Courts Delays and Crime Deterrence

(An Application to Crimes Against Property in Italy)

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Abstract

Using Italian data in the period 1999-2002, we estimate the impact of trials delay on the willingness to commit crimes against property. However, the endogenous relationship that links the former to the latter could generate serious problems of inconsistency in the estimation procedure. Since geographical distance can be considered an exogenous determinant of the probability of belonging to peripheral courts, which are typically considered less efficient than main ones, it should represent a valid candidate instrument for trials delay. Estimates obtained by means of Two-Stages Least Squares show a significant positive effect of trials duration on crimes, supporting the hypothesis that some criminals are either sensitive to the discounting process of punishment or aware of the probability of prescription, or both. As a side result, we also find a relationship between courts' fragmentation and trials duration. This suggests that an optimal dimension of courts is likely to exist, and that policy makers should take this into consideration in the design of the jurisdictional geography.

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1 Introduction

Theoretical literature assesses that courts delays seriously undermine the deterrence effect of justice (Mühl and Vereeck, 2000; Torre, 2003; Darley and Robinson, 2003). In particular, dilution of the burden of sanctions inflicted on criminals operates as a discounting factor attached to the expected cost of punishments (Listokin, 2005).

This paper focuses on the empirical relationship between the excessive length of criminal[1] judicial procedures and crime rates in Italy. The reason why we concentrate on Italy is that in several areas of this country trials and appeals frequently last longer than prescription terms[2], so that plenty of crimes —especially minor crimes— remain unpunished. These facts imply that the willingness to commit illegal actions is particularly sensitive to trials duration, since the discount factor represented by courts delays becomes negligible when the expected time required to complete a judicial proceeding matches prescription terms[3].

Using panel data from the Italian National Institute of Statistics (ISTAT) at a provincial[4] level, we estimate the impact of trials and appeals delay on the willingness to commit crimes against property, like thefts, robberies, racketeering and frauds.

In the period 1999-2002, our estimates show a significant positive effect of the length of trials on these crimes, possibly validating the hypothesis that certain types of illegal agents are concerned about discounting the burden of punishment they must —or sometimes only should— bear.

The choice of crimes against property is driven by the presumption that a rational cost-benefit analysis is more likely to be carried out by offenders before undertaking their actions with respect to other types of crime. In fact, it is widely assessed that monetary units of measurement for cost-benefit analysis are a commonly accepted reference point for marginal utility units (Farrel and

[1] Despite in Italy the debate has been so far dealing with the inefficiency of civil proceedings (Marchesi 1998, among others), criminal ones normally take longer than in other countries to be completed.

[2] This rule, which is not peculiar to Italy, states that a crime is considered like never been committed if a judgement has not yet been pronounced within a certain period of time.

[3] Moreover, a recent reform introduces the reduction of prescription terms, thus exacerbating an already serious status of the Italian judicial environment.

[4] In Italy, a *province* is an administrative sub-division of a region, which is an administrative sub-division of the state. A province consists of several administrative sub-divisions called *comune*. The country was divided into 20 regions and 103 provinces at the time we collected our data. As of 2006, there are 110 provinces.

Roman, 2002).

In the case of crimes against property, benefits can be easily converted into consistent monetary units of analysis and compared to the cost of a fine or of time spent in jail. Conversely, for other types of crimes —e. g. murders— it is plausible that more irrational factors, like jealousy or madness, affect criminals' willingness to commit that specific action. Here, benefits should be represented by the satisfaction obtained by killing someone other, which is almost impossible to evaluate[5].

The traditional literature on crime and punishment (Becker, 1968) states that the rational willingness to commit a crime is inversely linked to some institutional and judicial variables, such as the probability of detection, the probability of conviction, and the punishment inflicted by the court. Following Marselli and Vannini (1996), we compute these measures together with trials and appeals duration and use them to predict crime rates.

However, estimating crime rates through judicial variables presumes their perfect knowledge from the criminal's standpoint. This might sound quite weird for ordinary people carrying out their existence "legally". However, there is a possible explanation for this to occur to actual and potential criminals.

