The Deterrent Effects of Prison Treatment*

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ABSTRACT

This paper examines the impact of prison conditions on future criminal behaviour. The analysis is based on a unique dataset on the post-release behaviour of 25,000 Italian former prison inmates. We use an exogenous variation in prison assignment as a means of identifying the effects of prison overcrowding, deaths in prison, and degree of isolation on the probability of re-offending. We find no evidence of deterrent effects of prison severity. In particular, we find that the extent of overcrowding and the number of deaths in prison do not reduce the probability of recidivism. Instead, we find that the degree of isolation in prison from the rest of society increases recidivism, while the number of volunteers engaged in social activity with prisoners decreases their propensity to re-commit criminal acts.

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1. Introduction

In modern criminal justice systems, imprisonment is the most important form of sanction. The relevance of imprisonment as the main tool for the deterrence and incapacitation of criminals has increased in recent years, as the substantial growth in prison populations in most countries proves. Figure 1 reports the trends in the growth rates of prison populations since the mid-nineties for a group of countries. Compared to the index year of 1995, by 2004 the number of inmates per 100,000 population had increased from 600 to 723 in the U.S., from 99 to 149 in the U.K. and from 87 to 96 in Italy.

The empirical literature on crime and punishment largely studies the deterrent effects of imprisonment or sentence lengths.[1] In particular, this literature aims at identifying whether and to what extent the threat of prison can deter individuals from committing criminal acts.[2] In these works prison is taken as a uniform sanction. Nevertheless, if we open the black box of prisons, we find very different punitive situations in terms of overcrowding, health services, social activities for inmates and so on. Theoretically, prison conditions may greatly affect the deterrent effects of

[1] Some contributions in this field are: Nagin (1978), Donohue and Siegelman (1998), Levitt (1998), Kessler and Levitt (1999), Pintoff (2006), Lee and McCrary (2005), Drago, Galbiati and Vertova (2007), Helland and Tabarrok (2007), Kling (2006),

[2] More in general, this stream of literature is related to the extensive literature on crime and punishment started by Becker (1968). For surveys of empirical and theoretical works, see Bushway and Reuters (*forthcoming*) Levitt and Miles (2007), Polinsky and Shavell (2000), Western, Kling and Weiman (2001), and Garoupa (1997). Some recent contributions are: Di Tella and Dubra (*forthcoming*), Owens (forthcoming), and Levitt (2004). For models that embed Becker's paradigm in a dynamic equilibrium framework see Imrohologlu, Merlo and Rupert (2004) and Gallipoli and Fella (2006).

imprisonment: for a given prison sentence, prison conditions may influence the propensity of individuals to engage in criminal activities. From a policy perspective, it is important to understand how prison conditions affect individuals' propensity to commit criminal acts. Indeed, changing prison conditions could be relatively easier and less costly than other interventions (e.g. increasing incapacitation through sentence length) that aim to reduce crime.

While the issue of the deterrent effects of prison treatment appears particularly important for both scientists and policy makers, the empirical evidence is notably scarce. Only a few recent works analyze the effects of prison conditions on criminal behaviour. Katz, Levitt, and Shustorovich (2003), using death rates among prisoners as a proxy for prison conditions, show that more punitive facilities have a small but statistically significant deterrent effect. Exploiting aggregate data on crime rates, they find a decline in local crime rates where prison conditions measured by death rates are harsher. This result conforms to the deterrence hypothesis. Instead, they do not find any systematic evidence that the execution rate influences crime rates. Bedard and Helland (2004) exploit the expansion of female penal system capacity in the United States to study the deterrent effects of increasing the distance of prisons from cities. They find that, on average, increasing this distance (assumed to coincide with a reduced number of visits) tends to lower the female crime rate. Bayer and Pozen (2005) use data on juvenile offenders to compare the effect of facility management type on recidivism outcomes. They find that for-profit management operates at a lower cost to the government but leads to a statistically higher recidivism rate. Chen and Shapiro (2007) use individual-level data to estimate the effect of prison conditions on recidivism rates. By exploiting a discontinuity in the assignment of federal prisoners to security levels, they provide

credible evidence that serving a sentence in a higher security prison implies a significantly higher post- release propensity to commit a crime.[3]

In this paper we undertake a broad empirical analysis of the deterrent effects of prison treatment. In particular we test how prison conditions, measured by several indicators, affect the propensity of former inmates to re-commit criminal acts. We exploit a unique large data set, reporting individual-level data on the recidivism of former inmates who were released as a result of the Collective Clemency Bill approved by the Italian Parliament in July 2006. This law, enacted to address the widespread situation of overcrowding in Italian prisons, provided for an immediate three-year reduction in detention for all inmates who had committed a crime before May 2006. Upon approval of the bill, almost 25,000 inmates were released from 198 Italian prisons on August 1st 2006.

In order to identify the effects of prison conditions on recidivism, we exploit an exogenous source of variation provided by the process governing the assignment of inmates to prisons. Many inmates served their sentence in a jurisdiction different from their hometown for reasons ranging from overcrowding in the closest prison to the Italian Prison Administration's view that a certain facility is incompatible with the inmate. We label these prisoners as "movers". As we shall discuss in more detail in the paper, the institutional features of assigning movers to prisons entail that such an assignment does not depend on individual characteristics that may explain recidivism, but at the same time may be correlated to measures of prison conditions. As a consequence of restricting our sample to movers, we can control for province of residence fixed effects and so account for any unobserved heterogeneity at the level of the province where these former inmates live. Considering

[3] Kuziemko (2007) analyzes a specific feature of the prison system, i.e. the parole system as opposed to the fixed-sentences regime. She provides evidence that the abolition of the parole system in Georgia has increased both per prisoner costs and recidivism.

that this is the main source of unobserved heterogeneity that might correlate with prison conditions, we are able to minimize an important possible bias.

Moreover, our dataset based on the records of inmates released as a consequence of the Collective Clemency Bill allows us to overcome other obstacles hampering identification. First, it provides criminal data at the individual level, thus allowing us to overcome the typical identification problems connected with the use of aggregate crime rates. A second important feature of our dataset is that all these prisoners were released at the same moment and thus faced equal crime opportunities. This eliminates the confounding element of time-varying unobservable characteristics that might correlate with prison conditions.

