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EVALUATING THE EFFICIENCY OF THE ITALIAN PENITENTIARY SYSTEM*

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Abstract

In the aftermath of an official general pardon in 2006 Italian penitentiaries are struggling with overcrowding and budgeting problems. In order to identify the main causes of such difficulties we analyze an unbalanced panel of 142 Italian penitentiaries for the time period 2003-2005. A primary source of inefficiency is identified in unexploited economies of scale. In addition, estimation of a stochastic cost frontier highlights significant technical inefficiency, mainly attributable to overstaffing. Average prison size and technical efficiency are both smaller in the South than in the rest of the country.

JEL Classification. H50, H83.

Keywords: Prisons, Public Expenditure, Efficiency

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Introduction

In the last decade almost all European countries have experienced a dramatic increase in prison population: the ratio of inmates to population rose by about 17% over 1997-2006 in Europe¹. The reasons for this growth are manifold. Criminologists draw a distinction between ‘deterministic’ and ‘policy-driven’ explanations. The former focus on such background factors as variations in the crime rate, demographic changes and social and economic determinants, including child poverty, the breakdown of the family, poor education and unemployment. Policy-driven explanations see the growth of prison population as primarily the consequence of changes in public attitudes towards imprisonment and the subsequent responses in terms of more severe legislation and longer and tougher sentences, even in absence of any evidence that these measures are more effective in reducing crime.

Even though many national governments embarked in substantial prison building programmes in order to increase capacity, the rise of prison population invariably led to overcrowding. At the end of 2005 the ratio of prison population to total capacity of penal institutions was equal to 1,02 in Europe, with large cross-country differences. The negative consequences of overcrowding are manifest: it makes more difficult for the penitentiary system to offer acceptable conditions of life to both prisoners and prison staff and to pursue the fundamental objectives to first isolate criminals from society and then rehabilitate them (that is to favour the chances of prisoners, when released, to be successfully reintegrated into the community).

Overcrowding can be tackled by resorting to a large array of legislative and procedural measures: reducing the use of pre-trial (or remand) imprisonment, increasing the availability of alternatives to prison sentences and encouraging courts to make full use of those alternatives and, though only in a short-time perspective, launching amnesties for less serious offenders from time to time.

In a longer term perspective an increase in capacity is an obvious option. However, in the current environment of tight public budgets prison building programmes may fall down the priority list. Severe fiscal limitations have increasingly drawn the attention to the efficient allocation of public resources in the prison system. In many countries it is recognized that there is significant scope for increasing efficiency in the prison system.²

Italy represents a case in point. Over 1995-2005 prison population increased by 22%, more than the European average, while capacity remained almost stable (+5.5%). As a result overcrowding (measured by the population-capacity ratio) in Italian prisons rose dramatically,

¹ Our calculations on data from Walmsley (1999 and 2007).

² See for example the case of UK as discussed in the Lord Carter’s Review of Prisons (2007).

hitting the record level of 1,39 at the end of 2005, second only to Greece (1,72) in Europe. This emergency situation forced the government to enact in 2006 an amnesty which cut the number of prisoners by about 35%. However since then the number of inmates has soared again coming close to the before-the-amnesty level in just two years. At the same time the growing fear of crime in the general public, together with a loss of confidence in the criminal justice system, put pressure on policy makers to pass more severe legislation, generally implying longer imprisonment periods.

The rising demand on the prison system contrasts with the harsh fiscal challenges that Italy is facing: reducing the general government deficit and debt, moderating the already relatively high tax burden and creating fiscal space for meeting new spending needs. Within this framework, as an initial step to enhance public spending effectiveness and efficiency, in 2007 the Italian government initiated an assessment of selected public spending programmes, including the penitentiary system.

The aim of this paper is to empirically assess the efficiency of Italian prisons. Even if “modern prisons may be viewed as multi-product firms providing incarceration days and rehabilitation opportunities” (Avio, 1998), here the focus is mainly on the detention function and, as a consequence, the output of the penitentiary system is defined in terms of number of inmates. Moreover since the goal is here to evaluate the use of resources, the stress is on the minimization of inputs rather than on maximization of output. As a matter of fact inmates are in our perspective an exogenous variable, which depends on the institutional framework (legislation, court decisions, crime rates, etc.).

The paper is organized as follows. The second section offers a critical review of the relevant literature. The third section sketches the main institutional features of the Italian penitentiary system. In the fourth section the data used in the empirical analysis are presented. The fifth section discusses the specification of the econometric model used to estimate the cost function for the Italian prisons and presents the results. The sixth section concludes.

