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The Incapacitation Effect of Incarceration: Evidence From Several Italian Collective Pardons

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Abstract

Incarceration of criminals reduces crime through two main channels, deterrence and incapacitation. Because of a simultaneity between crime and incarceration–arrested criminals increase the prison population–it is difficult to measure these effects. This paper estimates the incapacitation effect on crime using a unique quasi-natural experiment, namely the recurrent collective pardoning between 1962 and 1995 of up to 35 percent of the Italian prison population. Since these pardons are enacted on a national level, unlike in Levitt (1996), we can control for the endogeneity of these laws that might be driven by criminals' expectations: it is optimal to commit crimes shortly before a collective pardon gets enacted. This effect represents a deterrence effect, which, if not properly controlled for, would bias our IV estimates towards zero. The incapacitation effect is large and precisely estimated. The elasticity of crime with respect to prison population ranges, depending on the type of crime, between 0 and 49 percent. These numbers are increasing during our sample period, which suggests that habitual criminals are now more likely to be subject to pardons than in the past. A benefit-cost analysis suggests that pardons, seen as a short term solution to prison overcrowding, are inefficient.

Keywords: Crime, Pardon, Amnesty, Deterrence, Incapacitation

JEL classification codes: K40, K42, H11

1 Introduction

This paper estimates the causal effect of incapacitation on crime and breaks the simultaneity between crime and incarceration using a unique quasi-natural experiment, namely Italy's recurrent collective pardoning of up to 35 percent of the prison population. Levitt (1996) uses overcrowding litigation status to generate an exogenous variation in the US prison population, though only in rare occasions do judges release prisoners to alleviate overcrowding. In the absence of actual releases the channel through which litigation is supposed to affect prison population in the short run is by influencing the inflows of prisoners (i.e. laxer police, fewer offenders sentenced to prison terms). Our instrument, on the contrary, generates immediate changes in prison population.

Due to collective pardons and amnesties[1] inmates with a residual sentence length of a given number of years, usually 2 or 3, are released. The last collective pardon has been passed in July 2006, and in less than a month 22,000 inmates (more than one third of the whole prison population) have been freed (DAP, 2006). This policy, seen as a short term solution to prison overcrowding, generates a large variation in prison population.

Crime is likely to respond to collective pardons in three different ways. Since pardons reduce the expected sanction, everything else equal, we should expect crime to be higher in a society that every once in a while makes use of them (long term deterrence effect). Given the unavailability of a counterfactual Italian society without pardons, this effect is hard to estimate. Criminals might also try to strategically time their criminal activity in order to minimize their expected sanction, especially if the expected sentence length is similar to the usually pardoned sentence length (short term deterrence effect). For example, criminals might decrease their criminal activity immediately after a pardon, simply because the next pardon is likely to occur only after several years. Not controlling for this short term deterrence effect would certainly downward bias the estimate of the incapacitation effect, which represents the last way collective pardons might affect crime, that is by releasing potential criminals. This effect depends on the criminals' physical presence on the criminal scene. Most of the effect is likely to be driven by recidivists, but there might also be some spillovers. One one hand, the increased supply of criminals might influence the probability of crime detection, and so attract new entrants on the criminal scene, while on the other hand released criminals might

[1] In Italian these policies are called "Indulto" and "Amnistia"

drive some of the old criminals out of the market (Freeman, 1999).

To evaluate how pardons affect crime it is also necessary to realize that they clearly are endogenous: increased crime rates may lead, if no new prisons are build, to prison overcrowding, which may lead to a collective release. A first way we deal with this endogeneity is to first difference the data. It is less likely that yearly changes in crime lead to collective pardons.[2] The second way we deal with this endogeneity is by exploiting the national character of these pardons. Regional variation in crime and prison population allows us to identify the incapacitation effect dealing with both, the endogeneity of the policy and the deterrence effects.[3]

The within-year between Italian regions fraction of pardoned inmates depends on the distribution of the residual sentence length and on the distribution of criminal types residing in a region, both of which are plausibly exogenous. Since controlling for time fixed-effects leaves little variation in our instrument, we also present estimates that control for time effects using two alternative semi-parametric specifications: a national cubic spline based on three-year intervals and a pardon specific linear time trend.[4] In these cases the identification of the incapacitation effect is based on both, regional differences in the fraction of pardoned inmates (due to differences in the distribution of the residual sentence length), and discontinuities in changes in crime around the collective pardons.[5]

Several papers have tried to estimate the effect of prison population on crime, though without separating incapacitation from deterrence. Marvell and Moody (1994) uses state-level panel data and, after rejecting that crime Granger causes prison population, estimates an elasticity of crime with respect to prison population of -0.16. Spelman (1994) finds similar effects. Levitt (1996) controls for the simultaneity using an IV approach and finds elasticities that are 2 to 3 times larger.

Only few papers study the effect of pardons on crime. One reason for this is that most empirical research on the criminal justice system studies the US (Levitt and Miles, 2004), and in the US

[2]Differencing the data is also important in case crime levels and prison population are non-stationary. A regression in levels might then just give spurious results.

[3]In Levitt (1996) instead, changes in prison populations are due to overcrowding litigations carried out at the state level. Two recent papers have been able to identify the deterrence effect (Kessler and Levitt, 1999, Lee and McCrary, 2005), but to our knowledge our paper is the first one to identify a pure incapacitation effect.

[4]It is important to remark that including year fixed effects alters the significance of the estimates, but not their magnitude.

[5]Anything that evolves sufficiently smoothly and affects changes in crime rates on a national level should be captured by our specification for time. If, for example, pardons represent a short-term solution to jail overcrowding, police activity, which is highly centralized in Italy, might depend on overcrowding as well.

pardons are rare. One exception is Mocan and Gittings (2001), which estimates the deterrence effect of gubernatorial pardons of person on death row and finds that three additional pardons generate one to 1.5 additional homicides.

In Italy, despite the recurrent use of pardons, there is only one empirical study on the relationship between pardons and crime, carried out in 1978 (Tartaglione, 1978). This study finds that after the 1954, 1959, 1966, and 1970 pardons national changes in crime tend to be above average. The exceptions are the 1963 one, where only one year was pardoned, and the 1969 one, which applied to certain crimes committed during student demonstrations. It also documents that pardoned inmates have a recidivism rate of 31.2 percent, which is not different from s 32.9 percent, the recidivism rate of prisoners that are released at the end of their term. Standard errors are not shown, so we don't know whether these differences are significant or not. The judges who worked on this pioneering study did not use regression methods, making it impracticable to analyze the link between prison population and crime, or to use regional variation in the fraction of released prisoners. There is also no attempt to value the monetary cost of the increased crime, or to separate the incapacitation effect from the total effect.

Whenever the supply of criminals is inelastic, the incapacitation effect is directly linked to recidivism, and recidivism can also be estimated based on prisoners surveys (DiIulio and Piehl, 1991, Peterson et al., 1980, Piehl and Diiulio Jr, 1995, Visher, 1986). According to these surveys the number of non-drug related crimes committed per year is positively skewed, with the median close to 10 and the mean close to 140. This heterogeneity and the heterogeneity in the types of crime committed generate a distribution of criminal specific social costs. Abstracting from the deterrence effects, incarceration is optimal when the expected harm done by an offender in a period exceeds the per-period cost of imprisonment (Shavell, 1987). Pardons might, therefore, act as an imperfect screening device to free criminals whose social cost lies below the cost of incarceration, but without getting rid of the entire deterrence effect of incarceration. In spirit of this "selective incapacitation" the penal codex establishes that pardons and amnesties (art. 151) should not be given to recidivist, recurrent, and career criminals. Despite this law, in the 1990 and 2006 pardons and in the 1990 amnesty the legislator has decided to extend the benefits to these types of criminals. Moreover, due to the evidence that criminal activity decreases with age, the legislator has sometimes increased the

number of pardoned years for older criminals (usually defined as being older than 65 or 70 years of age).

We find that changes in incapacitation that are driven by collective pardons and amnesties have a significant positive effect on changes in crime. Elasticities of crime with respect to prison population lie between 0 and 49 percent, with drug crimes, frauds, and bank robberies showing the largest responses. A preliminary cost benefit analysis of pardons compared to expanding the prison capacity seems to indicate that the latter should be preferred. Though we do believe that the cost of pardons and amnesties could significantly be reduced by using more selective procedures: keeping criminals who are *more* likely to recommit *more* socially costly crimes in jail.

2 Italy's General Collective Pardons and the Prison Population

Starting in 1992, collective amnesties and pardons are issued by the legislator with an absolute majority requirement of 2/3 (constitutional law n.6 of 1992). Before that year the President could issue them, but only after being mandated by the parliament with a simple majority requirement. The main difference between amnesty and pardon is that amnesties eliminate both the sentence and the crime, as if it never happened, while pardons eliminate only part of the sentence. Given that for Italian prosecutors it is mandatory to investigate all felonies (art. 112 of the Constitution), pardons are usually followed by amnesties.[6] Otherwise, prosecutors would have to spend time and effort investigating pardoned crimes, even if it was impossible to actually punish the perpetrators. Another difference between the two is that whenever the pardoned prisoner recommits a crime within five years, the commuted prison term gets added to the new term. Amnesties, instead, are permanent.

Both, pardons and amnesties have the effect of reducing the prison population.[7] [8] Pardons and amnesties reduce also the number of arrestees who are subject to restrictive measures that are different

[6]The 2006 pardon has been an exception to this rule.

[7]The Italian Statistical Office (ISTAT) groups together pardoned and amnestied prisoners.