Our analysis concerns two dimensions of prison conditions. First, prison harshness. We focus on two different features of prison severity: the extent of overcrowding and the number of deaths (from all causes) in prison during the inmate's stay. Death rates and overcrowding are likely to be correlated with many aspects of unpleasantness of prison facilities, including space limitations, competition for resources, bad health and bad health-care conditions among others. Second, the degree of isolation of prisoners from the rest of society. As a proxy for the degree of isolation we use the distance from the prison of detention to the chief-town of the province[4] in which the prison is located. Longer distances imply higher costs (in terms of transportation, organization and motivation) for volunteer organizations to develop social activities, education, and job training for inmates. In addition, longer distances imply less attention from local media concerning prison

[4] Italy is administratively organized in territorial areas. In particular, there are 20 regions and each region is composed of several provinces (the total number of provinces is 109). A province corresponds to a large area around a chief town in which the main economic, social and administrative activities of the area (e.g. courts, health services, local headquarters of political parties, volunteer associations) are concentrated.

problems and events and fewer visits (even for "movers"). This means that the greater the distance of a prison from the chief province town, the weaker are the social ties in which prisoners are embedded (and thus the higher the degree of isolation from the rest of society). As a second proxy for prison isolation we use the number of volunteers in a given prison, which is negatively correlated to prison distance.

We do not find evidence supporting the idea that harsher prison conditions reduce recidivism. All our measures reveal a very small and statistically insignificant effect of prison conditions on recidivism. Hence, worse prison conditions do not seem to deter individuals who have already been incarcerated.[5] Instead, we find that prison isolation does have an effect on recidivism. In particular, an increase in the distance of the detention facility from the chief town of the province increases the propensity to commit new crimes. We calculate that a 10 km increase in distance is associated with a 2.8 percent increase in the probability of recidivism. This means that the isolation of prisons from the rest of society tends to increase recidivism. Similar results are found for the number of volunteers, which is negatively associated with recidivism. This effect is only partially mediated by the distance measure, suggesting that the channel through which distance impacts recidivism does

[5] This might be surprising. If we assume that incarceration leads criminals to update their beliefs about the consequences of punishment, an implication of the basic crime model of Becker (1968) is that having experienced a more severe punishment should lead to a lower propensity to recommit a crime. Hence, to rationalize our results we should note that other forces can offset the deterrent effect of harsher prison conditions. In particular, harsher prison sentences may imply a higher human capital deployment and worse labour outcomes (Waldfogel, 1994). Moreover, harsher prison conditions may induce hostility toward society that leads to an increased likelihood of deviant behaviour upon release (Murton, 1976).

not only operate through volunteers. Our results for distance and volunteers indicate how prison society osmosis affects crime. By isolating individuals from external social networks, prison has two opposite effects. On the one hand, by isolating from possible contacts with criminal networks it is likely that prison isolation tends to reduce future criminal opportunities; on the other hand, more isolation also means less opportunity to maintain positive social relations or human capital, thus increasing the post-release returns from crime. Our results suggest that this second force tends to dominate and so condemns prison isolation to increasing recidivism. As long as imprisonment *is* essentially isolation from the rest of society, these results pose a provoking question about the effectiveness of imprisonment as a sanction, at least as far as the deterrent effects of isolation for those already sanctioned are concerned.

The paper proceeds as follows. In section 2 we describe our dataset and in section 3 we report the identification strategy. Section 4 presents the results. Finally, in section 5 we make some concluding remarks.

(*Figure 1 about here*)

2. Data Sources and Description

We perform our analysis of the effects of prison conditions on recidivism by means of a unique dataset constructed from various sources. First, individual-level variables of former inmate individual characteristics and recidivism are drawn from an internal database that the Italian Department of Prison Administration (DAP) maintains on offenders under its care. We were granted access to the DAP database records on all the individuals released pursuant to the collective pardon law between 1 August and 28 February 2007. This law, enacted to address the widespread situation of overcrowding in Italian prisons, provided for an immediate three-year reduction in

detention for all inmates who had committed a crime before 2 May 2006. This feature of the data is particularly useful for our analysis because all the subjects in our sample are analyzed in the same time span, thus avoiding any possible correlation between time and prison quality. The full sample includes 25,716 individuals. For each individual the data provide information on whether or not the individual committed another crime in the period between release and February 28th 2007. Most of the individuals re-entering prison by this date were caught by police while they were committing a criminal act and were subject to pre-trial detention, i.e. they had not already been processed through the justice system when they re-entered prison. The dataset contains information concerning a large number of variables at the individual and facility level. For each individual, information is reported on: the facility where the sentence was served, the official length of the sentence, the actual time served in the facility, and the kind of crime committed (i.e. the last crime committed in the individual's criminal history). The Appendix provides a description of the crimes included in the different categories. Moreover, the data also report inmates' age, level of education, marital status, nationality, province of residence, employment status before being sentenced to prison, and whether the individual had a final sentence (or was waiting for the first verdict or for the results of an appeal) at the date of release. Since data on subsequent convictions are not available, we use a subsequent criminal charge and imprisonment as the measure for recidivism.

For data on prison quality, the rate of overcrowding at the facility level is directly provided by the DAP database facility. Excluding judiciary mental hospitals from our sample (98 inmates), it covers 198 prisons, the total number of Italian prisons. Data on the number of facility deaths that occurred during each former inmate's period of imprisonment were constructed by referring to the report on "Deaths in Prison" from the Associazione Ristretti.[6] For each inmate we count the number of deaths

[6] *Associazione Ristretti* is an association for inmates' rights. The report on deaths in prison has been conducted annually by directly collecting news about deaths in the Italian prison system. It reports

that occurred in the facility of detention from 2003 (or, alternatively, from an inmate's moment of entry into the facility for those arrested after 1 January 2003) to July 2006 (the last month spent in prison for all the individuals in our sample). Note that this measure of deaths occurring in a prison is different from the measure used by Katz et al. (2003), who resort to aggregate data and use the total number of deaths (per 1000 inmates) occurring in a state's prisons. Unlike Katz et al. (2003), we can construct a measure of the number of deaths that occurred in a facility from the moment of entry for each single individual in the data set (in particular, for those who entered starting from January 2003). This measure is particularly useful in evaluating the effect of prison conditions on post-release criminal behaviour as it captures the specific conditions faced by each individual during the time served in a facility.

Finally, we independently construct the measure of distance and volunteer presence in the facilities. We report the road distance between each facility and chief town of the province where the facility is located by calculating the distance between the facility address and each town.[7] For each prison we count the number of volunteers as reported by the facility administration.[8] We construct an index of volunteer density by dividing the number of volunteers by the number of inmates present in the facility at the end of 2005. These volunteers are part of religious, political and civil rights

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monthly information about each death at facility level (the report is downloadable from the website: www.ristretti.it).

[7] We use the road distance as calculated by the internet map site www.viamichelin.com. This allows us to calculate the distance to any facility address from the chief town city centre coordinates (the web-site automatically calculates the coordinates of the city centre).