In fact, it is widely known that people growing in highly illegal-prone areas are more likely to become criminals as well (Krohn, 1986). Thus, crime is somehow clustered for reasons due to bad living conditions, unemployment, insufficient education, and lack of infrastructures (Chiricos, 1987; Power and Wilson, 2000; Raphael and Winter-Ebmer, 2001, to mention just a few). But information can be clustered as well. Basically, people surrounded by criminal activities are put in the condition to make inference on how and when the law prosecutes their neighbors. They are frequently involved in talking concerning the sorts of a substantial number of individuals who have committed crimes, while individuals living outside the cluster cannot access this information. Therefore, crime propensity and information acquisition may be endogenously generated.

Moreover, the presence of *unmeasurable* components that affect both judicial variables and crime rates may also account for another form of endogeneity

[5] In addiction, there is a vast literature that assess the incapability of the maximum penalty of reducing murders. In fact, an inverse correlation has been documented: when states abolish death penalty a corresponding drop in capital crimes is reported (Pfohl, chapter 3, 1994, among others). This indirectly state that the cost-benefit analysis plays no role in determining the choice of committing murders.

which is extremely relevant for our estimation purposes. The "ability" of judges and a general attitude towards the compliance with rules are an example of simultaneous determination of crimes and trials and appeals duration. Reverse causality between dependent and independent variables is then a by-product of endogeneity. In fact, on the one hand, it may be that trials duration affects crime rates due to underdeterrence. On the other hand, it is also possible that a higher number of proceedings induces courts' delay.

Due to these issues, facing our objective by means of standard Least Squared estimation techniques would provide spurious results. In order to solve this problem, we use an instrumental variable approach, choosing instruments that are correlated to trials and appeals delay but not to unmeasurable factors determining crime rates.

Basing on the conventional wisdom that peripheral courts are less efficient than main ones (Senate of the Italian Republic, 2002) at a first glance a variable —typically a dummy— that tells whether a court is peripheral seems a candidate instrument for trials and appeals delay. However, peripheral courts are created with the aim of reducing main courts' workload and are often placed right where judicial proceedings last longer than elsewhere. This implies some degree of endogeneity for this kind of instrument. Hence, we use exogenous proxies for the probability that peripheral courts are set along with main ones in some areas of the country.

These exogenous variables are represented by measures of distance between minor towns and the main city of a certain geographical district. In fact, distance from the main courts is one of the most frequent reasons why new peripheral ones are created. Distance determines —and is not determined by— the probability of belonging to a peripheral district and should not be correlated with unmeasurable components, like the ability of judges and compliance with rules.

The remainder of this paper is organized as follows. In the next section we illustrate criminality rates in Italy, in Section 3 we analyze the state of justice and the problems associated to courts delay, and in Section 4 we describe the dataset in detail. In Section 5 and 6 we concentrate on the estimation procedures followed in the econometric analysis and discuss possible causes of endogeneity and available instruments. Finally, section 7 exposes the results, and Section 8

concludes.

2 Criminal Issues in Italy

Measuring crime rates has long been a puzzling issue (O'Brien et al., 1980), since often injured do not formally report facts to judicial authorities, and even sometimes report facts that never occurred or do not properly correspond to crimes. This is particularly true for crimes against property[6].

However, all through our analysis we assume that these two events compensate (Dalla Pellegrina et al., 2005) and that the number of crimes reported to the corresponding authority reflects on average a correct ranking of crime rates in Italian provinces.

Crimes against property represent a share of 73.4[7] per cent on the overall number of injuries. Italian data are almost in line with those of other developed countries, such as US and Canada (Marselli and Vannini, 1999).

However, looking at international statistics, it is not difficult to realize that in this country the situation has deeply deteriorated in relatively recent times, starting from the late Eighties.

In particular, in the decade 1990-2000, despite the growth rate of the population has been 0.17 per cent, crimes against property increased at a rate of 19.39 per cent[8].

These data justify some sort of social warning perceived by the population, which is also reported by media and surveys (Multiscope Analysis on Italian Households[9]).