[8]The grand majority of pardoned prisoners are convicted criminals, though some might be in preventive detention with an expected sentence that is below the maximum number of pardoned years. In 2006, for example, where the number of pardoned years was 3, 10.7 percent of the prisoners that have been freed were in preventive detention (Marietti, 2006).

from imprisonment, namely social work outside prison, semiliberty, and house arrest. Between 1975, the year in which these measures have been introduced in Italy, and 1995, 19 percent of apprehended criminals (or alleged criminals) were subject to these alternative measures. It has been shown that recidivism rates for these individuals are significantly lower (Santoro and Tucci, 2004), and some of these individuals might commit crimes even while subject to these alternative measures. Nevertheless, changes in crime might in part be due to these additional pardoned individuals. Between WWI and today there have been more than a dozen pardons (mostly coupled with amnesties), and while they were mainly aimed at reconciling a politically divided nation, in more recent times their main goal is to reduce prison overcrowding. Figure 1 shows that the official prison capacity (measured as the number of beds per 100,000 residents) has been declining between 1960 and 1975, significantly reducing the cushion between the total prison population and the total capacity. Although 81 new prisons have been build between 1971 and 2003, during the same period 87 of them have been dismissed because obsolete (de Franciscis, 2003). As a result between 1975 and 1991 prison capacity has been basically flat at almost 50 beds per 100,000 residents. Only in more recent times has capacity increased.

As a result of flat capacity and a steady increase in crime, in 1983 time prison population exceeds for the first time the "official" capacity, even if aggregated at the national level.[9] The 1986 pardon has been the first one to solve a dramatic situation of overcrowding. Partly because of the tougher majority requirements, 16 years have passed between the last pardon, in 2006, and the pardon before that. During the same period the prison population has triplicated from about 20,000 to 60,000, dropping to about 35,000 after the last pardon.[10]

Figure 2 shows the log changes in prison population and the fraction of pardoned prisoners. It is evident that collective pardons induce an almost one for one change in prison population. Overall the fraction of inmates that gets freed can be as high as 35 percent, and reaches sometimes 80 percent in single regions. But the effect appears to be short-lived. Within one year the inmate population recovers more than half of the size of the initial jump. Between 1959 and 1995 the inmate population increased on average by 449 inmates per year. Excluding the year of the pardons, year in which the inmate population decreases on average by 3,700 inmates, the year immediately after the pardon the

[9] In case of necessity the prison administration can add new beds to existing cells, which lead them the definition of "tolerable" capacity. Unfortunately there are no data on capacity based on this definition.

[10] No regional data are yet available for the 2006 pardon.

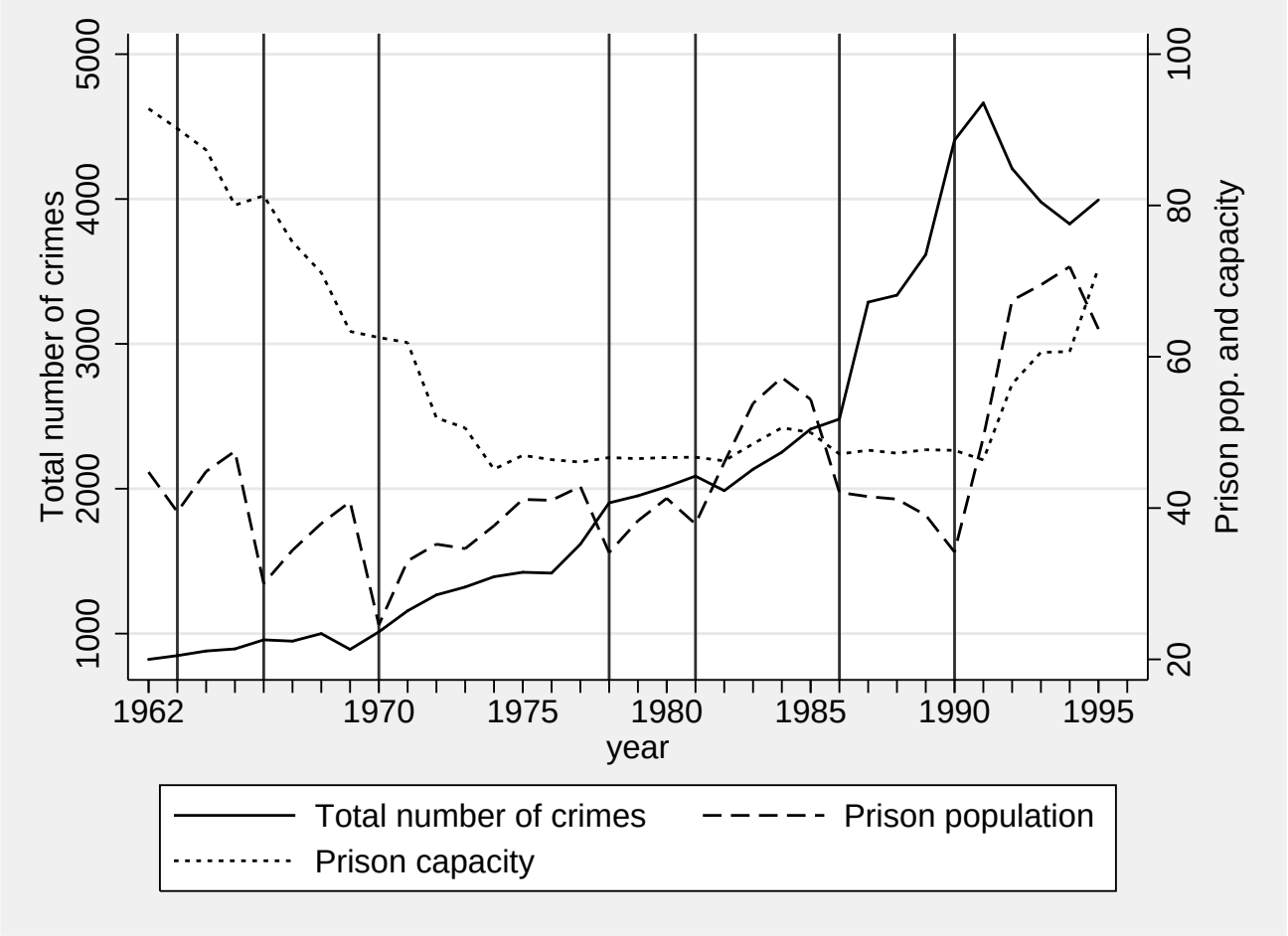

Figure 1: End of the year prison population, prison capacity, and the total number of crimes (per 100,000 residents)

average increase is by 2,944 inmates, compared to only 1,165 in all other years. In other words, in the year following the pardons, and excluding the year of the pardon, the inmate population grows three times faster.

As for how these pardons affect crime, ideally one would compare monthly crime level statistics with the number of pardoned criminals. Unfortunately the only data of this kind that is available to us are for bank robberies, and only with respect to the July 2006 pardon. Figure 3 shows the number of bank robberies per 100 banks between January 2004 and December 2006. The vertical line represents the month where the prison population has dropped from 60.710 to 38.847 (-36 percent). During the same month the number of bank robberies double ($p-value = 0.004$), which corresponds to an elasticity of more than one. Such a large elasticity might in part be explained if potential bank robbers are overly represented among the pardoned prison population. Since the number of bank robberies starts declining again just a month after the release, it is also likely that the large

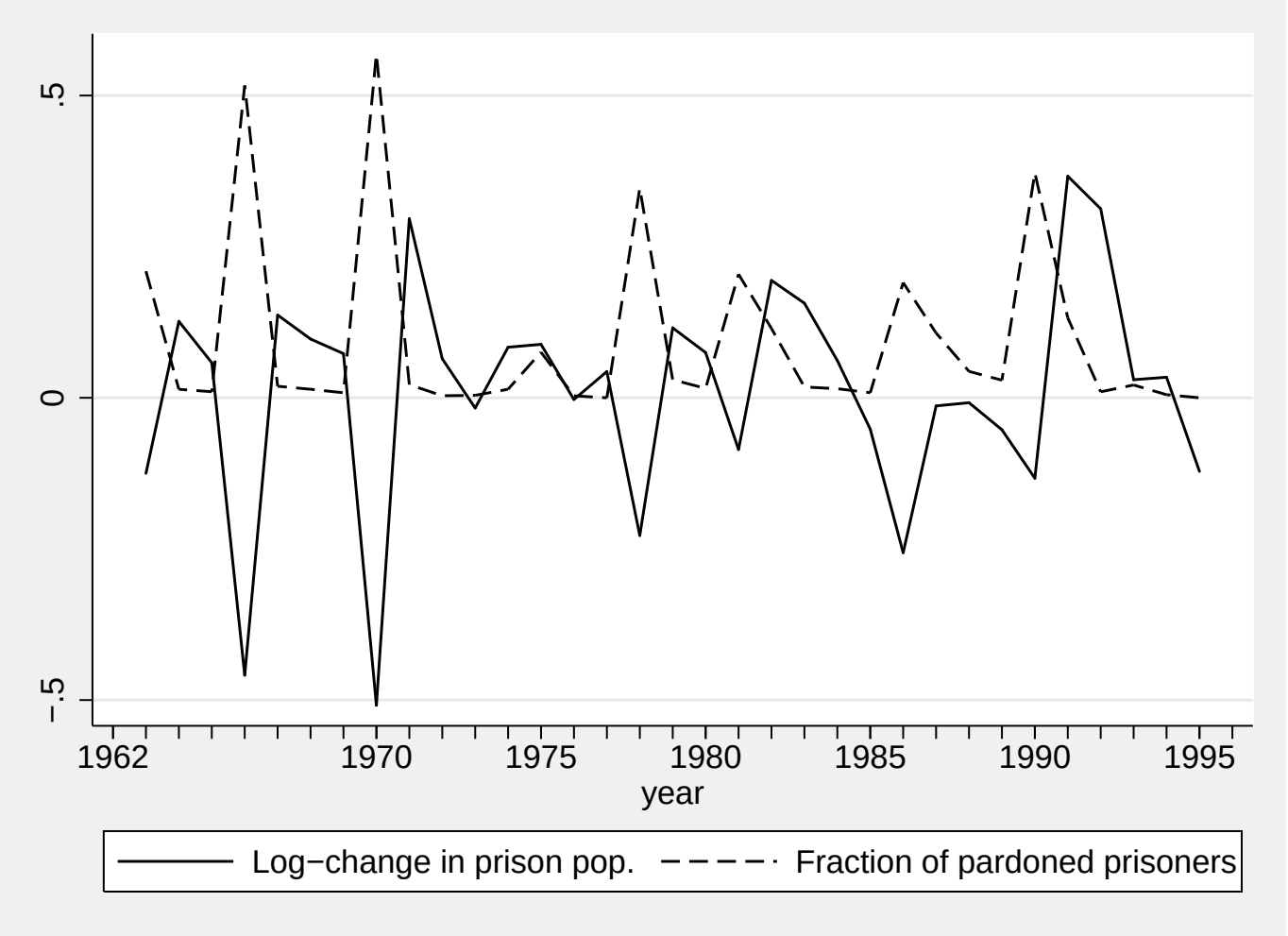

Figure 2: Fraction of pardoned inmates and change in inmate population

increase is due to an implicit coordination. Liquidity constrained criminals might start robbing bank immediately after being freed, and slow down their criminal activity later on.