[8] Data on volunteers has been provided by the association FIVOL (*fondazione italiana volontariato* - www.fivol.it), while data on the number of inmates in each facility are provided by the Associazione Antigone and published in the report "Dentro il Carcere", Carocci, Rome (2006).

organizations which have access to prisons to give moral assistance to inmates and to develop educational, recreational and job training programs.[9] It is important to stress that these programs are not initiated or promoted by the prison administration but are the outcome of the voluntary action of associations. The result of the process is a unique dataset including, for each of the almost 26,000 former inmates, a measure of recidivism, individual characteristics, and facility-level information.

Table I reports descriptive statistics on the individual-level data both for the entire sample of individuals released and for the sub-sample of those who served a sentence in a facility outside their province of residence (the so-called movers). As will become clear in the next section, we analyze the movers in order to address the main identification challenge of this paper, the likely endogeneity between criminal opportunities and prison conditions in a certain province. By restricting our analysis to the movers, we are able to control for province of residence fixed effects, thus absorbing any kind of unobserved heterogeneity in the inmates' residence area. Even though possible differences between movers and non-movers are not an issue for our identification strategy, it is worth noting that the observable characteristics are on average similar across the whole sample and the sub-sample of movers. In particular, for both groups the recidivists constituted 11% of the final sample. Males make up 95% of the sample. The average age of former inmates is nearly 37; 34% of them were employed before being sentenced to prison, and 29% were married in both samples. As for our measures of prison harshness, we observe that the average overcrowding rate (number of inmates in the facility of detention for every 100 places available) encountered by former inmates in our sample was about 150. Each former inmate had seen 1.26 (1.01 if a mover) people die in his/her facility during the period of detention. The average facility/jurisdiction chief-town distance is 15.5 Km (18.74 Km for the movers) and the average number of volunteers is 0.1422 (0.1390 for the

[9] Unfortunately, we are not able to distinguish between the different kinds of programs and assistance offered to inmates.

movers). The final sample we use is made up of 13,160 individuals distributed between almost 200 different residential facilities.

(*Table I about here*)

3. Empirical Analysis

3.1. Identifying the Effects of Quality of Life and Isolation in Prison

The available measures of quality of life in prison are the overcrowding index and number of deaths. For the first measure, the model we estimate can be written as

$$y_{ij} = \beta_1 overcrowdingindex_j + \sum \beta_k x_{i(k)} + \varepsilon_{ij}, \quad (1)$$

where *i* denotes the individual and *j* the prison where his sentence was served. The outcome we observed, *y*, is equal to 1 if the individual was rearrested during the interval of time considered (seven months) and 0 otherwise. The set of variables at the individual level, denoted by *x*, includes gender, marital status, education, stage of judgment, the most recent crime, employment status before arrest, and sentence. The type of crime and the sentence are the most important variables in terms of the dangerousness of the former inmate. We also include time served as an individual variable because it is, in general, different from the sentence (time served and sentence do not coincide since our data come from the Collective Clemency Bill, which provided for an immediate three-year reduction in detention for all inmates who had committed a crime before 2 May, 2006).

The empirical challenge in estimating the effects of quality of life in prison on recidivism is that of addressing the potential problems of endogeneity in quality measures. It could be that prison quality is worse in areas where former inmates have a lower opportunity cost of committing a crime. For example, a higher overcrowding index may simply be the result of many arrests in a city in which

the relative cost of committing crime is low. It could equally be possible that areas with lower crime intensity have prisons with bad quality measures. In any case, the estimated coefficient β_1 would be biased. In order to provide a credible estimate of the relationship between prison quality and recidivism, we must account for this unobserved heterogeneity.

The idea behind our solution to the problem of the endogeneity of the prison quality measure is to exploit a feature of the Italian prison system. As mentioned previously, many prisoners serve their sentence in jurisdictions other than their hometown. We call these inmates "movers". Denote the province where a mover lives after release *h*. The equation that we can estimate, for movers only, is:

$$y_{ijh} = \beta_1 overcrowdingindex_j + \sum \beta_k x_{i(k)} + \lambda_h + \varepsilon_{ijh}, \qquad (2)$$

where λ_h are province fixed effects that account for differences across provinces that drive criminal behaviour after release. Notice that without information on the movers we could not have included fixed effects at the province level. Instead, in model (2), we have it that for individual *i*, prison *j* is always located in a province other than the one where individual *i* lives after release. In this way we absorb any kind of unobserved heterogeneity of this province that would lead coefficient β_1 to be biased. Under the assumption that unobserved heterogeneity across movers is uncorrelated with prison quality, the estimated β_1 captures the causal impact of our measure of prison quality on recidivism. In section 3.2 we discuss this identifying assumption in detail.

When we focus on the recidivism effects of the other proxy for prison quality (deaths), we still exploit the presence of the "movers" but need not assume that unobserved heterogeneity across movers is uncorrelated with prison quality. The reason for this is straightforward: since the number

of deaths per capita[10] varies at the individual level within each prison, we can also include prison fixed effects in the regressions as:

$$y_{ijh} = \beta_1 deaths_{ij} + \sum \beta_k x_{i(k)} + \lambda_h + \alpha_j + \varepsilon_{ijh}\,. \qquad (3)$$

Prison fixed effects control for any possible non-random assignment of movers to harsher prisons. Some clarifications regarding model (3) are necessary. The number of deaths that occur during the period of imprisonment is clearly positively correlated with the inmate's prison spell. However, by including time served and sentence as additional regressors in (3), for a given sentence the deaths variable will not merely pick up the effects of more time served in the prison. Once we control for sentence, whether one inmate served more time than another is due to the date of entry in prison, a variable that is as good as random. Hence, by controlling for sentence and time served, inmates within each prison differ in the number of deaths seen for reasons that are unlikely to be correlated to unobservables.