2. Assessing Prisons Efficiency: Review of the Literature

Efficiency assessment can be based on either a parametric or a non-parametric approach. The parametric approach allows the estimation of a production or a cost function and requires the definition of the corresponding functional form. The main advantage of this approach is the possibility to test for the significance of specific parameters. The non-parametric approach does not rely on any specific functional form. It imposes less restrictions on the data but makes inference more difficult (Balassone *et al.* 2002).

The literature on evaluating prisons’ efficiency is scanty with only a few papers providing cross-section analyses. To our knowledge there are four main studies, two applying non-parametric

methods (data envelopment analysis, DEA) and two applying parametric methods (deterministic frontier). All define prisons' output with reference to the detention function of the system, although in some cases controls are used to take into account the rehabilitation function.

The two studies based on DEA estimations are: (a) Ganley and Cubbin (1992)³, who estimate the technical efficiency of 33 UK local prisons and remand centres for the financial year 1984/85, and (b) Butler and Johnson (1997), who estimate the technical efficiency of 22 Michigan men's prisons with 1992 data. These studies use different, but similar, measures of output: the number of prisoner days in a year in Ganley and Cubbin (1992) and the yearly number of prisoners confined per facility in Butler and Johnson (1997). They differ more radically concerning the choice of the input set. The UK analysis only uses expenditure data as proxies for inputs, separating labour expenses from other costs. The US work employs direct measures of the quantity of inputs (number of staff and number of beds) together with total expenditure.

In general Ganley and Cubbin (1992) provide a more accurate estimation: output quality is controlled along three dimensions rather than one as in Butler and Johnson (1997). The latter only take into account whether prisoners are involved in any institutional programs, while the former distinguish between remand and non-remand prisoners, control for the number of serious offences (i.e. incidents of escape, assaults on staff, wilful damage to prison property) and use a measure of overcrowding to account for the effects the latter may have on both rehabilitation and the quality of prison life⁴.

Ganley and Cubbin (1992) estimate a mean technical inefficiency equal to 0.88 (assuming varying returns to scale). The main cause of inefficiency is identified in excess manpower used for the containment of remand prisoners.

The two studies applying parametric methods are Trumbull and Witte (1981a), who estimate a cost function on quarterly data for a sample of just 6 US federal correctional institutions over 1976-1978⁸ and Panci (1999), who estimates both a production and a cost function on annual data for a sample of 107 Italian prisons in 1996. Both studies follow a simple regression approach (Feldstein, 1967) and do not report estimates of an efficiency frontier. However Panci (1999) does present indicators of percent inefficiency for individual prisons compared to an efficient frontier.

Trumbull and Witte (1981a) regress the log of prison average cost (AC) against the level and log of output (to allow for non-constant return to scale) and a number of control variables. Besides output (Y) and control variables (A_i), their original specification included the log of factor prices (P_L and P_K respectively for labour and capital). However, since they "were unable to secure

³ This is an extension of a previous work by the same authors (Ganley and Cubbin, 1987).

⁴ In practice this amounts to controlling for the quality of output as measured by detention days.

adequate data for input prices” [p.121], the authors “decided that input prices would have to be excluded from the model” [p.122], reducing the estimating equation to

$$(1) \quad \ln AC = \beta_0 + \beta_1 Y + \beta_2 \ln Y + \sum \gamma_i A_i$$

Costs include actual disbursements, increments in accounts payable, and depreciation. Output is measured by the total number of confinement days provided in each period. Nineteen control variables were used, referring to:

- a. output (provision of rehabilitative activities; overcrowding; composition of personnel - guards vs. other staff, etc.);
- b. labour input (composition of staff by race, age and sex);
- c. capital input (age of prison; square feet of living area per bed etc.).

Trumbull and Witte (1981) main finding is the presence of large economies of scale in facilities confining up to about 1,400 inmates. Non-linearity of the average cost function is confirmed by statistical significance of the coefficients of Y (positive) and $\ln Y$ (negative)⁵. Results for control variables are not always intuitive. On the one hand, as one would expect, average costs are positively correlated with the provision of rehabilitative activities and the share of inmates with alcohol or drug dependency. On the other hand, somewhat puzzlingly, average costs are positively correlated with overcrowding and negatively correlated with square feet of living area per bed, the share of single cell beds, and the ratio of toilets to capacity⁶.