The next section presents the other crime data that is used to measure how other types of crime respond to collective pardons and amnesties, this time those that have been passed between 1962 and 1995. We have chosen to collect information on crime and prison population up to 1995, because 1990 represents the last year in which a pardon gets passed for which these data are available.

2.1 Data

The Italian statistical office (ISTAT) publishes a yearly statistical supplement about the Italian judiciary system. From these supplements we collected information about the evolution of the prison population, and about crime for 20 Italian regions between 1962 and 1995. ISTAT publishes two

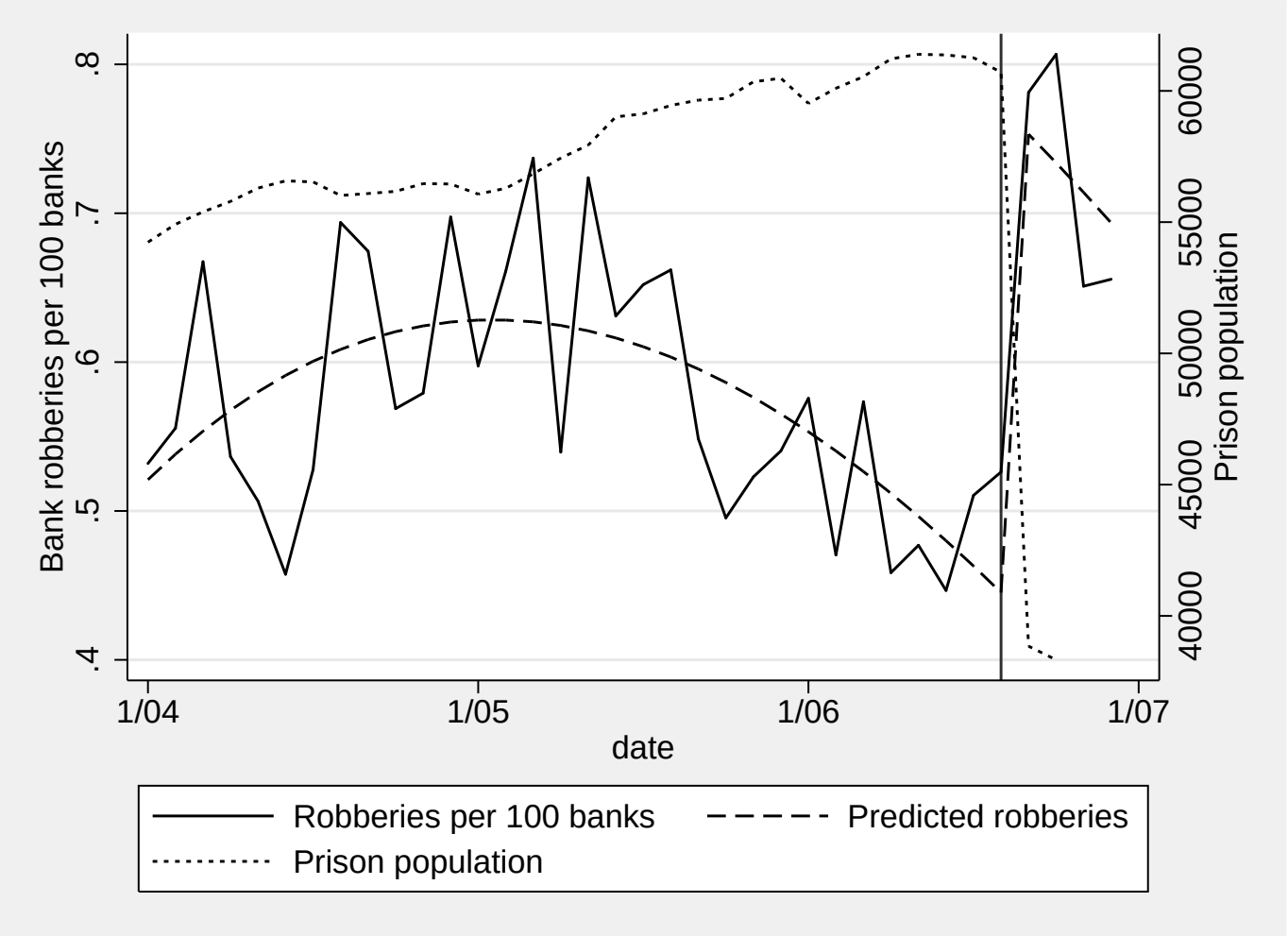

Figure 3: Bank robberies per 100 banks.

crime statistics, those collected directly by the police corps (*Polizia di Stato*, *Carabinieri* and *Guardia di Finanza*) from people's complaints (*Le Statistiche della Delittuosita'*), and those collected by the judiciary system (*Le Statistiche della Criminalita'*) when the penal prosecution, which in Italy is mandatory, starts. The two statistics differ if the judiciary activity is delayed with respect to the time the crime has been committed, and every time crimes are reported to public officials who do not belong to the just cited police corps. Since the exact timing of our statistic is important in most of our analysis we use crime as measured by the police. When single crime categories are unavailable in the police data, and as a robustness check, we also use the judiciary statistics.[11]

Table 2 shows the summary statistics of the variable that we use. Between 1962 and 1995 there

[11]In 1984 ISTAT changed the categorization of crimes in the police statistics, providing a more detailed crime categorization. On the other hand, judiciary data we can use a sample on single crime categories that starts from 1970 (Marselli and Vannini, 1997).

were an average of 42 inmates per 100,000 residents. During a similar time frame Levitt (1996) shows that in the US the inmate population is 168, exactly 4 times as large as in Italy. The total amount of crimes per year per 100,000 residents is 1,983. This number is significantly smaller then Levitt's number for the US (approximately 5,000), even though, unlike in our data, his classification scheme is hierarchical, it counts multiple-offense events as one, the most severe, criminal event. In 1984 ISTAT started separating reported crimes into more specific categories. Some categories are identical to the ones reported by Levitt, and allow a comparison between Italy and the US. Burglaries are less frequent in Italy (270 versus 1,200), and so are larcenies (200 versus 2700), though the definition and level of reporting of these crimes might differ as well. For motor vehicle thefts, where the definition is clear, and where underreporting and multiple offenses are less frequent, the two countries are similar: 317 per 100,000 residents in Italy and 402 in the US.

3 The Estimated Incapacitation Effect

3.1 Identification Strategy

We instrument changes in prison population with the number of pardoned prisoners to solve the simultaneity problem between prison population and crime. As said, crime might respond positively to expected future pardons (deterrence effect), as well as to past and current pardons (incapacitation effect). Criminals might change their criminal activity depending on whether they believe that a pardon is going to be issued in the near future. Fortunately, whenever pardons get enacted they only apply to crimes committed up to a specific date, usually three to six months before the signing of the law. The risk of committing a crime that is too close to a pardon, and is therefore excluded from the pardon, is likely to significantly reduce the incentive to commit pardonable crimes shortly before the law passes.

In order to isolate the incapacitation effect we need to realize that in Italy pardons are nationwide policies, and that the deterrence effect is, therefore, unlikely to vary across regions. A simple model can be used to formalize this intuition, and to lead to our empirical specification. Suppose criminal i at time t (the mass of criminals is normalized to one by dividing the number criminals by the regional

population), ex-ante identical to all other criminals, faces the following problem

$$\max E[r_{i,t} - p_{t,r}J(S_t)|I_t]C_{i,t}, \tag{1}$$

where the return from crime $r_{i,t}$ is, for simplicity, uniformly distributed between 0 and R, the joint probability of apprehension and conviction varies across regions, and the distribution of the disutility from jail $J(S_t)$ depends on the expected sentence length, conditional on the information available up to time t, including information about possible future pardons.

Differences in the probability of apprehension and conviction are assumed to be temporary with mean $E[p_{t,r}] = p_t$. Later in the empirical specification we deal with possible systematic differences by controlling for proxies of p, by differencing the data, and by controlling for regional fixed effects. Information I does not vary across regions. The criminal is going to commit a crime if $r_{i,t} > p_t E[J(S_t)|I_t] = p_t J_t$

In the simplified case of a sentence length of one year the law of motion of criminals is

$$C_{t,r} = \underbrace{1}_{\text{total criminal pop}} - \underbrace{\left[\frac{p_t J_t}{R}\left(1 - p_{t-1,r}C_{t-1,r}\right)\right]}_{\text{fraction deterred of free population}} - \underbrace{p_{t-1,r}C_{t-1,r}}_{\text{fraction incapacitated}}.$$

It is possible to relax, in a reduced form approach, the assumption that sentence length $S = 1$. If sentence length S is equal to two the model becomes

$$C_{t,r} = \underbrace{1}_{\text{total criminal pop}} - \underbrace{\left[\frac{p_t J_t}{R}\left(1 - p_{t-1,r}C_{t-1,r} - p_{t-2,r}C_{t-2,r}\right)\right]}_{\text{fraction deterred of free population}} - \underbrace{p_{t-1,r}C_{t-1,r} - p_{t-2,r}C_{t-2,r}}_{\text{fraction incapacitated}},$$

and after rearranging

$$C_t = 1 - \frac{p_t J_t}{R} - \left(\frac{p_t J_t}{R}p_{t-1} - p_{t-1}\right)C_{t-1} - \left(\frac{p_t J_t}{R}p_{t-2} - p_{t-2}\right)C_{t-2}.$$

Generalizing to sentence lengths up to duration $S_{\max}$:

$$C_{t,r} = 1 - \frac{p_t J_t}{R} - \sum_{s=1}^{S_{\max}}\left(\frac{p_t J_t}{R}p_{t-s} - p_{t-s}\right)C_{t-s,r}$$