The last issue analyzed in this paper is how isolation affects recidivism. The aim of imprisonment is to isolate condemned individuals from the rest of society for a certain period of time with the purpose both of incapacitating and of re-educating them to social life. Since prison essentially *means* isolation from society, testing how the degree of prison isolation affects recidivism is a particularly important issue. As a proxy for the degree of prison isolation we use two measures. First, the distance of the prison from the closest chief province town. We believe that this variable captures the degree of isolation of prisoners for this reason: ceteris paribus, the more distant a prison facility from the chief town is, the higher the costs are for associations, groups of volunteers,

[10] In the regressions we use the number of deaths per capita (i.e. the number of deaths per each inmate over the number of prisoners in a given facility as of December 2005). We resort to the per capita measure to normalize the number of deaths for each prison population. Results are robust to measures of deaths seen by each inmate in absolute value.

and civil rights organizations to access the prison to develop social activities, education, and job training for inmates.[11] Since both the population density and the density of associations are higher in chief towns, offering a certain social activity in a prison more distant from the town implies higher costs of transportation, organization and motivation of volunteers. Greater distances also imply less attention by the local media to prison problems and events. More generally, the degree of osmosis between prison and the rest of society is higher in facilities located near the centre of the chief town. Greater distance also leads to fewer visits (even for "movers"). For the interpretation of the results it is important to know whether more distant prisons are associated with more amenities (e.g. more distant prisons might have been built more recently). In this case distance would capture good prison conditions rather than isolation. Although casual evidence suggests that this is not the case, we do not have data to address this concern. However, we observe that the raw correlation between our measure of distance and deaths is positive (0.1016), suggesting that more distant prisons are associated with worse living conditions. The other variable we use to proxy prison isolation is the number of volunteers per capita. This measure is negatively correlated with the measure of distance (the raw correlation is -0.2027). Overall, the distance measure may capture a number of aspects of prison isolation, while the number of volunteers indicates one particular feature of prison isolation, and the results presented in the next section do in fact support this interpretation.

Estimating the effects of prison isolation captured by prison location and number of volunteers on recidivism may present problems of endogeneity similar to those already discussed in relation to the overcrowding index. For example, in areas with higher opportunities to commit another crime, prisons might have been built further from the chief province town in order to minimize the social

[11] In Italy there is a strong tradition of associations organizing activities in prison facilities, with an important contribution made by volunteers.

ties of inmates. Or it may be that, in areas with high crime intensity, prisons have been built closer to the chief town in order to minimize the costs of imprisonment. In order to address these potential problems of unobserved heterogeneity, we restrict our sample, as before, to the "movers", those inmates who served their sentence in a jurisdiction other than their hometown. Hence we estimate model (2) by including prison distance and number of volunteers from the chief town as key control variables.

3.2. Evidence on the Identifying Assumption

The key assumption for the identification of model (2) is that, conditioning on the region of residence, the assignment of movers does not depend on individual characteristics that explain recidivism and are correlated to prison quality (this assumption is not necessary when estimating model (3) because the inclusion of prison fixed effects controls for any possible non-random assignment of movers). Note that it is not necessary that being a mover is uncorrelated with prison conditions, but rather that once an inmate is designated as a mover, his destination does not depend on prison conditions.

There are both arguments and evidence in support of the identifying assumption. The Italian law[12] on this issue indicates that *whenever possible*, assignment to facilities should follow a territorial criterion, namely that inmates should be assigned to facilities close to their town of residence and, in general, within the province of residence. If arrested and waiting for first judgment, prisoners can be assigned to a facility close to where they were arrested. After final judgment, the territorial criterion applies. Nonetheless, often the provisions of the law are not applied. Indeed, an inmate can be assigned to a facility outside her province of residence if the Department of Prison

[12] See in particular the Decree of the President of the Republic, 230, 30 June 2000, and Law 354/1975 (Article 42).

Administration (DAP) envisages some kind of incompatibility. Possible reasons are: a reasonable presumption that assignment to a facility inside the province of residence could be dangerous for the inmate and/or for other inmates in the facility; the particular needs of the detention facility (e.g. overcrowding or inaccessibility); or needs of the inmate such as health care or study. When an inmate is assigned to a facility outside her province of residence but still in the same region, it is the regional directorate of the DAP that decides to which facility she will be assigned. If for any reason the mover is assigned to a facility outside her region of residence, the destination is decided directly by the central directorate of the DAP.[13] We conducted several interviews with members of the inmates' rights association "Ristretti" and DAP officers[14] in order to understand in greater detail the decision process concerning movers. As a first step, we needed to know the variables that the decision-maker (the DAP officer) uses to decide who becomes a mover, and then how the assignment to facilities works.

According to the information collected in our interviews, the decision-maker decides that an inmate cannot be assigned to the facility closest to her home-town in two possible cases. At the moment of the arrest or conviction each inmate is provided with an inmate's dossier containing personal information and a summary of the judicial decision about her sentence. On the basis of this dossier the decision-maker evaluates whether there is any incompatibility between the inmate and the facility closest to her home-town. It is worth noting that for inmates at their first experience of the prison system the dossier contains roughly the same characteristics that we have in our dataset (i.e.

[13] Italian public administration is in general organized on a territorial basis. Central administrations operate at national level and then there are territorial administration at the levels of regions and provinces (within regions).

[14] We wish to thank Francesco Morelli (Ristretti) and Antonella Barone (Ministry of Justice) for providing us with precious information about the assignment process.

personal characteristics, sentence length and sentence motivation, in our case the crime committed). The second reason for incompatibility is that the closest facility has reached a maximum threshold of overcrowding. For each facility this threshold depends on the prison administration evaluation and may vary according to local conditions at the facility level (e.g. in some facilities in periods of prison tension and violence an overcrowding rate of 150 percent may be evaluated as being above the threshold level, whereas in other periods this overcrowding rate may be considered below the threshold).[15] Once an inmate is designated as a mover, the decision process governing assignment to facilities follows a "space availability" criterion.[16] An inmate is assigned to one of the facilities that at the moment of assignment are less overcrowded or below the threshold level. Hence, for movers the facility is determined according to the level of available space of other facilities at the moment of arrest or conviction. If the moment of conviction is orthogonal to inmates' unobserved characteristics, we can safely assume that movers' characteristics do not predict the quality of the facility assigned.[17]

We examine whether the data support the hypothesis that the assignment of movers to a facility of higher or lower quality does not depend on unobservables influencing the likelihood of recidivism.

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[15] Although it is not an issue for the analysis, this implies that overcrowding is not always systematically lower in the facilities to which the inmates move.

[16] For example, in a recent interview the regional director of DAP for the Bologna region declared that the facilities in the region are reaching a level of overcrowding that will require the transfer of inmates to regions where more space is available (See the daily newspaper: *Il Resto del Carlino* March 4th 2008, "Bologna: Provveditore; carceri piene? Trasferiamo i detenuti").

[17] There are other papers supporting the idea that inmates' unobservable characteristics are orthogonal to the moment of conviction. See Drago, Galbiati and Vertova (2007) and Kuziemko (2007).