[6] Think about rarely denounced cellular phones thefts. Or again, often people are not sure wether someone stole their wallet or they simply lost it. They go to the police, but they may report incorrect events.

[7] Percentages refer to the period of time considered in the empirical analysis (1999-2002). See next section for further details.

[8] Data are provided by the Italian Ministry of Justice and ISTAT.

[9] This is a survey carried out by the Italian National Institute of Statistics in the period 1987-1991 on a sample of about 24,000 households.

3 Trials and Appeals Delay

Pending proceedings have risen to almost 9 millions in the last few years in Italy, two thirds of them belonging to the criminal sector, while the remaining are civil ones. Considering that this country has a population of about 57 millions inhabitants, these figures are simply astonishing.

Trials and appeals delay and the large stock of pending proceedings are one of the major problems associated to the inefficiency of justice. If one thinks about criminal proceeding that evolve through some preliminary investigation, a preliminary hearing, then a first and —in some cases— a second instance, their computed average length is more than 4.5 years (Attorney General, Supreme Court, 2005).

According to the ISTAT, the length of criminal proceedings has now more than doubled as compared to the length registered in the Seventies, showing a deep critical situation around the mid Eighties.

The fact that crime rates boosted right after the sharp increase of trials duration leaves much to consider about the causal relationship going from the latter to the former.

As we already mentioned, it might be that a very long trial postpones the timing of punishment and this could be an important factor inducing people to take on more criminal actions.

Furthermore, when judicial proceedings reach abnormal delays, the probability of exploiting prescription principles in order to avoid punishment becomes considerably high, thus increasing the willingness to commit crimes. Such behavior may eventually exacerbate the alarming situation of the judicial apparatus. Under these circumstances, trials and appeals duration ends up to be endogenously determined.

A recent Italian reform nourishes the vicious circle described above. Basically it consists in the reduction of prescription terms associated to some types of crimes, including those against property. Perhaps with the aim of cutting the burden of proceedings pending on courts and speeding up a huge stock of judicial proceedings, the legislator did not sufficiently take into consideration that in some circumstances these provisions might end up with a *boomerang* effect, meaning a substantial dissolution of the deterrence purpose of justice and a higher incentive to commit crimes.

For example, crimes that are punished with jail until five or six years[10] —such as thefts, corruption, and usury— were before associated to a prescription of 15 years, while according to the law mentioned above they prescribe in 7.5 years, a phenomenon that is expected to dramatically rise the number of unpunished crimes.

It is worth to observe that in 1999 about 113,000 crimes fell into prescription in Italy, then jumping to 151,000 in 2002, and it is not difficult to guess that they will definitely boost as a consequence of the reduction of terms (Attorney General, Supreme Court, 2005).

Moreover, the disastrous situation of jails in this country leaves no room to further push on repression devices, but rather suggests devoting much effort toward various instruments of prevention and deterrence in order to cope with the problem of micro-criminality .

Finally, an inefficient justice contributes to decrease trustworthiness toward the legal apparatus. More efficient courts would instead encourage a stronger respect for judicial sentences, perhaps also inducing a lower number of people lodging an appeal and reduce the overall delays. This phenomenon would release new resources which might be eventually diverted toward those divisions where they are mostly required.

4 Data

Data have been collected yearly for the period 1999-2002 on all (103) Italian provinces for a total of 412 observations.

In the period considered in our analysis, the average number of crimes[11] every 1,000 inhabitants is 50.69, where 37.21 (73.4 per cent) are crimes against property (Table 1). Among this category, 28.11 are thefts, 0.93 are robberies, 3.31 and 0.13 are respectively frauds and racketeering (4.73 are damages to things and animals, which are not accounted for by our analysis).

Figures A1-A4 in the Appendix —representing crimes against property every 1,000 inhabitants across the provinces of Italy in 1999-2002— show another

[10] Prescription is correlated with the maximum punishment settled by the law for any type of crime.

[11] These are crimes for which the Judicial Authority has started a legal action.

peculiar feature related to their impact on different areas of the country. In fact, thefts and robberies spread throughout the Northern provinces following a track that goes from the North-West to the Mid-East (Figures A1 and A2), while racketeering and frauds are more specific to the Southern provinces (Figures A3 and A4).