However, the small sample size is a source of concern about the robustness of results (Kritzer, 1981). Estimates are based on regressions with 21 explanatory variables over a sample of 60 observations. Moreover, the use of quarterly observation to stretch the data-base (the sample only includes 6 correctional facilities) begs the question of the informational content of such quarterly data. Finally, it should be noted that the sample used for the regression was selected from a larger pool of 21 correctional facilities: first individual cost functions were estimated for each facility based on monthly data and then a generalized Chow test was used to identify the subset of facilities with homogeneous technology. According to the authors this is necessary “to uniquely determine the effect of prison size on costs [...] if we were to estimate a cost curve using prisons with widely differing methods of operation, we would confuse cost savings due to changed method of operation with cost savings due to changes in prison size” [p. 134]. However, this means that

⁵ Trumbull and Witte (1981) construct an average cost curve based on parameters estimated and assuming that variables other than output have their average value in the sample. This curve is asymmetrically U-shaped, “with the cost increases associated with very small facilities exceeding those associated with very large facilities. The average cost of a confined day is lowest for a prison which confines, on average, 1371 inmates”⁵ [p. 129].

⁶ The authors argue that may be more privacy and comfort, while more costly per se, may be reducing other costs. For instance, they note that, according to the National Advisory Commission on Criminal Justice Standards and Goals, “without privacy and personal space, inmates become tense and many begin to react with hostility. As tension and hostility grow, security requirements increase; and a negative cycle is put into place” [p. 131].

findings concerning economies/diseconomies of scale are specific to the method of operation adopted by the 6 facilities considered. Other methods of operations may be more effective at cost containment over different ranges of prison size.⁷

Panci (1999) estimates a production function, with labour, intermediate consumption and fixed capital as explanatory variables and a total cost function with the number of confinement days (by type of inmate) and a regional control as explanatory variables. He does not control for overcrowding and, in the cost function, does not include prices. Both functions are specified as translog.

In the production function output (Y) is measured by the total number of confinement days; labour input (L) is given by the total number of staff (guards and other); intermediate consumption (C) is proxied by living and health care expenditure; and fixed capital (K) is proxied by expenditure on maintenance and management of facilities. All variables are converted into index numbers (\underline{Y} , \underline{L} , \underline{C} , \underline{K}), whose logs enter the estimating equation:

$$(2) \quad \ln \underline{Y} = \beta_0 + \sum_{I \in (L, C, K)} \beta_I \ln \underline{I} + \sum_{I, J \in (L, C, K)} \beta_{IJ} \ln \underline{I} \ln \underline{J}$$

In the cost function, total costs (TC) is measured by total cash outlays; output is measured by four categories of confinement days referring to: inmates under a light surveillance regime (Y_1), inmates under a reinforced surveillance regime (Y_2), inmates affected by a pathology (Y_3), and other inmates (Y_4). The regional control (N) is a dummy variable taking value 1 if the prison is located in the North of Italy. As in Trumbull and Witte (1981) factor prices are not included among explanatory variables in the cost function. Except for the regional dummy, also in this case all variables are converted into index numbers whose logs enter the estimating equation

$$(3) \quad \ln \underline{TC} = \beta_0 + \sum_{i=1 \dots 4} \beta_i \ln \underline{Y}_i + \sum_{i,j=1 \dots 4} \beta_{ij} \ln \underline{Y}_i \ln \underline{Y}_j + \beta_N N$$

Panci (1999) main finding is that there are significant economies of scale for prisons whose size is below the sample average. The extent of such economies of scale appears larger when assessed using cost function estimates. While in general, when conditions for duality hold, estimating either a production or a cost function delivers exactly the same information about production, in Panci (1999) this is not the case given the different definition of output in the specification of the two functions and the absence of controls in the production function.

Additionally the paper shows that:

- a. Technical inefficiency, as measured by the distance from the estimated frontier, amounts to 8 % on average for production and 14 % for costs⁸;

⁷ Indeed Trumbull and Witte (1981b) do find that “when both prison size and method of operation are allowed to vary [...] prison costs decline continuously with prison size” [p. 145].

⁸ Again, different results reflect the different specification of the two functions.

- b. Average figures hide wide dispersion: the inefficiency score exceeds average by more than 25 % in 10 % of prisons, for production, and 30% of prisons for cost;
- c. An increase in the number of inmates subject to light surveillance induces lower extra-costs than a similar increase in any other category of inmates; this is in line with results by Trumbull and Witte (1981) concerning the cost-effect of inmates with alcohol or drug dependency;
- d. *Ceteris paribus* total costs are lower in prisons located in the North of Italy; hinting at the possibility of excess labour input in Southern facilities.