Specifically, we test whether (conditioning on the region of residence and the administrative level at which assignment decisions are taken) there is a significant relationship between the observable characteristics of movers and the index of overcrowding of the facility of destination and prison distance from the chief town. This can be done by estimating regressions of these two measures on observable characteristics of movers and then by running an F-test on the coefficients of the inmates' observables. For example, if there is selection on unobservables, we should also expect variables describing the degree of dangerousness (type of crime and sentence) to predict prison harshness. On the contrary, a non significant F-test at conventional levels suggests no significant relationship between (all) individual characteristics and the quality of the facility of assignment. This does not prove random assignment, since the assumption requires there be no correlation between prison quality and both observable and unobservable mover characteristics. However, if selection on observables is similar to selection on unobservables, then a lack of a significant relationship between prison quality and observable characteristics indicates empirical support for the identification strategy. In symbols, we test the following models:

$$overcrowdingindex_{ij} = \sum \beta_k x_{i(k)} + \gamma_n + \varepsilon_{ij},$$

$$prisondist_{ij} = \sum \beta_k x_{i(k)} + \gamma_n + \varepsilon_{ij},$$

$$volunteers(percapita)_{ij} = \sum \beta_k x_{i(k)} + \gamma_n + \varepsilon_{ij}.$$

Here *j* and *i* stand for the facility-level and individual-level indexes and γ_n is region of residence fixed effects that account for differences across regional DAP directorates that drive the assignment to facilities.[18] The test of the joint null hypothesis that the coefficients β_k on observables at the

[18] We include region fixed effects instead of province fixed effects (which are included in model (2)) because the institutional decision-making process is governed at the regional level (as

individual level are all equal to 0 gives an F-statistic of 1.22 (p=0.22) when we regress the overcrowding index, 1.34 (p=0.13) when we regress prison distance, and of 1.20 (p=0.21) when we regress the number of volunteers per capita. Hence, at conventional level, we cannot reject the joint null hypothesis that all the coefficients on individual observables are equal to 0.

There is another piece of evidence which supports the identifying assumption. As we can see from Table 1, movers are different from non-movers in some individual variables. By regressing a dummy equal to one if an inmate is a mover on all the observables, we find that some individual variables are strong predictors for being a mover (in particular sentence length and being non-Italian have a positive effect on the probability of being a mover, whereas age has a negative effect). It seems plausible to assume that if the assignment of movers to prisons is not as good as random, in the assignment process the decision-maker should use at least some of the information he actually uses for determining who becomes a mover. For example, one should expect that if assignment is not random, sentence length should play a role in assignment. The fact that length of sentence and some other variables predict mover status but not prison quality measures lends further support to our hypothesis that there is no correlation between the individual determinants of recidivism and assignment to a better or worse quality prison for movers.

4. Results

Given the large number of fixed effects included in our models, we rely on linear probability models. Our dependent variable is 1 if between 1 August 2006 and 28 February 2007 the individual was rearrested, and zero otherwise. All specifications include individual variables: age, sentence, juridical status, education, employment status and marital status before the first conviction,

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mentioned in the introduction, Italy is divided into twenty regions and each region is composed of several provinces).

nationality, gender and time served. Standard errors are adjusted for clustering at the prison level to allow any arbitrary autocorrelation of the errors in each prison.[19]

4.1 Prison harshness

We start by discussing results for the effects of the overcrowding index on recidivism. Taking the overcrowding index as the indicator of quality of life in prison, in Table II we present empirical estimates of variations on equation (2) for movers only. In column 1 we include as additional covariates only individual variables. The coefficient on the overcrowding index is negative and associated with large standard errors (t-*statistic* equal to -0.85). It reveals a very small effect on recidivism. Even taking the lower bound extreme of the 95% confidence interval, we have it that an increase of 1 percentage point in the overcrowding index implies a reduction of 0.0002 in the probability of being re-arrested. In the next two columns we include the type of crime and the province of residence fixed effects. The coefficient is still negative and statistically not significant at conventional levels. It decreases in absolute value after inclusion of type of crime and fixed effects. Overall, we obtain a small and statistically insignificant effect of overcrowding. We try to obtain more precise estimates of the effects of the overcrowding index on recidivism by excluding from the regressions: potential outliers, the most populated prisons, and then the least populated prisons in absolute values. However, neither the size nor the precision of the estimated effects improves (results not reported).

(*Table II about here*)

[19] While clustering at the prison level seems to be more appropriate in this context, we also tried to cluster standard errors at the province of residence level but this did not alter the basic results.

We now present the results using prison deaths per capita as the indicator of the quality of life in prison (see Table III). In column 1 the results include only individual variables as additional covariates. We now have a positive coefficient on deaths per capita but it is not precisely estimated (t-*statistic*, adjusted for clustering, equal to 0.87). In the next column we also include the type of crime. From column 1 and 2 we do not find evidence that harsher prison conditions lead to a higher probability of recidivism. Column 3 reports results from a specification that includes province of residence fixed effects; the results obtained are similar. This suggests that finding no evidence of a negative impact of deaths per capita rates on recidivism is not due to the omission of heterogeneity at the province level.

(*Table III about here*)

To explore whether unobserved prison heterogeneity might be a reason for the positive coefficient, in column 4 we present results from the specification that "soaks up" most variation in the data by including province of residence fixed effects and prison fixed effects. By including prison fixed effects we absorb any kind of unobserved heterogeneity at the prison level and control for any potential non-random assignment of prisoners to prisons. We can include prison fixed effects because the key variable differs for each mover even at the prison level (it depends on how many deaths occurred during the prison spell (see the discussion of model (3) in section 3.2). The coefficient on deaths per capita is still positive but it is not precisely estimated (the t-*statistic* is 0.61). Overall, from this analysis we do not find compelling evidence that harsh prison conditions reduce recidivism.[20] At the outset, however, we have to acknowledge that a lack of deterrence

[20] Note that for each inmate we have the number of deaths that occurred in the facility of detention from 2003 (or, alternatively, from an inmate's moment of entrance into the facility for those

might be simply due to the short time period of 7 months. It should be clear that is hard to draw any strong conclusions about long-run effects.