Now let us introduce a pardon. The effect of pardoning Z years is to free $W_{t,r}$ criminals at the beginning of period t, $1 - \frac{p_t \tilde{J}_t}{R}$ of which are going to recommit crimes during the year:

$$\tilde{C}_{t,r} = 1 - \frac{p_t \tilde{J}_t}{R} \left(1 - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} + W_{t,r} \right) - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} + W_{t,r}$$

We allow the pardon to have an effect on future expected sentence lengths $\tilde{J}_t$. The difference between the scenario with and without a pardon is going to be

$$\begin{aligned} \tilde{C}_{t,r} - C_{t,r} &= 1 - \frac{p_t \tilde{J}_t}{R} \left(1 - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} + W_{t,r} \right) - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} + W_{t,r} \\ &\quad -1 + \frac{p_t J_t}{R} \left(1 - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} \right) + \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} \\ &= \left(\frac{p_t J_t}{R} - \frac{p_t \tilde{J}_t}{R} \right) \left(1 - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r} \right) + W_{t,r} \left(1 - \frac{p_t \tilde{J}_t}{R} \right) \end{aligned} \tag{2}$$

Notice that the number of criminals in a region varies because of the incapacitation effect (which varies because of differences in the actual realizations of p), and because of the deterrence effect. Criminals might face changes in the deterrence effect $\frac{p_t J_t}{R} - \frac{p_t \tilde{J}_t}{R}$ whenever the expected sentence length changes. This change influences the regional criminal population that is not incapacitated $1 - \sum_{s=1}^{S_{\max}} p_{t-s,r} C_{t-s,r}$.

We do not observe the counterfactual criminal scenario of a "pardon–year" without a pardon. What we do in our empirical specification is to proxy for the counterfactual of crime using years that are contiguous to the pardon. If regional effects, time effects, and time-varying variables capture changes in the deterrence effect, then the coefficient on the number of pardoned prisoners captures the incapacitation effect $1 - \frac{p_t \tilde{J}_t}{R}$.

Including year fixed effects the exogenous variation in the prison population that we exploit is the variation in the fraction of prisoners that are pardoned across regions at a given point in time. This fraction depends on the distribution of the residual prison time of the inmate population, which at the time of the pardon is arguably exogenous.[12][13]

[12] Kuziemko (2006) uses a similar variation to estimate the effect of time served on recidivism.

[13] The link between regional prison population and regional crime depends crucially on the law that establishes that arrested criminals have to be incarcerated in prisons that are located inside the competent judiciary jurisdiction,

Unfortunately, as will be clear once we show the first stages of our IV strategy not much variation in the number or the fraction of pardoned prisoners is left after controlling for year fixed effects. In order to approximate the evolution of the criminals' expectations without giving up all the national variation in pardoned prisoners we pursue two different solutions. In one specification we control for a cubic spline using three-year intervals, in the other we control for pardon-specific linear time trends. When we use splines we assume that criminals' changes in expectations evolve smoothly, without discontinuities. This might be either because the time constraints of the pardons effectively limit such discontinuities or because criminals simply do not take the pardon's timing into account. Notice that the identification strategy is quite similar to a regression discontinuity approach. When we use pardon-specific linear trends we assume that criminals' expectations jump to a new level in the year of the pardon, but evolve linearly afterwards.

The different time controls are shown in Figure 3.1. The dotted line represents the year fixed effects, meaning the regional average, of the log-change in total number of crimes. Log-changes in crime are smoother when we use the three-year cubic spline (solid line), especially during the 80s and 90s. The pardon-specific linear time trends on the other hand (dashed line) are close to the fixed effects during the 60s (it is the decade with the highest number of pardons). Figure 3.1 shows the same semi-parametric approximations, but this time looking at changes in levels. The cyclical variation in crime (and log-crime), we will see, can in part be ascribed to the cyclical use pardons.

Notice that variations in logs are more or less constant over time while variations in levels are increasing. This is due to the impressive increase in the total number of reported crimes (Figure 1).

Table 3 shows the fraction of pardoned inmates across regions. In 1963, year of the first pardon in our sample, in most regions only 20 percent of the prison population is pardoned. Table 4 shows that this corresponds to approximately 10 prisoners per 100,000 residents. Only three years later, in 1966, a new pardon gets passed that frees three times as many inmates. In the Abruzzo and Molise regions, aggregated because of data limitations, 85 percent of the inmate populations leaves jail. The 1968 pardon instead, which applies to crimes committed during student demonstrations, only a

"*Competenza per Territorio, Article 8 of the Codice di Procedura Penale*" (where the crime has been committed). Each region has one or more jurisdiction, with the exception of the Valle D'Aosta and Piedmont region who share the jurisdiction of Torino. In the analysis that follows were are implicitly assuming that criminals operate always inside the same region. There is, indeed, no clear evidence of criminal spillovers to contiguous regions, which suggest that criminals act locally.

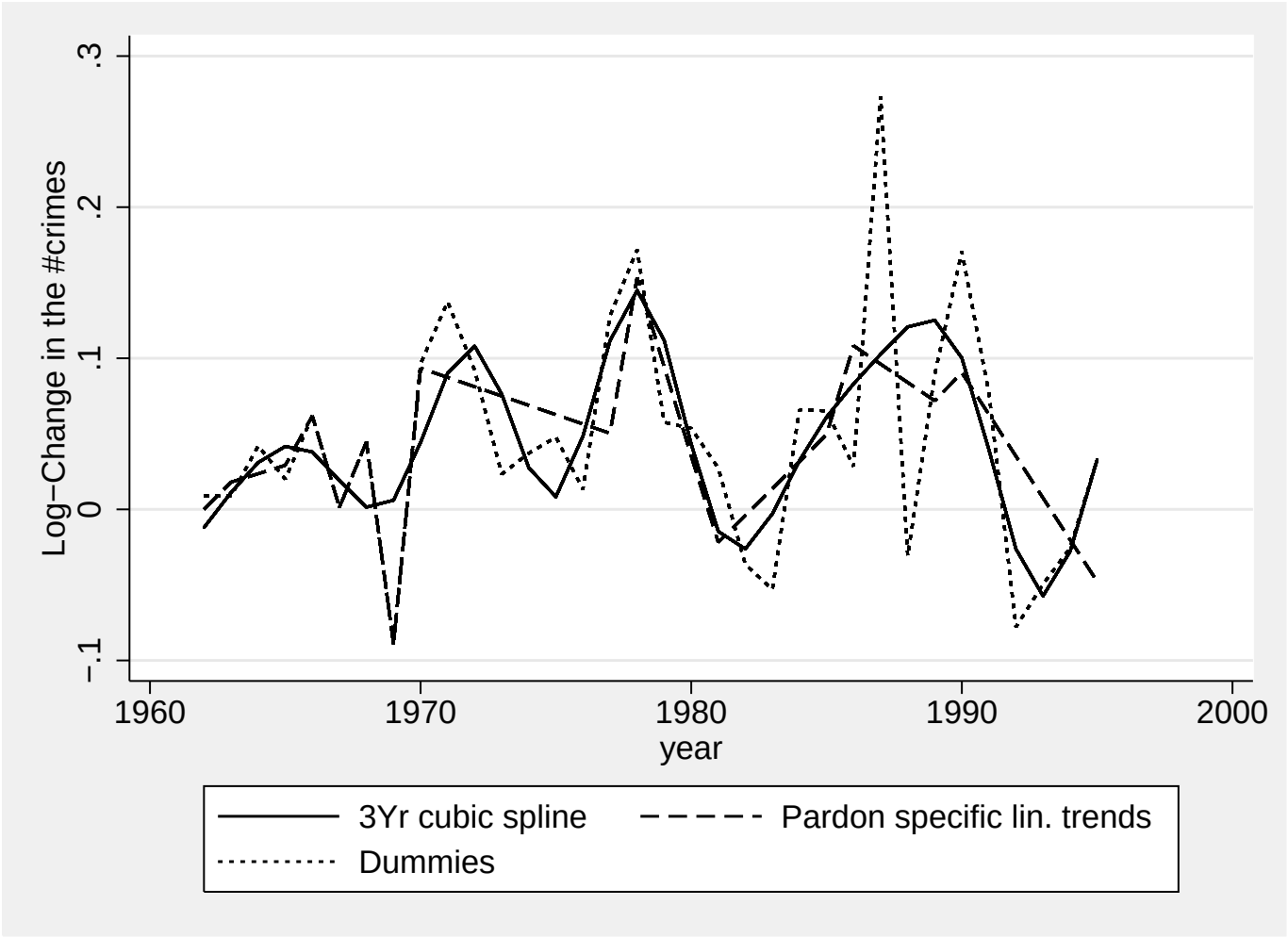

Figure 4: Log-change in the total number of crimes

negligible fraction of inmates gets pardoned. Two years later, due to a very large collective pardon, in five regions, namely Abruzzo, Molise, Friuli-Venezia Giulia, Liguria, Trentino Alto Adige more than 70 percent of prisoners are freed. At the end the 70s and in the 80s there are three pardons, the first is quite large (around 40 percent of the prison population gets freed), while the other two are moderately sized (around 25 percent gets freed). The last pardon in our sample happens in 1990, and the reason is that the data about the 2006 pardon are not available yet.[14]

When we analyze the effect of the prison population on total crime, we use both a model in levels

[14] A special event has taken place in Italy in July 1990, the soccer world cup. In the 12 regions that hosted at least a game log changes in crime are, compared to the remaining regions, 12 percentage points larger in 1990 than in either 1989 or 1991 (p-value of 8 percent). Prisoner flows, instead, do not seem to differ significantly because of the world cup. In order to control for changes in crime that are due to the world cup all regressions control for whether in 1990 the region hosted a world cup game.