3. The Italian Penitentiary System: the Institutional Framework

The Department of Prisons' Administration (hereafter DAP), which is part of the Ministry of Justice, is in charge of the Italian penitentiary system. Different from other countries experience (e.g. the US and the UK) the Italian penitentiary system is entirely State-run. It is disciplined by dedicated legislation (Law n. 354/1975) and ensuing administrative regulations. Adult detention institutes are divided in four main categories based on the function which they are in charge of:⁹

1. Custody Institutes (*istituti di custodia cautelare*, art.60 Law n. 354/1975), District Houses (*case di reclusione*) or Remand Houses (*case mandamentali*), are meant to detain people awaiting trial under judicial authority and to ensure the custody of "in transfer" inmates. They include special sections for inmates sentenced to detention for no more than 3 years;
2. Sentence Serving Institutes (*istituti per l'esecuzione della pena*, art.61 Law n. 354/1975) correspond to traditional detention houses;
3. Safety Measures' Institutes (*istituti per l'esecuzione delle misure di sicurezza*, art.62 Law n. 354/1975) such as clinics and judicial psychiatric hospitals;
4. Observation Centres (*centri di osservazione*, art.63 Law n. 354/1975), independent institutes or sections of other institutes, where legal/medical assessments of inmates personality are carried out.

Overall, in 2008, the Italian penitentiary system counts 206 institutes, 199 of which are mainly devoted to detention purposes for a certified normal accommodation capacity of almost 42.000 units. In June 2008 the system was hosting 54.000 inmates (tab. 1).

Table 1. District Houses and Sentence Serving Institutes (at 30/06/2008)

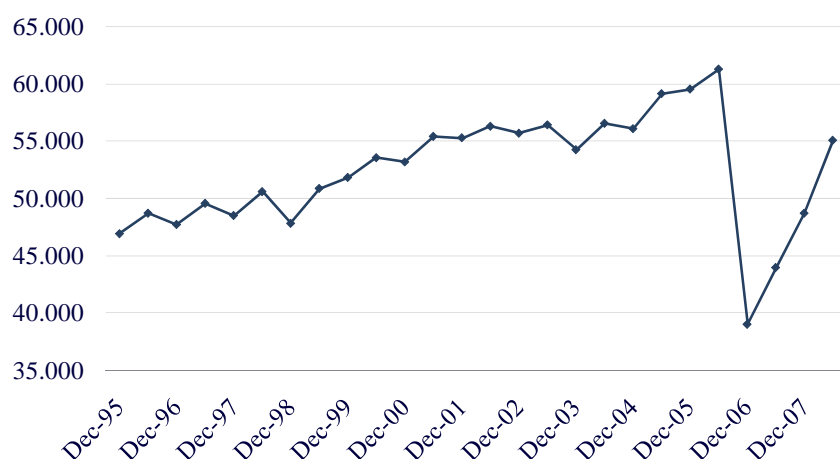
⁹ Art.59 Law n. 354/1975.

	Penitentiary institutes	Certified normal accomodation	Present inmates at 31/12	Overcrowding (%)
District Houses	158	33.371	45.070	140,5
Female District Houses	3	407	506	146,2
Sentence Serving Institutes	36	7.896	8.356	109,9
Female Sentence Service Institutes	2	145	94	57,0
TOTAL	199	41.819	54.026	128,2

Source: Ministry of Justice

Prison population declined considerably after an official pardon in 2006. The number of prisoners dropped from 61.000 to 39.000. Afterwards the number of inmates soared again and prison population is now close to the level recorded in 2005 (fig. 1).

Figure 1. Prison Population (1995-2008)



Source: Ministry of Justice

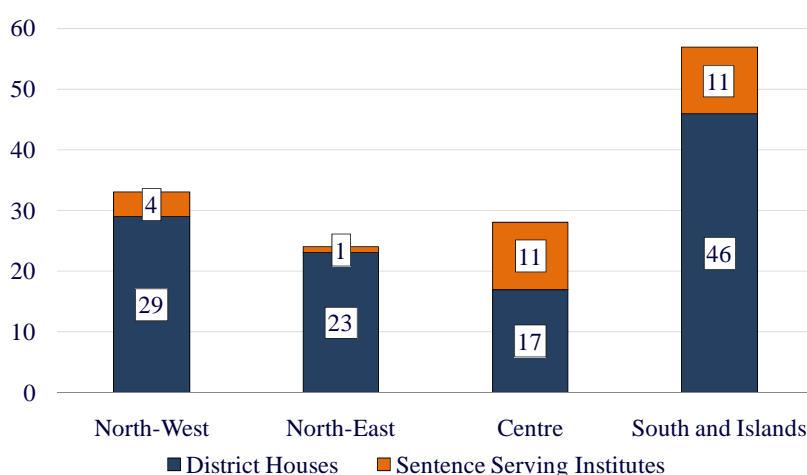
In 2007, the DAP counted about 48,000 employees: 41.315 police and 7.000 administrative staff (Ministry of Justice 2008). In the same year, the DAP budget amounted to 2,9 billion euro, 73% of which was used to pay staff (both police and administrative). Intermediate consumption¹⁰ accounted for 2.5% of total expenses, whilst 4.6% was destined to investment.