Moreover, it seems that thefts and frauds are a typical phenomenon of larger, richer and highly populated towns. Therefore, priors —frequent in Italy— concerning the exclusive presence of crime in the Southern regions need to be taken cautiously and even partially ruled out (see Marselli and Vannini, 1999).

Crimes in Italy are instead jeopardized. It seems that within the same region there are virtuous provinces and others very badly performing, a fact that necessarily requires crime data that are disaggregated at a provincial level in order to carry out a sound econometric analysis.

[Insert Table 1 about here]

We measure the inefficiency of courts with the length[12] of trials and appeals. Preliminary investigation is included in trials duration. In Table 2 are reported the length of both stages of the judicial proceeding.

Data show that trials last on average 2.96 years. If we add the average length of the appeal (1.73 years) the cumulative length reaches 4.69 years.

Furthermore, it emerges that the probability of lodging an appeal, computed as the ratio of proceedings accruing to the Court of Appeals to total trials, is quite high (27 per cent).

Table A2 reports descriptive statistics on the length of trials and appeals in different areas of the country. As expected, there is evidence for an inefficient situation of many first instance Southern courts. Conversely high appeals delay concerns courts located in the Northern and Central part of the country.

[Insert Table 2 about here]

As we discussed above, if criminals are sufficiently informed, trial delays should stimulate in particular those crimes that involve a rational cost-benefit

[12] For the computation of trials duration see Marselli and Vannini, 1999, Chapter 7.

analysis before being carried out. However, even if such an analysis is supposed to be conducted, it is also possible that other standard factors (à la Becker), like the probability of detection and conviction, and the burden of punishment, are going to affect this rational calculus.

Following Marselli and Vannini (1996), for each type of crime considered in the econometric analysis, we use the ratio of crimes with unknown author over the overall number of crimes to measure the probability of avoiding detection. Hence, the probability of detection for crime x, where x can be either theft, robbery, racketeering or fraud, is computed as follows:

$$\text{Probability of detection}_x = 1 - \frac{\text{number of crimes}_x \text{ with unknown author}}{\text{total number of crimes}_x} \quad (1)$$

Table 3 reports that the highest probability of detection occurs for racketeering (55 per cent), followed by frauds (36 per cent), robberies (11 per cent), and thefts (6 per cent).

We also use the number of guilty sentences pronounced over the total number of crimes by known authors in order to take account of the probability of conviction:

$$\text{Probability of conviction}_x = \frac{\text{number of guilty sentences on crime}_x}{\text{number of crimes}_x \text{ with known author}} \quad (2)$$

The highest probability of conviction (see again Table 3) is for robberies (79 per cent), followed by thefts (76 per cent), racketeering (49 per cent) and frauds (8 per cent).

Moreover, we assume that the average time spent in jail represents the punishment inflicted to guilty fellows:

$$\text{Punishment}_x = \text{average months of jail for crime}_x \quad (3)$$

The dimension of punishments seems to reflect crime seriousness. In fact, more violent ones are associated with a higher number of months of jail, while crimes that involve a pure damage on property are more softly punished. According to our data the highest punishment is inflicted for robberies (24.8

months) and racketeering (24.9, but with a higher standard deviation as compared to robberies), followed by frauds (6.6 months) and thefts (4.9 months).

The probability of inflicting fines is also included as a regressor. The highest probability of paying fines occurs for racketeering (31 per cent), followed by thefts (8 per cent), frauds (0.6 per cent), and robberies (0.6 per cent).

[Insert Table 3 about here]

As we mentioned above, economic and social features, like unemployment and income should be risk factors that more likely induce individuals to commit crimes.

Unemployment rate, which dramatically increases going from the Northern to the Southern regions of the country[13], is considered one of the main factors pushing people, and especially young individuals, toward apparently attractive illegal activities.

Per-capita income (typically higher in Northern provinces) should also be positively correlated with some crimes, and the reason might be that criminals select their operational places also according to the amount of resources that they can appropriate[14]. Furthermore, per-capita income and unemployment might help explaining the impact of the economic cycle on crime. We also add square terms in order to capture possible nonlinearities in these variables.