4.2 Prison isolation

Table IV presents the results for the number of volunteers (per capita) on recidivism. From column 1 and 2 we observe a negative impact of volunteers on recidivism, but imprecisely estimated. In column 3, the inclusion of province of residence fixed effects leads to a larger and statistically significant coefficient on the number of volunteers. Table V presents the results of prison location on recidivism. In column 1 only individual variables are included as additional covariates. We find a positive and highly statistically significant coefficient on distance from the chief province town. In column 2 we report the results of the regression also including the type of crime committed, and in column 3 we also include province of residence fixed effects. Results are similar: the coefficient on distance is still positive and precisely estimated. It is interesting to note that the coefficient is essentially unchanged by the inclusion of more controls. The estimated effect is not small: given that in our sample the probability of returning to crime is 0.11, the results suggest that an increase in the distance of the prison of 10 km leads to a 2.8 percent increase in the probability of recidivism. We experimented with different robustness checks by including in the regression 4, 5, and 6 dummies for distance (e.g. first dummy equal to one if distance is lower than 5 km, second dummy equal to 1 if distance is between 5 and 20 km and so on). The results are robust and indicate a

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arrested after 1 January 2003) to July 2006. In a given facility, this measure is the same for all the former inmates with long sentences that started before 2003. In the prison fixed effects specification, identification of the coefficient on the number of deaths is obtained by using information on inmates with sentences that started after 2003. Results are essentially unchanged when we restrict the sample to only these inmates.

statistically significant effect. From column 4 of Table V we observe that the effect of distance is not explained by the number of deaths, overcrowding or number of volunteers (i.e. the coefficient on distance is essentially unchanged by the inclusion of these variables). In column 5 we include in the regression both the distance and the number of volunteers. Although the coefficient on volunteers becomes statistically insignificant, it appears that the effect of volunteers is not fully explained by prison distance (we observe a drop in the point estimate of volunteers of 30 percent). Hence, the effect of prison distance on recidivism does not develop only through the costs that distance imposes on volunteer access to facilities. Taken together, this evidence supports the idea that the effect of distance on recidivism is not due to prison harshness *per se*, but rather to isolation. A greater distance not only implies less accessibility for volunteers and for religious and civil rights associations that wish to visit the facilities, but also a lower degree of accessibility for the rest of society. These data suggest that greater isolation and a higher cost of reaching the facilities implied by greater distance may negatively affect the post-release opportunities and preferences of inmates, thus increasing their propensity to commit another crime.

(*Table IV and Table V about here*)

Overall, controlling for an important source of unobserved heterogeneity, we find that harsher prison conditions measured by the extent of overcrowding and the number of deaths do not reduce recidivism, whereas prison isolation is associated with a higher level of post-release criminal behaviour. To gauge the impact of controlling for heterogeneity at the province level, we observe that from the previous tables the estimated standard errors of the key variable (and other individual variables) are generally smaller when we include province of residence fixed effects (about 100 dummies). This suggests that the there are several effects on recidivism that vary at the province

level and that this is potentially an important source of heterogeneity to condition on. This is particularly true for the specification in which we estimate the effect of the distance from the prison of detention to the chief-town of the province where the prison is located. Indeed, by running a regression for the whole sample (movers and non-movers) without fixed effects we obtain a smaller coefficient on distance, which is only marginally statistically different from zero (results not reported).

Finally, a potential issue is whether all the results for movers can be generalized to all the individuals in our sample. Although differences in observables between movers and non-movers are not large, movers are not a random sample. The main way in which movers differ from the rest of the sample is the average sentence, with movers having on average a longer sentence (see Table I). Since sentence reflects the degree of dangerousness of inmates, it could be possible that our results are driven by a subset of movers with very long sentences, whose post-release behaviour is not affected by harsher treatment in prison. To explore this possibility, in the previous specifications we include an interaction term between sentence and the key variable that proxies for prison conditions. If the interaction term is not statistically different from zero, we can conclude that heterogeneity in sentence across movers is not driving the results presented above. As Table VI shows, the coefficient on the interaction term is always associated with large standard errors. We do not find convincing evidence that movers with longer sentences respond differently to previous harsher prison treatment.

(*Table VI about here*)

5. Concluding Remarks

In this paper we have investigated the effects of prison conditions on post-release recidivism among former Italian inmates. We have studied the effects of two main dimensions of prison conditions:

prison harshness (proxied by prison overcrowding and death rates in prison) and prison isolation (proxied by the distance between prison and chief province town and number of volunteers). Our results suggest that harsher prison conditions do not exert any significant effect on former inmates' post-release propensity to commit new crimes. However, greater prison distance from chief towns and fewer volunteers, proxies of the degree of isolation, positively affect post-release crime levels.

Given that former studies such as Katz et al. (2003) and Bedard and Helland (2004) show that harsher prison conditions are associated with lower crime rates, it is worth asking what kind of implications we should draw from our results. Because our study is the first of its type to exploit individual-level data from outside the U.S., it is difficult to make quantitative comparisons between our results and other studies which rely on U.S. data. Nonetheless, we can observe that our findings help to clarify some former results in the literature. Chen and Shapiro (2007) show that the general deterrent effect found by Katz et al. (2003) could be outweighed by the positive impact on recidivism implied by higher security levels in the U.S.. Our results suggest that the effect found by Chen and Shapiro could arguably be induced by the higher degree of isolation being related to higher security levels, whereas harshness of prison conditions *per se* should not imply higher recidivism. Nonetheless we cannot conclude that policy makers should ignore the effects of harsher prison conditions, or, even worse, that harsher prison conditions are desirable because they seem to have a general deterrent effect. As shown by Katz et al. (2003), the aggregate impact of changing prison conditions on crime rates appears to be small: "*Given the limited efficiency gains implied by these estimates, the moral and ethical considerations surrounding these issues would appear to dominate any economic arguments. In a society predicated on civil liberties, the social costs of degrading living conditions in prisons beyond their current state are likely to overwhelm any marginal reductions in crime*" (Katz et al., p. 340). Our results confirm this view and suggest that we should consider the limits of incarceration as a means of redeeming people more carefully.

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Appendix: Types of Crime Included as Control Variables and their Definition

Drug offences. In this category are included all the violations of the law on the use and selling of drugs (Decree of the President of the Republic, 9 October 1990, 309 and subsequent modifications and amendments).

Crimes against property. In this category are included theft, larceny, robbery, bag-snatching and all the offences regulated by Book II, Section XIII, of the Italian Penal Code.

Crimes against public administrations. In this category are included crimes against the public interest and administration, regulated by Book II, Section II of the Italian Penal Code.

Crimes against public safety. In this category are included all crimes related to possible danger to the safety of people, things, public utilities, buildings. All the crimes in this category are included in Book II, Section VI, of the Italian Penal Code.

Violation of gun law. In this category are included all the violations of the law on using and carrying guns and other arms (Law 110/75 and subsequent modifications and amendments).