4. The data

¹⁰ The cost of raw materials and other inputs, which are used up in the production process.

Data for individual institutes, kindly provide by DAP, allow a more detailed analysis of the Italian system. Available information covers the period 2003-2007 but the break due to the 2006 pardon makes it necessary to focus the analysis on the period 2003-2005. Overall, the dataset is referred to as an unbalanced panel of about 142 penitentiaries for three years.¹¹ The dataset is composed of District Houses and Sentence Serving Institutes: this is functional to the econometric analysis in section 5 aimed at assessing efficiency of the detention function of the penitentiary system.¹² The large majority of observed penitentiaries are District Houses (80%). 40% of prisons is located in Southern Regions and Islands, 20% is in Central regions, 23% is North-Western regions and 17% in North-Eastern regions (fig. 2).

Figure 2. Territorial distribution of penitentiary facilities by type (2005)

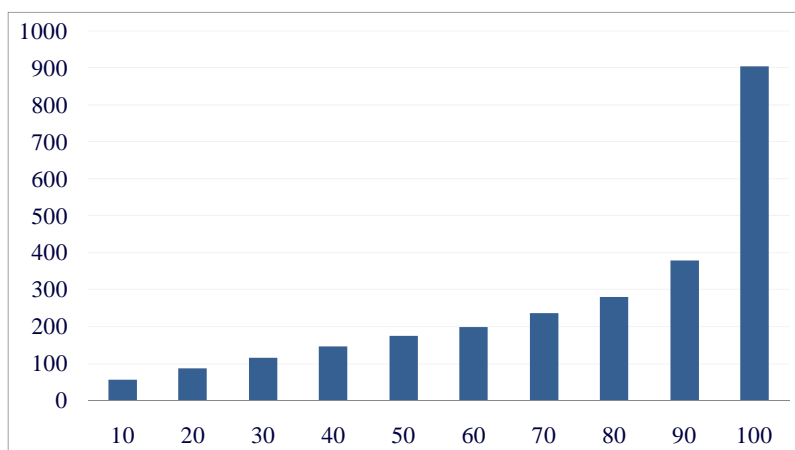


The dimension of facilities is measured by the certified normal accommodation (CNA) which is defined, by the Ministry of Justice, taking the structural characteristic of the detention centre into consideration. Capacity is usually low, with more than 80% of institutes below 300 beds (fig. 3). However, the variance of prisons' size is large (capacity varies from a minimum of 20 beds to a maximum of 903).

¹¹ The dataset includes 133 prisons in 2003, 136 in 2004, and 142 in 2005.

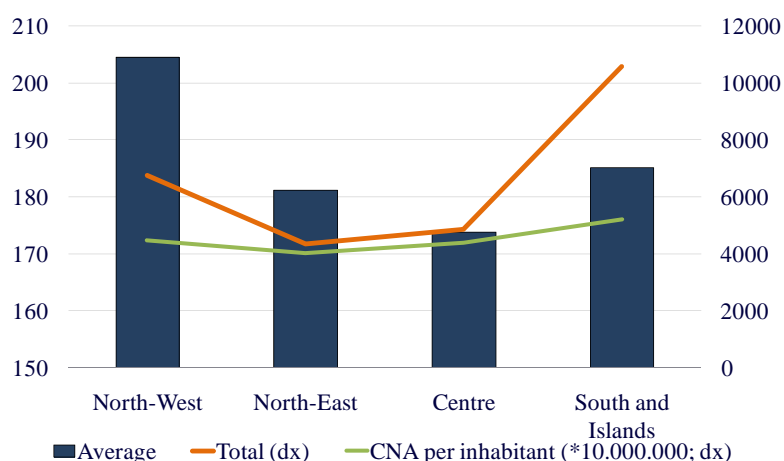
¹² In other words, Psychiatric Hospitals as well as juvenile detention institutes-among the others- have been dropped from the original dataset.