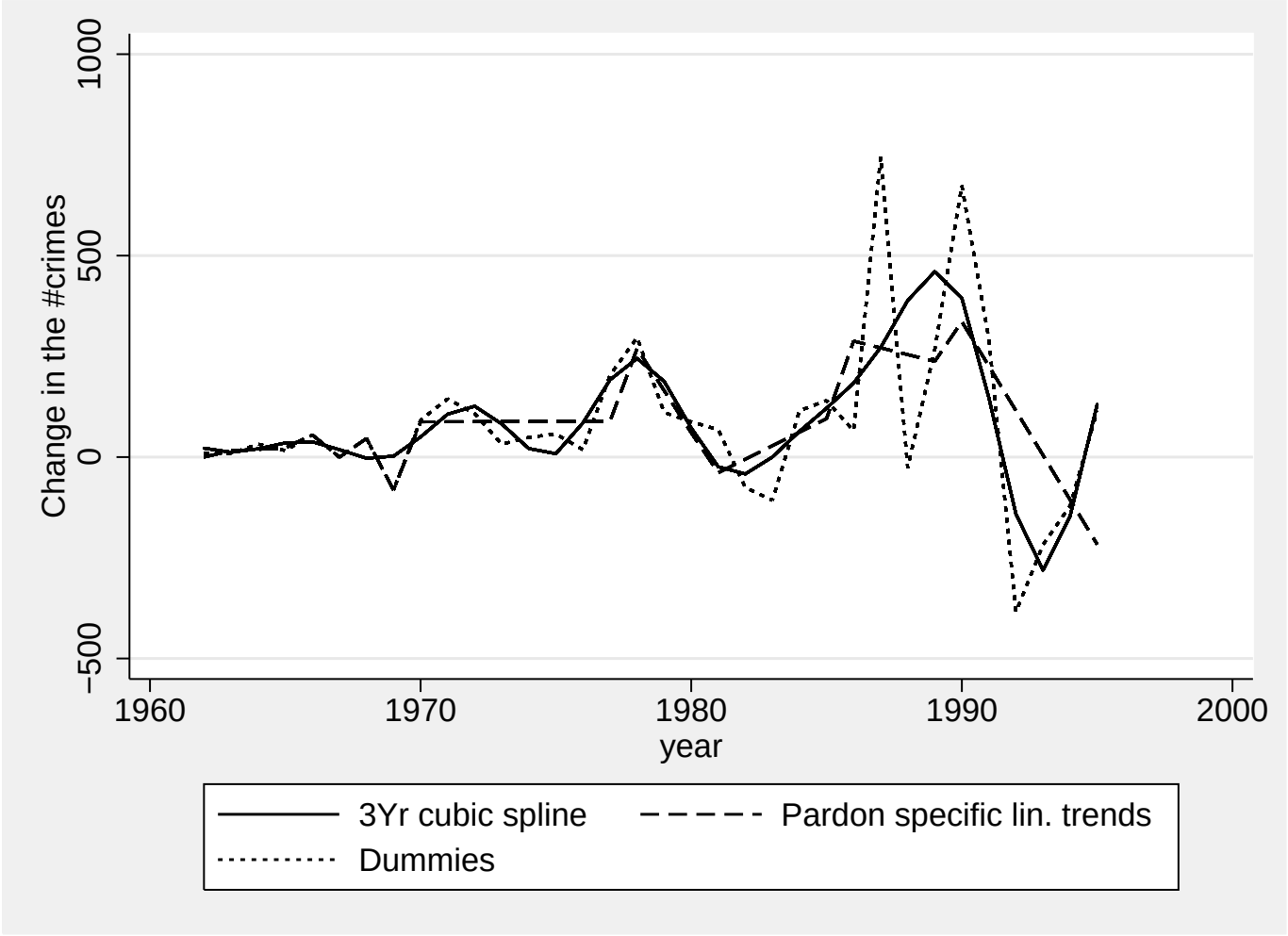

Figure 5: Change in the total number of crimes

and one in logs,

$$\Delta[log]CRIME_{t,r} = \beta\Delta[log]PRISON_{t,r} + f(t) + \delta' X_{t,r} + \gamma_r + \epsilon_{t,r}. \tag{3}$$

All regressions include regional fixed effects γ_r, allowing for regional differences in systematic changes in the probability of apprehension and conviction, systematic changes in the labor market, etc. The variables are already differenced (which controls for systematic differences in the levels) and expressed in terms of 100,000 residents. Changes in prison population are instrumented using the number of pardoned prisoners, while log changes in prison population are instrumented using the number of pardoned prisoners over the number of prisoners in the preceding year.

Notice that the IV's reduced form equation in levels,

$$\Delta CRIME_{t,r} = \beta PARDONED_{t,r} + f(t) + \delta' X_{t,r} + \gamma_r + \epsilon_{t,r}. \tag{4}$$

is directly related to equation 2. The term $f(t) + \gamma_r + \delta' X_{t,r}$ is supposed to capture the deterrence effect and isolate the incapacitation effect $\beta = 1 - \frac{p_t \tilde{J}_t}{R}$. Not controlling for the deterrence effect could bias the estimated incapacitation effect downward. The reason is that post–pardon increases in expected sentence lengths are likely to reduce crime (it is optimal to increase criminal activity before the pardon and reduce it afterwards).

Given that some released prisoners get rearrested within a year, we would like to estimate how crime rates vary immediately after a pardon gets enacted. But pardons and amnesties are sometimes passed in the middle of the year, and we have no access to monthly regional data. Fortunately we can use the date the pardon gets passed to adjust the change in the prison population and the number of pardoned prisoners to produce "full-year equivalent" pardoned prisoners, that is prisoners who can potentially commit crimes for a whole year. Take, for example, the 1978 pardon. The law was issued on the 5th of August. Assuming that criminal activity is uniformly distributed over time after the pardon, recidivist prisoners would be able to commit crimes for 5 months in 1978. A way to take this timing into account and produce "full-year equivalent" prisoners is to reduce the number of pardoned prisoners by 7/12 in the year of the pardon and add these prisoners to the year after the pardon, year in which they can potentially commit crimes for the whole year.[15]

More generally, based on the day of the year d the pardon becomes active full-year equivalent pardoned prisoners are

$$PARDONED^*_{t,r} = \frac{365 - d}{365} PARDONED_{t,r}$$

in the year of the pardon,

$$PARDONED^*_{t,r} = \frac{d}{365} PARDONED_{t,r-1} + PARDONED_{t,r}$$

[15] In 1990, the amnesty was done in April, while the pardon was done in December. As a result the weight is going to be the average of the two periods weighted by what fraction of released prisoners got released because of the pardon (80 percent) and the amnesty (20 percent) (Censis, 2006).

the year after the pardon and

$$PARDONED^*_{t,r} = PARDONED_{t,r}$$

in all other years. We also adjust the prison population accordingly.

3.2 Results

Panel A of Table 5 reports the first stage estimates of the change in prison population on the number of pardoned prisoners. In column 1, where $f(t)$ is estimated using a three-year cubic spline the first stage tells us that by the end of the year each pardoned prisoner reduces the prison population by 0.46. Once we control for year fixed effects (column 3) the coefficient drops to -0.11, demonstrating that the instrument becomes weaker once we absorb the nation-wide variation in the number of pardoned prisoners.

Panel B shows the first stage regression when log-changes are used instead of changes in levels. In Panel C (D) instead the dependent variable is changes in crime (log-changes in crime). Let us immediately say that because of the simultaneity between crime and prison population OLS estimates are biased toward zero. In the years after pardons get passed high incarceration rates match high crime rates, introducing a positive correlation. The IV estimates tell us that for each pardoned prisoner the estimated number of crimes increases by between 30.85 if we use cubic splines to approximate $f(t)$ and by 44.48 crimes if we use pardon-specific linear time trends to approximate $f(t)$. This difference is mainly driven by the difference in the first stage estimates. The reduced form coefficients are not very different, 14.34 versus 17.80. Notice that both estimates are highly significant. The model in logs shows elasticities of 17 percent for the model with splines and 19 percent for the model with pardon-specific linear time trends. It is comforting that the IV estimates that include year fixed effects are, although not precisely estimated, similar to the IV estimates that use pardon-specific linear trends, both in levels and in logs.

In Table 5 we additionally control for things that might affect pardons and crime rates. From now on we control for our preferred (and the more conservative) specification, the one that uses three-year cubic splines. Since some of the additional controls are available for the years 1985-1995 only, the

sample size drops from 594 to 198. Changes in GDP are supposed to proxy for legal opportunities of criminals while changes in consumption are supposed to capture illegal opportunities. Controlling for these opportunities changes the reduced form elasticity (Table 5) from 32 percent to 28 percent, while the IV elasticity remains almost identical (27 versus 24 percent). Despite the smaller sample size the estimates are precisely measured and are larger than the elasticities estimated before, indicating that the incapacitation has increased over time.

Police enforcement might strategically respond to the legislator's pardons. Depending on their objective function police officers might either increase or decrease their efforts to apprehend criminals. The supply shock of criminals after a pardon is likely to increase the probability of apprehension (p) and also police activity (A) if their goal is to equate expected marginal benefits $pB(A)$ to marginal costs $C(A)$ and $B_{AA} < 0$, $C_{AA} > 0$. On the other hand, pardons are likely to weaken the police officers motivations, and, therefore, productivity. Pardons do not only waste part of their past efforts. Criminals who commit a crime before the pardon, but get arrested only after the pardon, can also benefit from the pardon. This means that even post–pardon arrests might end up being of little use. For these reasons in Columns 3 and 7 we control for changes in the number of police officers and for changes in the number of controlled people. Both, the reduced form estimate and the IV estimates are robust to this inclusion, indicating, at least, that police activity does not change as abruptly as the inmate population.

Finally, we control for changes in the fraction of inmates staying in dormitories and for the change in the rate of overcrowding (inmates divided by available beds). The reason is that changes in prison quality might have a deterrence effect (Katz et al., 2003). Although the change in the rate of overcrowding captures part of the variability that is due to the pardons, there are again no significant changes in either the marginal effects or the elasticities of interest, which suggests that pardons can be credibly treated as exogenous and that there is no need to control for other variables.