However, other features might as well explain the incentive to commit crimes against property, like the low availability of credit. In fact, borrowing could help individuals starting some economic activity instead of raising money illegally. Data on the amount of bank loans and subsidized credit are provided by the Bank of Italy.

Lack of education, measured by high school dropout rates, may also be positively correlated with crime rates. Moreover, we include the presence of the public sector using the index of infrastructures computed by ISTAT[15].

[13] On average in the period 1999-2002 the unemployment rate is less than 4.6 in the North-West, 4.0 per cent in the North-East, 7.1 in the Center, and 18.4 per cent in the South (data are provided by ISTAT).

[14] It is even possible that a higher income also implies its greater concentration. In this case, inequalities increase the incentive for illegal appropriation (Fajnzylber et al., 2002).

[15] see www.istat.it for details on computation of this index. This variable is available only at a regional level .

Finally, we account for population density in each province[16].

All descriptive statistics concerning the variables used in the empirical analysis are reported in the Appendix.

5 Estimation

We estimate the following equation:

$$y_{it} = \alpha_0 + \alpha_i + x'_{EX\ it}\beta_{it} + x'_{EN\ it}\gamma_{it} + \varepsilon_{it} \tag{4}$$

where y_{it} represents the number of crimes every 1,000 inhabitants in every province i at time t; $x'_{EX\ it}$ is a vector of exogenous explanatory variables described in the previous section; $x'_{EN\ it}$ is a vector of endogenous explanatory variables (identified as the length of trials and appeals); α_i is a provincial specific effect; and α_0 represents a constant term. The last component is an idiosyncratic shock, $\varepsilon_{it} \sim IID(0, \sigma^2_\varepsilon)$.

We try both fixed and random effects specifications. As it is standard in the panel data literature (Cameron and Trivedi, 1998), the first technique allows the specific individual effects α_i to be correlated with other regressors, while the second technique assumes that the α_i are randomly distributed with zero mean and constant variance, $\alpha_i \sim IID(0, \sigma^2_\alpha)$, and independent from the regressors[17].

However, due to the endogenous nature of $x'_{EN\ it}$, the parameters included in β_{it} would not be consistent if estimated via OLS. Hence, we run a previous auxiliary step where $x'_{EN\ it}$ is regressed on all other factors plus the vector of exogenous instruments x'_{it} (see next session for details on the variables included in this vector). Therefore, our instrumental variables specification becomes:

[16] Immigration could also be significant in explaining crime propensity. However, it is documented (Ministry of the Interior) that the most part of crimes committed by immigrants concerns illegal ones. Obviously, data on illegal immigrants are not available. Moreover, immigrants are often located in larger towns and highly populated areas. Hence, our measure of population density should be able to capture the effect of immigration.

[17] Hausman tests compare fixed and random effects specifications. Statistics are reported at the bottom of each table in section 7. Since all tests reject the hypothesis of the absence of correlation between provincial specific effects and the error term, we only report estimates obtained with a fixed-effects model.

$$x_{EN\ it} = \delta_0 + \delta_i + x'_{EX\ it}\lambda_{it} + z'_{it}\mu_{it} + \nu_{it} \tag{5}$$

$$y_{it} = \alpha_0 + \alpha_i + x'_{EX\ it}\beta_{it} + \widehat{x}'_{EN\ it}\gamma_{it} + \varepsilon_{it} \tag{6}$$

where $\widehat{x}'_{EN\ it} = E(x'_{EN\ it}|x'_{EX\ it}, z'_{it})$.

Since $x_{EN\ it}$ can be either trials or appeals duration, the equations in the system (5-6) are actually three for each type of crime. Hence, we try two alternative estimation techniques. The first (*Model 1*) separately estimates all equations in each crime' system, while the second (*Model 2*) jointly estimates trials and appeals duration.

6 Causes of Endogeneity and Available Instruments

An immediate signal of the endogenous nature the main explanatory variables in our model is easily identifiable through possible reverse causality between judicial delays and crime rates. As we already mentioned, our goal is to check whether trial delays have some role in increasing the willingness to commit crimes.