Figure 3. Certified normal accommodation: centile distribution



On average North-western regions have the biggest prisons (204 CNA), while smaller institutes characterize North-eastern regions (173 CNA). Total CNA is higher in Southern Region than in other macro-regions also when measured relative to resident population (though in this case the difference is smaller; fig. 4).

Figure 4. Certified normal accommodation by Macro region (2005)



During 2003-2005, the Italian penitentiary system suffers from considerable over-crowding, with an overall number of prisoners equal to 130% of CNA. Overcrowding – measured as the ratio of the number of inmates on December 31st to CNA – tends to be more of a problem in the North than in the South (tab. 2).

However not all penitentiaries suffer from over-crowding to the same extent. In 2005, a small share of penitentiaries shows an index of overcrowding lower than 50%, while the index

exceeds 120% in 80% of facilities located in the North and 50% of those located in the South. As far as the type of institute is concerned, District Houses – with an average index of 141% – are more crowded than Sentence Serving Institutes – the average index is 103%.

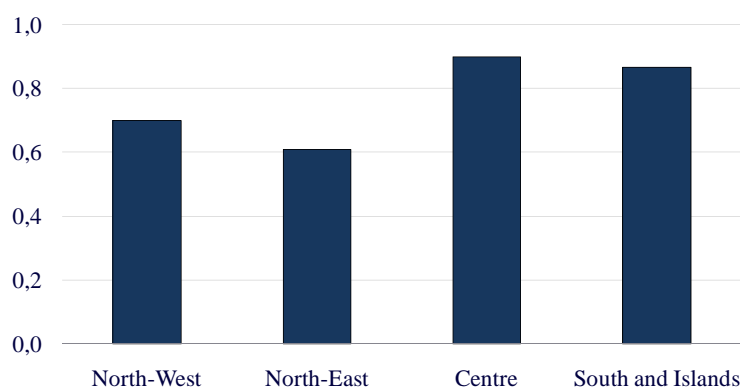
Table 2. Index of overcrowding (2005)

	Overcrowding (average)	Index of overcrowding<0.5 (% of penitentiaries)	Index of overcrowding>1.2 (% of penitentiaries)
North-West	1.5	1.1	79.6
North-East	1.5	0.0	85.9
Centre	1.2	3.5	52.9
South and Islands	1.2	5.6	54.3

Police staff is measured by the number of officer-years (number of worked months/12). Hence, if an officer worked only six months he will count as 0.5. Penitentiary police has five positions: commanding officer, commissioner of police, inspector, superintended, and police officer. Our dataset does not include information on salaries for commanding officers and administrative staff. The average wage of remaining police staff in each penitentiary institute varies according to the composition of staff by position; it goes from a minimum of €24.200 to a maximum of €30.800 (gross values). The average gross wage vary is higher in Central and Southern regions (about €28.800) than in Northern regions (about €27.900)

The average ratio of police to inmates present on December 31st of each year is about 0,85, with higher values in Central and Southern regions than in Northern regions (fig. 5)

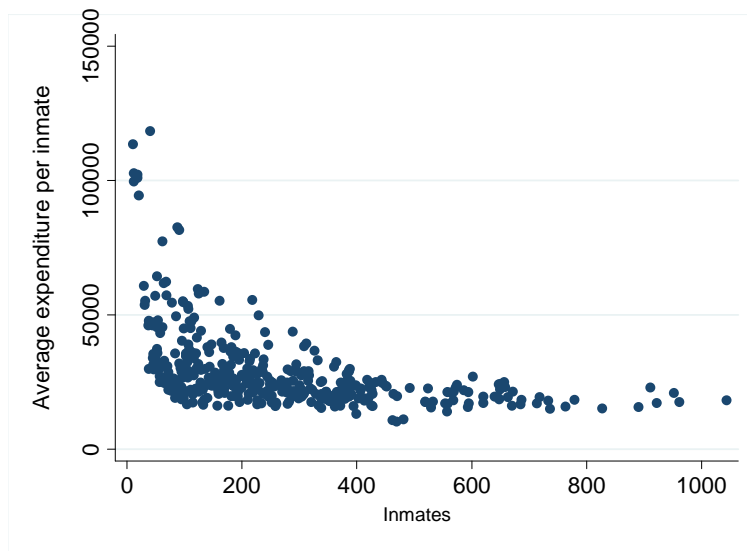
Figure 5. Police/Inmate by Macro region (2005)



Labour accounts for about 70% of the average cost per inmate, with the remaining 30% reflecting living costs, health expenditures, equipment, furniture, transport and accessory

expenses¹³. Living costs represent the largest share of non-labour expenses (more than 50%); direct living costs is just 26,6% of total, while around 40% is paid for energy and water supply. Average expenditure per inmate has a strong negative correlation to the number of inmates (fig. 6).