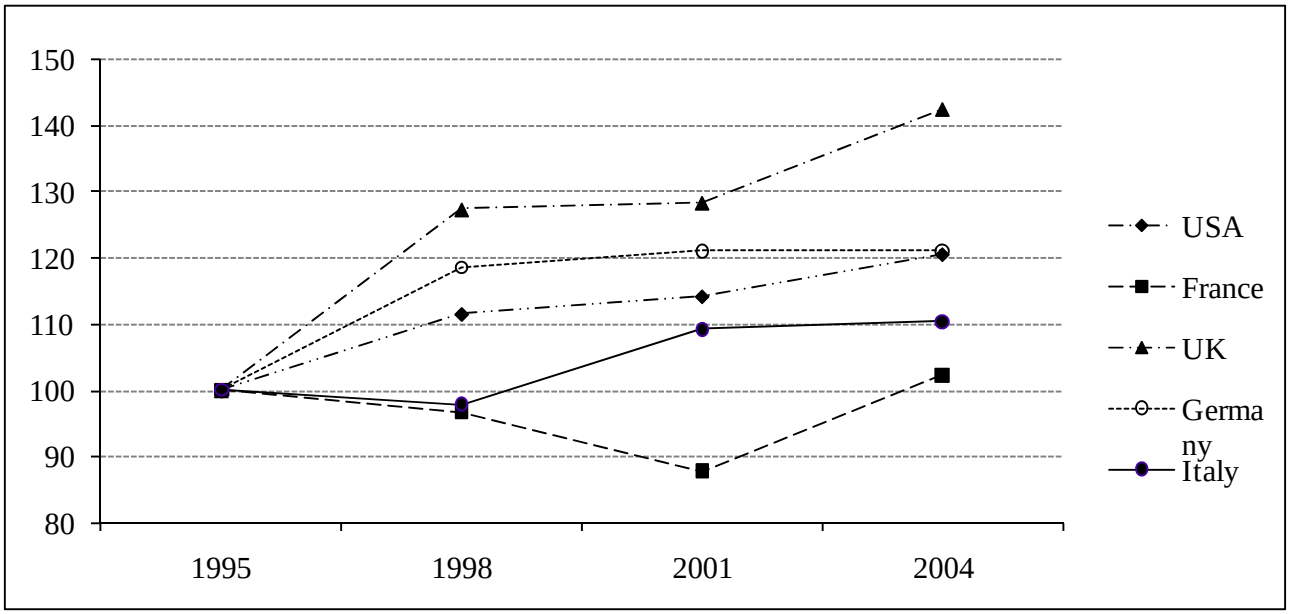
Immigration law. In this category are included all the violations of the law on the regulation of immigrants and the juridical status of foreign citizens (legislation of 25 July 1998, 286 and subsequent amendments and modifications).

Various crimes against persons. In this category are included assault, homicide, and all offences regulated by Book II, Section XII, of the Italian Penal Code.

Corruption and crimes against justice administrations. In this category are included crimes against the correct functioning of the justice administration and police and, in general, all crimes regulated by Book II, Section III, of the Italian Penal Code.

Figures and Tables

FIGURE 1: Trends in Prison Population Rates



Notes: 100 index 1995. The number of inmates per 100,000 inhabitants in the 1995 was: 600 for the U.S., 89 for France, 99 for the U.K., 81 for Germany, 87 for Italy. Data Source: International Center for Prison Studies, King's College London

TABLE I: Descriptive Statistics

		Full Sample		Recidivists	
Number of observations		25,716		2,792	
Individual characteristics					
		Mean	*Standard deviation*	*Mean*	*Standard deviation*
Recidivism		0.11	0.31		
Age on exit		36.68	10.07	34.30	8.67
Length of sentence		41.91	35.19	37.42	30.95
Distance from jurisdiction chief-town		15.45	20.92	16.09	22.10
Overcrowding (number of prisoners for 100 available places in the detention facility)		151.37	40.94	150.64	42.64
Average number of deaths occurred during detention in the same facility (for each inmate)		1.26	2.44	1.30	2.54
Number of volunteers per capita		0.14	0.15	0.14	0.15
		Frequency		*Frequency*	
Gender					
	Male	0.95		0.02	
	Female	0.05		0.98	
Nationality					
	Italian	0.62		0.63	
	Non-Italian	0.38		0.37	
Marital status					
	Married	0.29		0.19	
	Unmarried	0.57		0.67	
	Other	0.14		0.14	
Education					
	Illiterate	0.03		0.04	
	Primary	0.30		0.33	
	Junior High	0.53		0.53	
	High School	0.06		0.06	
	College (degree or equivalent)	0.01		0.01	
	Other	0.07		0.03	
Employment					
	Permanently employed	0.34		0.24	
	Unemployed	0.47		0.59	
	Other	0.19		0.17	
State of judgement					
	Final judgment taken	0.70		0.64	
	Mixed	0.19		0.24	
	Appellant	0.06		0.07	
	Other	0.05		0.05	
Kind of offense					
	Drug offenses	0.41		0.37	
	Crimes against property	0.40		0.49	
	Crimes against public admininstr	0.02		0.02	
	Violation of gun law	0.01		0.01	
	Immigration bill	0.03		0.02	
	Various crimes against persons	0.07		0.05	
	Other	0.06		0.04	

TABLE I (continues): Descriptive Statistics

		Movers		Recidivists	
Number of observations		13,160		1,491	
Individual characteristics					
		Mean	*Standard deviation*	*Mean*	*Standard deviation*
Recidivism		0.11	0.32		
Age on exit		36.15	9.81	34.16	8.70
Length of sentence		46.28	37.19	40.52	32.58
Distance from jurisdiction chief-town		18.74	24.26	20.33	26.05
Overcrowding (number of prisoners for 100 available places in the detention facility)		149.82	42.18	147.70	43.69
Average number of deaths occurred during detention in the same facility (for each inmate)		1.01	1.91	0.95	1.85
Number of volunteers per capita		0.14	0.15	0.14	0.15
		Frequency		*Frequency*	
Gender					
	Male	0.95		0.98	
	Female	0.05		0.02	
Nationality					
	Italian	0.56		0.56	
	Non-Italian	0.44		0.44	
Marital status					
	Married	0.29		0.20	
	Unmarried	0.59		0.69	
	Other	0.12		0.11	
Education					
	Illiterate	0.03		0.02	
	Primary	0.30		0.35	
	Junior High	0.51		0.50	
	High School	0.06		0.04	
	College (degree or equivalent)	0.01		0.01	
	Other	0.09		0.08	
Employment					
	Permanently employed	0.34		0.27	
	Unemployed	0.48		0.59	
	Other	0.18		0.14	
State of judgement					
	Final judgment taken	0.69		0.64	
	Mixed	0.20		0.24	
	Appellant	0.03		0.03	
	Other	0.08		0.09	
Kind of offense					
	Drug offenses	0.43		0.40	
	Crimes against property	0.39		0.46	
	Crimes against public admininstr	0.02		0.02	
	Violation of gun law	0.01		0.01	
	Immigration bill	0.03		0.02	
	Various crimes against persons	0.08		0.05	
	Other	0.04		0.04	

