a standard deviation of the mean for each observable characteristic.

- Exception Italians (in any case difference lower than 10% of standard deviation): in the regression analysis, however, results are robust for Italians and non-Italians

Residual sentence and recidivism



Main result

A policy commuting actual sentences in expected sentences significantly reduces recidivism.

Regression analysis shows that a marginal increase in the remaining sentence reduces the probability of recidivism by 0.16 percentage points (1.3 percent).

→ Alternative approaches to incapacitation relying on the behavioral response of criminals to disincentives to engage in criminal activity may be effective in reducing crime.

Reference Groups

To form plausible peer groups we make two assumptions:

1) We assume that the degree of interactions is stronger for individuals of the same nationality serving their sentence in the same prison (for foreign inmates). → e.g. Albanians serving their sentence in Rome form a group.
2) For Italians, we assume that the degree of interactions is stronger for individuals from the same region serving their sentence in the same prison (half of the sample serves his sentence in a prison located in region other than his region of residence). → e.g. Sicilians serving their sentence in a prison in Milan form a group.

Table II

Summary Statistics by National Group

Nationality	Number of observations	Frequency of Recidivism	Drug Offences	Property	Other	Age
Italy						
Campania	3060	0.12	0.29	0.54	0.17	39.47
Lombardia	1743	0.10	0.34	0.48	0.18	42.70
Lazio	1155	0.13	0.39	0.49	0.13	41.77
Morocco	2428	0.13	0.65	0.19	0.16	31.45
Tunisia	1234	0.13	0.76	0.11	0.13	34.15
Albania	1088	0.05	0.56	0.21	0.23	30.31
Algeria	774	0.21	0.54	0.30	0.16	33.27
Romania	761	0.06	0.06	0.63	0.31	29.56
Serbia	440	0.08	0.16	0.62	0.12	34.78
Nigeria	406	0.06	0.76	0.10	0.14	33.57
Senegal	176	0.11	0.57	0.22	0.21	35.93
Croatia	111	0.10	0.19	0.61	0.20	36.71
Egypt	103	0.13	0.40	0.37	0.23	36.92
Dominican Republic	100	0.06	0.89	0.04	0.07	34.21
Bosnia Herzegovina	99	0.12	0.12	0.70	0.18	35.97
Chile	96	0.09	0.15	0.73	0.12	31.15
Peru	91	0.08	0.21	0.62	0.17	37.54
France	83	0.19	0.54	0.36	0.10	35.67

The basic regression

Denote with j the prison, and k the nationality (the region for Italians). With Z the *residual sentence,* with y the fact that the individual *is rearrested or not*. We estimate:

$$y_{ijk} = \alpha_1 + \alpha_2 Z_{ijk} + \alpha_3 \overline{Z}_{(-i)jk} + X_{ijk}'\alpha_4 + \overline{X}_{(-i)jk}'\alpha_5 + \varepsilon_{ijk}$$

The coefficients of interest are α_2 and α_3.

Table III
Baseline results

	(1)	(2)	(3)
Average Residual Sentence	-.0024	-.0022	-.0027
	(.0011)	(.0011)	(.0012)
Average Sentence	.0000	-.0000	-.0001
	(.0001)	(.0004)	(.0003)
Individual Residual sentence	-.0015	-.0016	-.0016
	(.0002)	(.0002)	(.0002)
Individual sentence	0.0002	-.0002	-.0002
	(.0000)	(.0000)	(.0000)
Type of crime	NO	NO	YES
Individual characteristics	YES	YES	YES
R-squared	.021	.058	.064
Average Recidivism	.1152	.1152	.1152
Observations	18367	18367	18367

Interpretations and comments:

Increasing the average residual sentence by one month reduces the probability of recidivism by 0.27 percentage points. The "private incentive" seems to have a smaller effect (0.16 percentage points) than the incentives that other individual have (quite large spillover effects).

Second question

How can we explain such large indirect effects?

A natural candidate is endogenous social interactions (Manski, 1993) (*the effect of average recidivism in the group on individual recidivism*).

We want to estimate:

$$y_{ijk} = \beta_1 + \beta_2 Z_{ijk} + \beta_3 \overline{Y}_{(-i)jk} + X_{ijk}'\beta_4 + \overline{X}_{(-i)jk}'\beta_5 + \varepsilon_{ijk}$$

We cannot regress individual recidivism on average recidivism because of simultaneity (*the reflection problem*).