Figure 6. Average expenditure per inmate



5. Empirical Analysis and Results

In this section we report results of econometric estimates of a cost function¹⁴ for Italian prisons based on the dataset described in the previous section. Specifically we estimate a stochastic cost frontier to take into account the effect of factors other than inefficiency affecting costs. In a stochastic cost frontier the error term is decomposed into two elements: an idiosyncratic component and the inefficiency/efficiency term (Coelli et al. 2005). The latter can be either assumed to be varying over time or time invariant. Given the short time span covered by our sample we adopted a time-invariant specification.

Before running estimates we cleaned the data set of outliers. This resulted in dropping 4,6% of the original data and reduced the number of observations 411 for 148 institutes over 2003-2005. All variables are converted into index number as in Panci (1999).

We started with a translog specification of a short-term cost function (i.e. a function where capital is assumed to be fixed), regressing total costs against inmate population, average gross salary of police staff and a number of control variables covering both output quality (overcrowding, participation to education/training programs, health status of inmates, sex and nationality of

¹³ Furnishings expenses, barracks equipment and office expenses.

¹⁴ An attempt to estimate a production function failed due to high collinearity among regressors.

inmates, remand vs. non-remand prisoners, turn-over, etc.) and input quality (age and conditions of penitentiary facilities, type of facilities, etc.).

Compared to previous studies we did not have information on the type of crime inmates had been sentenced for. Moreover, we decided not to include any dummy controlling for the regional location of facilities because there is not any *ex ante* theoretical reason to assume that institutes placed in one region have to cost more than those in other regions.

This specification provided us with two strong results:

- (a) Except the index of overcrowding, control variables are not statistically significant or have opposite sign compared to the expected;
- (b) None of the quadratic terms is significant.

The first result does not sit well with evidence in Panci (1999). Moreover one would indeed expect such factors as the health status of inmates and their participation into education/training programs to affect overall costs.

However, it should be noted that Panci (1999) did not include among regressors the index of overcrowding and police average gross salary, which may have impacted on results concerning other variables. Overcrowding is found to be a significant explanatory variable also by Trumbull and Witte (1981a) and is discussed as a crucial determinant of costs and quality also by Ganley and Cubbin (1992). The inclusion of police staff gross salary is a novelty of this paper.

Once we drop all non significant explanatory variables we get the following, simpler, specification:

$$(4) \quad \ln \frac{tc_{it}}{\sum_i \sum_t tc_{it}} = \beta_0 + \beta_1 \ln \frac{ti_{it}}{\sum_i \sum_t ti_{it}} + \beta_2 \ln \frac{aw_{it}}{\sum_i \sum_t aw_{it}} + \beta_3 \ln \frac{oc_{it}}{\sum_i \sum_t oc_{it}} + v_{it} + u_i$$

where $i = 1, \dots, 156$ and the covariates represent:

- tc = total costs paid for each prisoner given by wages and other expenses;
- ti = total number of inmates at the end of the year;
- aw = average wage of police staff;
- oc = overcrowding index (inmates present at year end over CNA);
- v = iid disturbance term with a symmetric distribution;
- u = iid time-invariant truncated non-negative disturbance term (the inefficiency term).

We find that the coefficients of all three explanatory variables are significant (at the 1% confidence level) and have the expected sign (tab. 3):

- (a) both the number of inmates and average police salary are positively correlated with total costs;

(b) the overcrowding index, instead, is negatively correlated to average costs.

In OLS regression not reported here, the three variables explain 86% of cost variance across prisons.