Not all criminals are usually pardoned, usually some restrictions apply. Very violent crimes are generally excluded from pardons (see Table 1). Consistent with this selection, in Table 7 we find that between 1984 and 1995 types of crime that are explicitly excluded from pardons, like sexual assaults and kidnappings, do not show any significant increase related to pardons.[16] It is somehow

[16]Mafia related homicides, always excluded from pardons, also do not respond to pardons. Since many regions have

puzzling that larcenies and burglaries have an effect that is not significantly different from zero, though these crimes might be subject in the police data to serious measurement error. Motor-vehicle thefts, instead, that are known to be measured with high precision (the rates of reporting are close to one), have an elasticity of 20 percent. Bank robberies show an elasticity of 50 percent, and drug related crimes an elasticity of 60 percent, even if these were explicitly excluded from the 1990 pardon (though not from the 1990 amnesty).

As an additional robustness check, Table 8 shows that using judiciary crime data instead of police data only strengthen the incapacitation effect (30 percent versus 22 percent). Given that "judges for the initial investigation" (*giudice delle indagini preliminari*) are supposed to dismiss all irrelevant cases before reporting a crime, this might be due to the gained precision in the measurement of crime. Consistent with this possibility, the elasticity for thefts, which includes larceny and burglary, is now close to 40 percent and highly significant. Frauds show the highest elasticity (49 percent) and even the coefficient for murder and attempted murder is significantly different from zero (36 percent).

4 Policy Implications

In order to solve the problem of prison overcrowding, the important question is whether a forward-looking society would benefit from building new prisons, or expand alternative measures to imprisonment, instead of constantly relying on pardons. Collective pardons and collective amnesties have been shown to increase the total number of crimes. What is left to see is whether the marginal social cost of these crimes is, when compared to the marginal cost of incarceration, large enough to make pardons an inefficient policy.

Let us start with the cost of incarceration.[17] Regressing the total budgetary cost of the penitentiary administration (in 2004 euros) on prison population over the last 17 years we obtain a marginal cost per prisoners equal to 42,449 euros (95 percent confidence interval [11,066-73,832]) when we use OLS and equal to 57,830 euros (95 percent confidence interval [44,092 71,568]) when we use a

no mafia related homicides we analyzed changes in levels. Results are available upon request.

[17]Notice that we are implicitly assuming a linear social function. In case of risk aversion individuals would like to equate marginal expected (dis)utility from crime with their marginal tax devoted to finance the prison administration. Given that crime involves risk, people should be willing to pay even more than the marginal cost of incarceration to keep criminals in jail.

median regression. Dividing the budget by the prison population instead, we get an average cost of 46,452 euros with a range that varies between 35,496 euros (97 euros per day) and 70,974 (194 euros per day). Overall the upper bar seems to be 70,000 euros. These numbers are two to three times larger than in the US, though this seems to be driven by the inmate-to-staff ratio, that is two to six times larger than in the US states.[18] Notice that these costs do not include tax distortions (it costs more than one euro to collect one euro in taxes), inmates' wasted human capital, their post-release decline in wages, and the pain and suffering of inmates and of their families (including the one due to overcrowding).

Calculating the marginal cost per crime is more difficult and requires the use of different sources and several assumptions. Table 9 reports the estimated elasticity (ϵ), the probability of reporting (p), the marginal effect of incarceration ($\beta = \frac{\epsilon}{p} \times \frac{\overline{crimes}}{\overline{prison-pop}}$), the cost per crime ($c$), and the social cost ($s = \beta \times c$).[19]

All but two cost per crime estimates and the probabilities of reporting a crime come from ISTAT's 2002 victimization study (Muratore et al., 2004). Italy's Value of a Statistical Life (VSL), used to value a lost life due to intentional homicide, has been estimated in a study commissioned by the European Commission (Albertini and Scarpa, 2004) and its results are comparable to several other studies done in the US.[20] The social cost of frauds comes from a study made by the Italian association of retailers (Con, 2006).[21][22] For drug related crimes we could not find any cost estimate, while for attempted murder, which also has a positive elasticity we use a conservative estimate of 0. Notice that when computing the total social cost, question marks are treated as zeros, a conservative approach. For violent crimes we do not use quality of life reductions caused by pain and suffering, because no such estimates are available for Italy. The cost estimates also do not include preventive measures

[18] At the beginning of 2007 the Italian prison system employed more than 45,000 people, with an inmate-to-staff ratio close to one (www.polizia-penitenziaria.it). In 2001 in the US the inmate-to-staff ratio ranged between 1.7 in Maine (with an average cost of 122 dollars per day) and 6.8 in Alabama (with an average cost of 22 dollars per day , www.ojp.usdoj.gov).

[19] As in Levitt (1996) we need to assume that reported and unreported crimes are subject to the same elasticities, which, since criminals do not know a priori whether a crime gets reported or not, seems to be a reasonable assumption.

[20] Estimates of the VSL for Italy range from 1,448,000 to 2,896,000 euros (Albertini and Scarpa, 2004). See Ashenfelter and Greenstone (2004b) and Ashenfelter and Greenstone (2004a) for an overview of recent estimates of the VSL.

[21] The study uses the following sources for its estimate, fiscal police (*Guardia di Finanza*), customs police (*Agenzia delle Dogane*), survey data, and the anti-fraud phone (*Telefono antiplagio*).

[22] We could not estimate some elasticities, marked with a question mark, while for other elasticities, based on institutional details of the pardons, we have a conservative guess of zero, marked with a zero and a question mark.

taken by people to fight crime (insurance policies and the like). Apprehensions are also socially costly, because resources must be spent to rearrest pardoned prisoners, but since these costs are difficult to be quantified they also are excluded.

Taken with the grain of salt given the assumptions, the total social cost amounts to 153,000 euros. The most socially costly crimes following a pardon are frauds (55,000 euros) and non-mafia related murders (46,000 euros). Motor vehicle thefts (a total of 31,000 euros), other thefts (14,000 euros) and bank robberies (8,000 euros) follow. This variability suggests that pardons do not select the type of criminals that are being released based on a cost minimizing principle.[23] Even if we exclude the social cost that is related to frauds, which is the only one that is not entirely based on representative victimization surveys or on police reports, the social cost is still significantly above the 70,000 threshold.

Up until now we have excluded pardoned individuals who are subject to alternative measures to detention from the cost benefit analysis. The reason is that we do not have region–level data on these measures. We do know, though that pardons affect the prison population and the population subject to alternative measures of detention in the same way. Since the population subject to alternative measures of detention is likely to recidivate less and cost less than the prison population, including them in the cost-benefit analysis is likely to reduce the marginal cost of imprisonment, making the case against pardons and amnesties even stronger.

5 Conclusions

We use an atypical judiciary policy, namely Italy's collective pardons and amnesties, to estimate the causal effect of incapacitation on crime. We show with a simple model that whenever pardons and amnesties are nationwide policies the incapacitation can be separately identified from the deterrence effect. We can also control for the possible endogeneity of the policy that arises whenever criminals expect a sentence-reducing policy before the policy gets enacted. Ignoring this endogeneity could

[23] While some of these cost are simple transfers to criminals, we believe that from a political economy point of view, it is correct to exclude criminals' utility from the benefit estimates. Arrested criminals are typically not allowed to vote, and even if they were, given our estimates, median voters would decide to build new prisons, or use policies (typically active labor market policies) that would create incentives for pardoned prisoners to avoid recommitting crimes. This last policy implication, though, would only hold if pardons had no real detrimental deterrence effect, which is still an open question, and needs further research.

bias our estimates toward zero. Compared to Levitt (1996), which uses US States' overcrowding litigation status as an instrument and, therefore, is unable to control for expectations, or separate incapacitation from deterrence, our elasticities are only slightly smaller, and tend to be larger than previous "non-experimental" estimates (we show that our OLS estimates are also biased toward zero).

Collective pardons and amnesties could represent a more cost-efficient imperfect screening device than individual parole boards. This idea was certainly present in the mind of the legislator (at least before the 1990 pardon). "Formalized" habitual criminals were typically excluded from pardons, and elderly prisoners, believed to have lower recidivism rates, sometimes received larger sentence reductions.

This view could potentially lead to the definition of an optimal release policy, likely to be several times more efficient than the typical Italian pardon. We leave this to future research, and perform a cost-benefit analysis that compares the efficiency of pardons with the the status quo, i.e. keeping prisoners in jail. We find the social cost of pardons to be significantly larger than the cost of incarceration. In the absence of cost efficient alternatives measures to incarceration, this suggests that in Italy prison capacity should be increased.

A Definitions of crime, years available, and source

Mafia murders, 1984-95, police records Intentional homicides related to the organized crime

Sexual assaults, 1984-95, police records The carnal knowledge against someone's will

Kidnappings, 1984-95, police records

Drug related crimes, 1984-95, police records

Larcenies, 1984-95, police records The unlawful taking of property from the possession of another

Burglaries, 1984-95, police records The unlawful entry of a structure to commit a theft.

Motor vehicle theft, 1984-95, police records

Bank robberies, 1984-95, police records The seizing property from a bank through violence or intimidation.

Theft and aggravated thefts, 1970-1995, judiciary records

Homicides, 1970-1995, judiciary records

Frauds, 1970-1995, judiciary records The deceiving of someone to damage him usually, to obtain property or services unjustly. Examples are false advertising, identity theft, false billing, forgery of documents or signatures, false insurance claims, investment frauds, etc.

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Table 1: History of collective pardons from 1978 to 2006.