However, we can estimate the model by *using the average residual sentence as instrument for the average recidivism.*

The exclusion restriction is that average residual sentence affects ones behavior only via its effect on peers' behavior

Table IV
First stage: regressions of average recidivism on
average residual recidivism sentence

	(1)	(2)	(3)
Average Residual Sentence	-.0042	-.0041	-.0044
	(.0002)	(.0002)	(.0002)
Average Sentence	.0004	-.0005	-.0001
	(.0002)	(.0004)	(.0003)
Individual Residual sentence	-.0002	-.0002	-.0002
	(.0001)	(.0002)	(.0001)
Individual sentence	0.0002	0.0002	0.0002
	(.0000)	(.0000)	(.0000)
Type of crime	NO	NO	YES
Individual characteristics	YES	YES	YES
R-squared	.003	.065	.071
Observations	18367	18367	18367

Table V

IV Estimates of the effect of average group recidivism

	(1)	(2)	(3)
Mean Group Recidivism	.6345 (.1309)	.6401 (1551)	.6372 (.1403)
Individual characteristics	YES	YES	YES
Average characteristics	NO	YES	YES
Type of crime	NO	NO	YES
Observations	18367	18367	18367

The results indicate that:

an increase of 1 percentage point in peers' average recidivism increases the individual probability of recidivism by about 0.65 points.

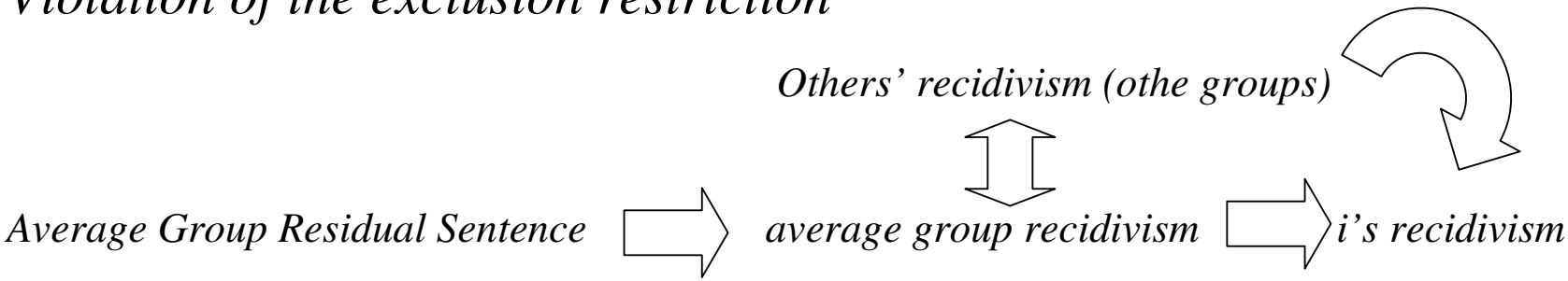
Note however that if our exclusion restriction is violated we are producing a) biased estimates of the overall effects of the policy b) we cannot identify correctly endogenous social interactions

The case is the following:

Valid exclusion restriction

Average Group Residual Sentence ⇨ *average group recidivism* ⇨ *i's recidivism*

Violation of the exclusion restriction



In this case we can still estimate <u>experimentally</u> the overall effect of the policy by estimating the across group spillover effects (e.g. Miguel and Cremer, on intestinal worms). Denoting with $\overline{Z}_{(-k)j}$ the average residual sentence of people in prison j not belonging to nationality (region) k we can estimate the following equation:

$$y_{ijk} = \alpha_1 + \alpha_2 Z_{ijk} + \alpha_3 \overline{Z}_{(-i)jk} + X_{ijk}'\alpha_4 + \overline{X}_{(-i)jk}'\alpha_5 + \alpha_6 \overline{Z}_{(-k)j} + \varepsilon_{ijk}$$

Where

$\alpha_2 =$ direct effects $\alpha_3 =$ within group externalities $\alpha_3 =$ across group externalities

Conclusions

- By exploiting a unique randomization of the incentives to re-commit a crime at the individual level, we have provided evidence on *indirect effects of crime control policies*

The unique design of our natural experiment randomizing expected sentences at the individual level allows us to estimate experimentally both within and between group externalities. Our results support the idea that criminal activity has an inherent social nature. Our analysis suggests that effective crime control policies should rely on this very social nature of crime

Thank you!