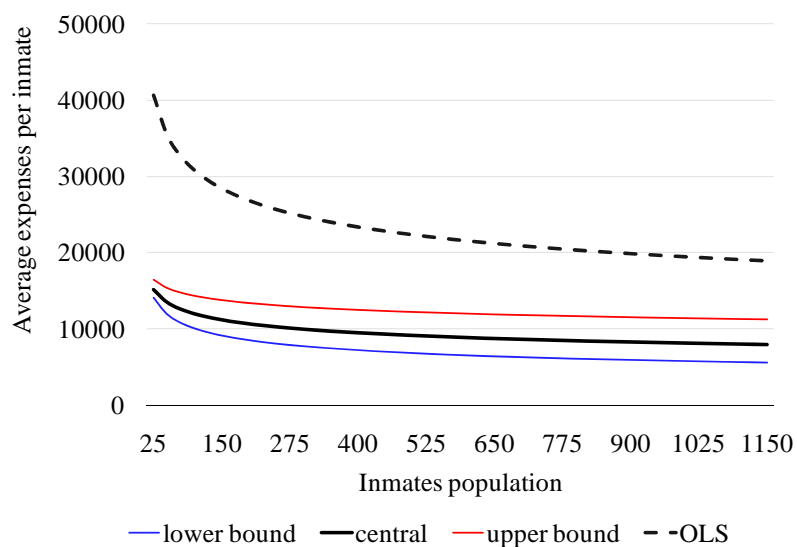
The sample average technical inefficiency is equal to 2,5. Taken at face value this means that, on average, Italian prisons spend more than twice what would be efficient (this measure would rise to 5,7 if we did not control for overcrowding). We prefer not to take this estimate as a precise quantification of technical inefficiency, rather as a qualitative indication of widespread margins for improvement. Given the specification of the cost function, inefficiency means excess staff and unbalanced composition of the work force.

Table 3. Estimation results

ln ti [^]	0.83***	(29.31)
ln aw [^]	1.02***	(18.64)
ln oc [^]	-0.78***	(-24.94)
constant	-0.87***	(-6.28)
Average inefficiency	2.5	
Observations	411	
Number of Groups	148	
Log Likelihood	394.28	
sigma u	0.25	
sigma v	0.04	
Chisq	1262.26	
x [^] = x/average(x)		
z statistics in parentheses *** p<0.001, ** p<0.01, * p<0.05		

Given the absence of quadratic terms costs are found to be continuously decreasing in the number of inmates over the range covered by our sample (from 25 to 1150 inmates; fig. 7). Since 80% of Italian penitentiaries have a CNA lower than 300, this suggests that there are significant economies of scale to be exploited. Economies of scale in the “prison industry” were also found by Trumbull and Witte (1981a) and Panci (1999).

Figure 7 Frontier and OLS estimation



As we saw in sections 3 and 4 the ratio of police to inmates, as well as the average salary, tends to be higher in southern penitentiaries. Moreover, the average size of prisons located in the South is smaller than average. Therefore both diseconomies of scale and technical inefficiency can be expected to be higher in the south. Indeed technical inefficiency as estimated above is higher in the South than in other regions though the difference may not be statistically significant (tab. 4).

Table 4. Average inefficiency by macro-area

Macro area	Average inefficiency
North-West	2.45
North-East	2.40
Centre	2.46
South and Islands	2.58

Concluding Remarks

This paper applies standard efficiency analysis to the Italian penitentiary system. Specifically, a short-term cost function for a panel of Italian prisons over the years 2003-2005 is estimated. The results suggest that substantial gains in technical efficiency are attainable in the management of most Italian prisons: average inefficiency stands at 2,5, that means that, given their output, on average prisons spend 2,5 times more than would be necessary. Given the specification of the cost function, inefficiency means excess staff and unbalanced composition of the work force.

Consistently with other studies (Trumbull and Witte, 1981a), our findings suggest that the industry is characterised by increasing returns to scale. Short-run average costs decrease as inmate

population of individual prison increases. Therefore there is a clear evidence of unexploited economies of scale: most of prisons are undersized w.r.t. the optimal scale with significant cost penalties associated with small prisons.

Both over-staffing and small size are problems more frequent among prisons located in the South, while overcrowding tends to be more severe in the North. In brief, if a long-term program to improve the Italian penitentiary system should include the construction of new large-scale prisons, a short-term feasible goal should be a more efficient allocation of both staff and inmates.

We plan further work to improve the analysis developed in this paper in a number of ways. First the quality of data could be refined. We plan to collect additional information to have a better proxy of output in terms of prisoner-days in the year (rather than the number of inmates detained at a given date). In addition we would like to control for the crimes inmates were sentenced for. Finally, it would be useful to check the robustness of results with respect to the use of a different definition of output that includes also a measure of outcomes in terms of rehabilitation of prisoners (see Drago et al. 2008). Second, we plan to compare the results of the parametric approach with those of an exercise in Data Envelopment Analysis. After these refinements it will be possible to estimate with some confidence the potential expenditure savings from efficiency enhancement.

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