TABLE II: Results on the Effects of Prison Overcrowding

Independent variable	1	2	3
Prison overcrowding index	-0.00007	-0.00006	-0.00005
	(-0.85)	(-0.79)	(-0.59)
Individual characteristics	YES	YES	YES
Type of crime	NO	YES	YES
Province fixed effects	NO	NO	YES
Average recidivism	0.1134	0.1134	0.1134
R-squared	0.018	0.022	0.032
Observations	11,334	11,334	11,334

Notes: Entries refer to a linear probability model; the dependent variable is a binary variable assuming value 1 if the inmate has been re-arrested after release and 0 otherwise. The prison overcrowding index is the number of inmates in each prison for 100 officially available places. Individual variables include: sentence length, time spent in prison, education, age at date of release, marital status and nationality dummies, judicial status and employment condition before imprisonnent. t-statistics (in parenthesis) adjusted for clustering at the prison level. The average sentence and number of months of time served is 47.45 and 29.97 months, respectively. The average prison overcrowding rate is 148.86 percent.

TABLE III: Results on the Effects of Deaths in Prison

Independent variable	1	2	3	4
Number of deaths in the facility (per capita)	0.22	0.18	0.09	0.28
	(0.87)	(0.75)	(0.33)	(0.61)
Individual characteristics	YES	YES	YES	YES
Type of crime	NO	YES	YES	YES
Province fixed effects	NO	NO	YES	YES
Prison fixed effects	NO	NO	NO	YES
Average recidivism	0.1134	0.1134	0.1134	0.1134
R-squared	0.018	0.021	0.035	0.053
Observations	11,346	11,346	11,346	11,334

Notes: Entries refer to a linear probability model, the dependent variable is a binary variable assuming value 1 if the inmate has been re-arrested after the release and 0 otherwise. The number of deaths per capita is the number of deaths ocurred since the inmate's entrance in the facility over the total number of inmates in the same facility. Individual variables include sentence length, time spent in prison, education, age at date of release, marital status and nationality dummies, judicial status, and employment condition before imprisonnent. t statistics (in parenthesis) adjusted for clustering at the prison level. The average sentence and number of months of time served is 47.45 and 29.97 months, respectively. The average number of deaths for each inmate is 0.0049.

Table IV: Results on the Effects of the Number of Volunteers

	1	2	3
Number of Volunteers (per capita)	-.0234	-.0216	-.0334
	(-1.22)	(-1.12)	(-1.72)
Individual Variables	YES	YES	YES
Type of crime	NO	YES	YES
Province fixed effects	NO	NO	YES
Average recidivism	0.1161	0.1161	0.1161
R-squared	0.019	0.022	0.039
Observations	10,198	10,198	10,198

Notes: Entries refer to a linear probability model. The dependent variable is a binary variable assuming value 1 if the inmate has been re-arrested after release and 0 otherwise. The number of volunteers per capita is the number of volunteers reported by the facility administration in 2007 over the total number of inmates in the same facility. Individual variables include sentence length, time spent in prison, education, age at date of release, marital status, nationalities dummies, judicial status and employment condition before imprisonment. t-statistics (in parenthesis) adjusted for clustering at the prison level. The average sentence and number of months of time served is 47.17 and 29.75 months, respectively. The average number of volunteers per capita is 0.1371.

Table V: Results on the Effects of Distance between the Facility and Province Chief Town

	1	2	3	4	5
Distance	0.0003	0.0003	0.0003	0.0003	0.0003
	(2.61)	(2.64)	(.2.77)	(.2.38)	(2.60)
Prison overcrowding index	-	-	-	0.00008	-
				(-0.96)	
Number of deaths in the facilit	-	-	-	-0.0394	-
(per capita)				(-0.12)	
Number of volunteers	-	-	-	-0.0223	-0.0214
(per capita)				(-1.13)	(-1.09)
Individual Variables	YES	YES	YES	YES	YES
Type of crime	NO	YES	YES	YES	YES
Province fixed effects	NO	NO	YES	YES	YES
Average recidivism	0.1173	0.1173	0.1173	0.1176	0.1176
R-squared	0.019	0.022	0.037	0.040	0.040
Observations	11,022	11,022	11,022	9,946	9,946

Notes: Entries refer to a linear probability model. The dependent variable is a binary variable assuming value 1 if the inmate has been re-arrested after release and 0 otherwise. Distance is expressed as road distance (in km) between the facility and the chief-town of the province where the prison is located. Individual variables include sentence length, time spent in prison, education, age at date of release, marital status, nationalities dummies, judicial status and employment condition before imprisonment. t-statistics (in parenthesis) adjusted for clustering at the prison level. In columns (1)-(3) the average sentence and number of months of time served is 47.30 and 29.83 months, respectively. The average distance is 19.11 km. In columns (4)-(5) the average sentence and number of months of time served is 47.22 and 29.73 months, respectively. The average distance is 16.71 km, the average number of volunteers per capita is 0.1364; the overcrowding rate and the average number of deaths for each inmate are 150.23 and 0.0051, respectively.

Table VI: Measures of Prison Conditions Interacted with Individual Sentences

Independent variable	1	2	3	4
Distance	0.003	-	-	-
	(.2.77)			
distance x sentence	-0.0012	-	-	-
	(-0.45)			
Prison overcrowding index		-0.0001	-	-
		(-0.73)		
Prison overcrowding index	-	0		-
x sentence	-	(0.51)		
Number of deaths in the facility	-	-	0.4626	-
(per capita)			(0.72)	
Number of deaths in the facility	-	-	-0.022	-
x sentence			(-0.48)	
Number of volunteers (per capita)	-	-	-	-0.0065
				(-0.22)
Number of volunteers (per capita)	-	-	-	-0.0005
x sentence				(-1.57)
Individual Variables	YES	YES	YES	YES
Type of crime	YES	YES	YES	YES
Province fixed effects	YES	YES	YES	YES
Prison fixed effects	NO	NO	YES	NO
Average recidivism	0.1173	0.1134	0.1134	0.1171
R-squared	0.039	0.035	0.053	0.039
Observations	11,022	11,346	11,346	10,198

Notes: Entries refer to a linear probability model. The dependent variable is a binary variable assuming value 1 if the inmate has been re-arrested after release and 0 otherwise. Individual variables include sentence length, time spent in prison, education, age at date of release, marital status, nationalities dummies, judicial status and employment condition before imprisonment. t-statistics (in parenthesis) adjusted for clustering at the prison level.