LAW EFFECTIVE	TYPE	N. OF YEARS PARDONED	INCLUDED CRIMES	EXCLUDED CRIMES	EXCLUDED CRIMINALS
Jan 24, 1963 (Dec 8, 1962)	Amnesty	3 years (4 years if the inmate's age is below 18).	Thefts of plants, crimes related to art. 82 of the penal codex (p.c.).	I(371); III(444); IV(516); V(528, 530).	Criminals who at the amnesty have been sentenced to more than 1 year for intentional crimes.
	Pardon	1 year (2 years if the inmate's age is below 18 or above 70).		I(314, 315, 317); III(439, 440, 441); V(519, 520); VIII(628).	Criminals who at the amnesty have been sentenced to more than 1 year for intentional crimes.
June 4, 1966 (Jan 31, 1966)	Amnesty	3 years (4 years if the inmate's age is below 18 or above 70).	Tax crimes, thefts of plants, wood and fish, crimes related to art. 57, 82, 330, 337, 340, 341, 414, 415, 507, 508, 610, 635 of the p.c.; crimes related to the Resistance Movement if committed between July 25, 1943 and June 2, 1946.	I(316, 318-322, 371); III(443-447); V(528, 530).	Criminals who at the amnesty have been sentenced to more than 2 years for intentional crimes.
	Pardon	2 years.	Tax crimes, crimes concerning the law of customs and monopoly.		Professional or recurrent criminals.
Oct 25, 1968 (June 27, 1968)	Amnesty	5 years.	Crimes committed because of, and during political demonstrations related to art. 338, 419, 423 of the p.c., crimes related to Vajont disaster.		Criminals who at the amnesty have been sentenced to more than 3 years for intentional crimes.
	Pardon	2 years.	Same as above, and crimes related to Vajont disaster.		Professional or recurrent criminals.

LAW EFFECTIVE	TYPE	N. OF YEARS PARDONED	INCLUDED CRIMES	EXCLUDED CRIMES	EXCLUDED CRIMINALS
May 22, 1970 (April 6, 1970)	Amnesty (particular)	5 years.	Crimes related to art. 302, 303, 338, 419, 423 of the p.c., illegal detention of arms, crimes concerning the law of customs, crimes related with tobacco monopoly.		
	Amnesty	3 years (4 years if the inmate's age is below 18 or above 70).	Non-financial crimes, thefts and crimes related to art. 314 of the penal codex (p. c.).	I(371, 372, 388); III(443, 444, 446, 447); V(528, 530).	Professional or recurrent criminals, criminals who at the amnesty have been sentenced to more than 3 years for intentional crimes.
	Pardon	2 years.	Crimes covered by the military penal codex (m.p.c.) if committed because of conscientious objection.		Professional or recurrent criminals, criminals who at the amnesty have been sentenced to more than 3 years for intentional crimes.
Aug 5, 1978 (March 15, 1978)	Amnesty	3 years (4 years if the inmate's age is below 18 or above 70).	Non-financial crimes with few exceptions, crimes related to art. 57 and 334 of the p. c., and WWII desertions.	I (316, 318-321, 355, 371, 372, 385, 391); III (443-445); IV (501, 501-bis); VII (590); VIII (644). Art. 218 of the m. p. c.. Crimes associated with construction (several laws (s. l.)), environment (s. l.), illegion detention of arms(s. l.), and currency(s. l.).	Professional or recurrent criminals, criminals who within 5 years preceding the amnesty have been sentenced to more than 2 years for intentional crimes, criminals who have been sentenced to more than 10 years for intentional crimes.
	Pardon	1 year for crimes related to art. 441, 442, 519, 521, 624 of the p.c.; otherwise 2 years.		I (253, 276, 283-286, 306, 314, 315, 317, 319, 385); III (422, 428 - 434, 438 - 440); VII (575); VIII (628 - 630). Crimes associated with reorganization of fascism (law), drugs (law), currency (s. l.), production and trade of arms (s. l.), and financial crimes.	

LAW EFFECTIVE	TYPE	N. OF YEARS PARDONED	INCLUDED CRIMES	EXCLUDED CRIMES	EXCLUDED CRIMINALS
Dec 19, 1981 (Aug 31, 1981)	Amnesty	3 years (4 years if the inmate's age is below 18 or above 70).	Non-financial crimes with few exceptions, crimes related to art. 57, 334, 476, 491, 482 and 610 of the p. c.	I (316, 318-321, 355, 371, 372, 385, 391); III (443-445); IV (501, 501-bis); VII (590); VIII (644). Art. 218 of the m. p. c.. Crimes associated with construction (s. l.), environment (s.l.), illegal detention of arms (s.l.), currency (s.l.) and terrorism.	Professional or recurrent criminals, criminals who within 5 years preceding the amnesty have been sentenced to more than 2 years for intentional crimes, criminals who have been sentenced to more than 10 years for intentional crimes.
	Pardon	1 year for crimes related to art. 441, 442, 519, 521, 624 of the p.c.; otherwise 2 years.		I (253, 270, 270-bis, 276, 280, 283-286, 289-bis, 306, 314, 315, 317, 319, 385); II (420); III (422, 428 - 434, 438 - 440); VII (575); VIII (628 - 630, 648 - bis). Crimes associated with reorganization of fascism (s. l.), drugs (law), currency (s. l.), production and trade of arms (s. l.), terrorism, and financial crimes.	Professional or recurrent criminals.
Dec 16, 1986 (June 8, 1986)	Amnesty	3 years (4 years if the inmate's age is below 18 or above 65).	Non-financial crimes with few exceptions, crimes related to art. 57, 476, 491, 482, 337 and 610 of the p. c., illegal detention of small weapons (s.l.), crimes committed by criminals under age 18	I (316, 318-321, 355, 371, 372, 385, 391); III (443-445); IV (501, 501-bis); VII (590); VIII (644). Crimes associated with construction (s. l.), environment (s. l.), modification of weapons (law) and currency (s. l.). protection of Venice (s. l.), ecological crimes (s. l.)	Professional or recurrent criminals, criminals who within 10 years preceding the amnesty have been sentenced to more than 3 years for intentional crimes.
	Pardon	1 year for crimes related to art. 441, 442, 519, 521, 624 of the p.c.; 3 years if the inmte's age is above 65; otherwise 2 years.		I (253, 270, 270-bis, 276, 280, 283-286, 289, 289-bis, 306, 314, 315, 317, 319, 385); II (416 - bis, 420); III (422, 428 - 434, 438 - 442); V (519, 521); VII (575); VIII (628 - 630, 648 - bis). Art. 167, 186, 195, 215, 216, 217 of the m. p. c.. Crimes associated with the reorganization of fascism (s. l.), drugs (s. l.), currency (s. l.), secret organizations (s. l.), illegal detention of arms (law), and financial crimes.	Professional or recurrent criminals.

LAW EFFECTIVE	TYPE	N. OF YEARS PARDONED	INCLUDED CRIMES	EXCLUDED CRIMES	EXCLUDED CRIMINALS
April 12, 1990 (Oct 24, 1989)	Amnesty	4 years.	Non-financial crimes with few exceptions, crimes related to art. 57, 336, 337, 588, 614, 640, of the p. c., illegal detention of arms (s. l.), crimes related to strikes (s. l.), crimes committed by criminals under age 18 (s.l.), crimes related to tobacco monopoly, crimes related to taxes on consumption of gas and electricity (s.l.), small crimes related to taxes committed by non-commercial entities.	I (316, 318-321, 353-355, 371, 372, 378, 385, 391); II(420); III (443-445, 452, 471, 478); IV (501, 501-bis); V(521); VII (590, 595, 610); VIII (644); IX (733, 734). Crimes associated with construction (s. l.), environment (s. l.), control of arms (law), mafia (law), protection of Venice (s. l.), risks of big accidents associated with certain industrial activities (law), ecological crimes (s.l.) and modification of artworks (law).	NO
Dec 24, 1990 (Oct 24, 1989)	Pardon	2 years.			NO
July 31, 2006 (May 2, 2006)	Pardon	3 years.		I (270, 270-bis, 270-quater, 270-quinquies, 280, 280-bis, 285, 289-bis, 306); II (416); III (422); VII (600, 600-bis, 600-ter, 600-quater, 600-quinquies, 601, 602, 609-bis, 609-quater, 609-quinquies, 609-octies); VIII (630, 644, 648-bis). Crimes associated with drugs.	NO

Notes:

I - Crime against the State/PA/Judiciary System; II - C.a. public order; III - Fraud; IV - C.a Economic System; V - C. a. morality; VI - C. a. family; VII - C. a. person (inc. violent crimes); VIII - C. a. wealth (thefts etc); IX - Crimes against the State's social activity. Article numbers reported within brackets in the column of excluded crimes are articles of the penal codex, unless something different is explicitly indicated. Date: Publication date is presented above the effectiveness date (in brackets). The Amnesty/Pardon is valid for crimes committed before the effectiveness date.

Table 2: Summary statistics (per 100,000 residents when applicable)

Variable	Mean	Std. Dev.	Min.	Max.	N
Prison population	42.471	17.178	7.647	100.995	612
Pardoned prisoners	3.583	6.093	0	35.343	612
GDP per capita (x1000)	13.704	3.526	7.247	21.97	288
Consumption per capita (x1000)	11.219	2.032	7.299	17.728	288
# of police forces	439.404	179.88	112.951	995.681	288
# of police controls	52931.831	28147.419	0	125339.326	255
Dormitories	0.122	0.057	0	0.361	611
Inmates # of beds	0.798	0.337	0.15	2.046	611
Mafia murders	0.434	1.164	0	7.971	255
Sexual assault	1.364	0.631	0	3.607	255
Kidnappings	1.102	0.538	0	2.578	255
Drug related c.	42.487	30.901	0	159.845	255
Larceny	193.444	188.906	0	1073.249	255
Burglary	253.103	131.561	0	760.621	255
Motor vehicle theft	303.592	268.271	0	1174.157	255
Bank robberies	1.32	2.107	0	12.588	612
Theft and aggravated theft	2073.106	1158.944	240.299	7967.78	468
Attempted and committed intentional homicides	3.609	3.316	0.258	23.575	468
Fraud	43.9	30.424	11.609	294.63	468
Total # crimes (Police)	1983.252	1293.943	538.976	7696.002	612
Total # crimes (Judiciary)	3283.724	1547.89	794.03	11464.021	468

Table 3: Fraction of the prison population that is pardoned.

	1963	1966	1968	1970	1978	1981	1986	1990
Abruzzo & Molise	0.301	0.847	0.007	0.732	0.426	0.184	0.274	0.459
Basilicata	0.285	0.642	0.007	0.445	0.287	0.119	0.153	0.348
Calabria	0.248	0.382	0.02	0.378	0.313	0.154	0.137	0.337
Campania	0.175	0.464	0.008	0.698	0.377	0.179	0.211	0.358
Emilia Romagna	0.218	0.619	0.003	0.675	0.318	0.231	0.2	0.433
Friuli-Venezia Giulia	0.276	0.62	0.003	0.709	0.429	0.289	0.333	0.514
Lazio	0.204	0.427	0.036	0.319	0.307	0.212	0.144	0.276
Liguria	0.192	0.579	0.007	0.715	0.392	0.234	0.236	0.372
Lombardia	0.223	0.556	0.028	0.617	0.339	0.214	0.161	0.366
Marche	0.199	0.747	0.025	0.695	0.418	0.152	0.119	0.341
Piemonte & Valle d'Aosta	0.23	0.55	0.014	0.676	0.272	0.15	0.171	0.428
Puglia	0.216	0.512	0.005	0.508	0.397	0.246	0.277	0.401
Sardegna	0.132	0.387	0.004	0.389	0.266	0.202	0.205	0.243
Sicilia	0.192	0.447	0.007	0.497	0.369	0.199	0.103	0.419
Toscana	0.224	0.69	0.012	0.579	0.357	0.239	0.256	0.281
Trentino-Alto Adige	0.247	0.591	0.091	0.772	0.638	0.32	0.415	0.504
Umbria	0.172	0.385	0	0.573	0.425	0.205	0.47	0.316
Veneto	0.251	0.62	0.011	0.549	0.366	0.193	0.287	0.462

Table 4: Pardoned inmates per 100,000 residents.

	1963	1966	1968	1970	1978	1981	1986	1990
Abruzzo & Molise	5.4	16.3	0.2	24.1	14.2	7.9	12.5	19.0
Basilicata	10.7	24.5	0.3	17.2	14.9	5.7	8.2	13.1
Calabria	12.1	15.8	0.9	14.9	13.9	7.4	8.3	12.4
Campania	11.4	28.4	0.4	35.3	18.7	6.6	14.5	15.8
Emilia Romagna	6.0	16.0	0.1	14.4	9.1	6.7	6.5	13.8
Friuli-Venezia Giulia	10.1	18.9	0.1	18.9	14.8	9.2	11.3	13.7
Lazio	8.8	19.1	1.4	11.9	15.3	13.3	9.3	12.0
Liguria	10.2	29.8	0.3	29.0	18.8	11.1	12.4	13.4
Lombardia	8.0	17.4	0.7	14.6	9.1	5.9	6.1	12.2
Marche	2.8	13.8	0.4	13.7	5.0	2.8	4.0	6.9
Piemonte & Valle d'Aosta	9.6	19.8	0.5	19.6	10.4	6.3	9.1	18.8
Puglia	10.1	20.2	0.2	18.6	18.2	12.7	12.9	14.1
Sardegna	7.0	18.7	0.2	15.5	11.8	11.3	10.7	11.5
Sicilia	13.3	29.3	0.4	24.8	22.4	11.7	7.3	19.5
Toscana	7.2	19.0	0.3	14.1	9.9	7.2	9.9	10.3
Trentino-Alto Adige	7.4	17.3	2.1	17.7	13.7	10.1	14.0	15.1
Umbria	5.7	13.0	0.0	22.0	16.6	5.4	7.3	8.5
Veneto	5.8	12.9	0.2	10.6	7.5	4.3	7.3	8.4

Table 5: (Log-) changes in crime on (log-) changes in prison population, 1963-1995.

		(1)	(2)	(3)	(4)	(5)	(6)
		Panel A: Δ prison pop.			Panel B: Δ log prison pop.		
FIRST	Pardoned	-0.46	-0.41	-0.11	-1.18	-1.12	-0.28
STAGE	prisoners	(0.06)**	(0.08)**	(0.08)	(0.13)**	(0.14)**	(0.12)*
	R-squared	0.36	0.33	0.49	0.44	0.47	0.67
		Panel C: Δ crime			Panel D: Δ log crime		
REDUCED	Pardoned	14.34	17.80	4.46	0.21	0.23	0.07
FORM	prisoners	(2.29)**	(3.97)**	(6.13)	(0.03)**	(0.05)**	(0.09)
	R-squared	0.37	0.32	0.43	0.29	0.28	0.32
IV	Change	-30.85	-44.48	-39.71	-0.17	-0.19	-0.24
	in prison pop.	(5.47)**	(11.18)**	(58.01)	(0.02)**	(0.03)**	(0.28)
OLS	Change	-4.89	-8.14	-0.36	-0.08	-0.11	0.00
	in prison pop.	(1.85)*	(2.16)**	(2.17)	(0.02)**	(0.02)**	(0.03)
	R-squared	0.29	0.25	0.43	0.19	0.19	0.32
REG FE		YES	YES	YES	YES	YES	YES
Year controls		spline	time trends	dummies	spline	time trends	dummies
Observations		594	594	594	594	594	594

Notes: Standard errors clustered by region in parentheses. * significant at 5 percent; ** significant at 1 percent.

Table 6: The incapacitation elasticity after controlling for additional factors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log-change in crime, reduced form				Log-change in crime, instrumental variable			
Fraction of pardoned	0.32	0.28	0.27	0.28				
prisoners (adj.)	(0.07)**	(0.08)**	(0.08)**	(0.08)**				
Log change in prison		-0.29	-0.23	-0.23	-0.27	-0.24	-0.25	-0.22
pop. (adj.)		(0.38)	(0.37)	(0.39)	(0.05)**	(0.05)**	(0.05)**	(0.04)**
Log change in GDP		0.67	0.26	0.34		-0.12	-0.13	-0.09
		(0.70)	(0.74)	(0.76)		(0.37)	(0.38)	(0.36)
Log change in consumption						1.74	1.77	1.27
						(0.47)**	(0.53)**	(0.57)*
Log change in police officers			0.17	0.16			-0.03	0.00
			(0.08)*	(0.08)			(0.07)	(0.06)
Log change in number			0.07	0.07			0.01	0.00
of people controlled			(0.06)	(0.05)			(0.06)	(0.06)
Log change in the fraction of				-0.00				-0.02
inmates staying in dormitories				(0.04)				(0.03)
Log change in overcrowding				-0.02				0.10
				(0.02)				(0.03)**
Observations	198	198	198	198	198	198	198	198
R-squared	0.33	0.50	0.51	0.51				

Notes: Standard errors clustered by region in parentheses. * significant at 5 percent; ** significant at 1 percent.

Table 7: The incapacitation effect for different types of crime for the years 1985-1995.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Sex. assault		Kidnapp.		Drug deals		Larceny		Burglary		MV thefts		Bank rob.		Total	
	RF	IV	RF	IV	RF	IV	RF	IV	RF	IV	RF	IV	RF	IV	RF	IV
							Panel B: Log-changes in crime									
Fraction of	0.23		0.06		0.65		-0.12		0.06		0.20		0.52		0.30	
pardoned pris.	(0.30)		(0.31)		(0.07)**		(0.23)		(0.07)		(0.08)*		(0.23)*		(0.09)**	
Log-change in		-0.22		-0.06		-0.60		0.11		-0.05		-0.18		-0.48		-0.28
prison pop.		(0.26)		(0.29)		(0.13)**		(0.20)		(0.06)		(0.05)**		(0.24)		(0.05)**
R-squared	0.07		0.05		0.44		0.07		0.13		0.44		0.14		0.50	
Observations	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216

Notes: Standard errors clustered by region in parentheses. * significant at 5 percent; ** significant at 1 percent.

Table 8: The incapacitation effect for different types of crime for the years 1970-1995.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Changes in log number of :									
	Thefts		Homicides		Frauds		Total crimes (judiciary)		Total crimes (police)	
	RF	IV	RF	IV	RF	IV	RF	IV	RF	IV
Frac. of par-	0.46		0.38		0.51		0.32		0.23	
doned inmates	(0.12)**		(0.11)**		(0.16)**		(0.07)**		(0.05)**	
Log-Change		-0.43		-0.36		-0.49		-0.30		-0.22
in prison pop.		(0.09)**		(0.14)*		(0.13)**		(0.06)**		(0.04)**
R-squared	0.31		0.06		0.23		0.27		0.30	
Observations	450	450	450	450	450	450	450	450	450	450

Notes: Standard errors clustered by region in parentheses. * significant at 5 percent; ** significant at 1 percent.

Table 9: Social benefit from incarceration

Crime	Total	Elasticity	Reporting prob.	Marginal effect	Cost per crime	Social cost
Against the person						
Massacre	24	0 ?	-	-	-	-
Mafia related murder	299	0.00	1.00	0.00	-	0.00
non-Mafia related murder	1,249	0.36	1.00	0.02	2,000,000	45,411
Attempted murder	1,542	0.36	1.00	0.03	0 ?	-
Infanticide	6	0 ?	-	-	-	-
Voluntary manslaughter	83	?	-	-	-	-
Involuntary manslaughter	8,294	?	-	-	-	-
Sexual assault	4,571	0 ?	-	-	-	-
Other (including assault, battery, pornography)	290,612	?	-	-	-	-
Against the family, the morale, the animals						
	18,180	0 ?	-	-	-	-
Against property						
Motor vehicle theft (motorbikes)	80,494	0.18	0.95	1.55	2,156	3,339
Motor vehicle theft (cars)	182,470	0.18	0.87	3.84	7,145	27,404
Other thefts	1,252,117	0.43	0.54	41.85	326	13,643
Bank robbery	21,033	0.48	1.00	0.38	21,033	8,043
Other robberies	34,037	0.18	0.50	1.25	326	407
Extorsion	8,024	?	-	0.15	-	-
Kidnappings	196	0.00	-	-	-	0.00
Harm to things, animals, property, etc.	300,352	?	-	-	-	-
Fraud	301,428	0.49	1.00	5.48	9,953	54,545
Against the economy and the public trust						
Commercial fraud	8,583	0.49	1.00	0.16	?	-
Drug related crimes	33,417	0.60	1.00	0.61	?	-
Other (forged currency, counterfeit)	193,095	0.49	1.00	3.51	?	-
Against the State and the public order						
	74,610	0 ?	-	-	-	-
Other crimes						
	153,878	0 ?	-	-	-	-
Total	2,968,594				Total social cost	152,792.55
					Total social cost without including frauds	98,247.09

Notes: See Section 4 for the list of sources and assumptions used.