However, problems arise form the fact that a high number of crimes may contemporaneously boost the stock of trials and appeals accruing to courts and reduce the speed of justice. More specifically, endogeneity arises due to the presence of *non-measurable* factors affecting both the dependent and some independent variables[18].

One of such factors is likely to be the variance of punishments. It is possible that, for the same crime, we observe more precise punishments in some courts and more volatile ones in others. However, although expected punishments are measurable —by years of jail or fines for each specific crime— their variance is not.

[18] This is like saying that one is not estimating a reduced form of a crime equation, but she is trying to estimate a structural one. This induces a violation of OLS basic hypothesis of estimation, i.e. the absence of correlation between independent variables and the error term in the estimated equation. See Cameron and Trivedi (1998) for further details.

On the one hand, the perception of a high variance of punishments might affect the willingness of committing crimes depending on people's attitude towards risk (Lee and McCrary, 2005). In particular, if criminals are risk loving (Becker, 1968), they will prefer highly volatile punishments.

On the other hand, the variance of punishments can be part of what can be loosely defined as the "ability" of judges. This may affect courts delays, since it is possible that good judges are also faster in releasing verdicts. Thus, if the variance of punishments is correlated to both crime propensity and the length of judicial proceedings, the latter becomes endogenous (Vietti 2005).

Moreover, as Buscaglia and Dakolias (1996) observe, a higher variation in times required by judges on similar cases tends to go hand in hand with corruption. In fact, courts delays together with a lack of enforceable standards applied to times to disposition to judges, induces the latter and court staff to charge "higher prices" either to speed up the proceeding, or to slow it down (in case one requires some additional time to fall under prescription). Hence, the variance of trials and appeals duration could also capture some degree of corruption, which is clearly correlated to crime.

Another factor affecting both trial delays and crime rates can be a general attitude toward compliance with rules. For example, citizens living in some areas of the country might be more likely to comply with the law and commit a reduced number of crimes. At the same time, if they get involved in a lawsuit it is also more likely that they accept the verdict and do not appeal. This attitude provides a lower amount of second instance proceedings and perhaps consequent few delays.

In order to provide instruments that are not correlated to the error term in equation (5) —but help predicting the expected value of courts delays— we rely on the conventional wisdom that peripheral courts are less efficient than main ones. This argument bases on the fact that these courts are too small to achieve sufficient scale economies as main ones (Marchesi, 2003). Moreover, they may also suffer from the scarce presence of best judges and courts' staff who may be more willing to operate in larger courts.

We define a peripheral first instance court a court that is not located in the main town of a provincial district. By the same token, we define a peripheral

Court of Appeals a court that is not located in the main city of the region[19].

However, a dummy variable that measures whether a court is a main or a peripheral one cannot be used in order to instrument trials and appeals delay. The reason relies again on endogeneity, since the fact of placing new courts in some areas of the country might be driven by high delays in those districts (Senate of the Italian Republic, 2004).

Hence, we use the distance between the main town of each province and the main Court of Appeals of the region in order to capture the probability that the province belongs to a peripheral judicial district. We also use the dimension of each provincial district in order to account for the probability that peripheral first instance courts are located in that district.

In fact, one of the reasons why minor courts have been set in certain areas of the country is to reduce discomfort for people and lawyers living far from the main ones (Senate of the Italian Republic, 2002). Moreover, distance and province areas are exogenous measures with respect to crime rates. Hence, they should represent appropriate instruments for, respectively, appeals and trials duration [20].

The area of each provincial district is indeed positively correlated (34.01 per cent) to the number of first instance courts placed in that district. Similarly, the distance of each province from the main town of the region is positively correlated (54.25 per cent) to the fact of belonging to a peripheral Court of Appeals.

Finally, it would be useful to adopt the rate of proceedings accruing to the Courts of Appeals to instrument appeals delay[21]. The idea is that when the rate of appeal is large, second instance courts slow down their job due to the

[19] First Instance Courts are located in the main town of the province, while Courts of Appeals are located in the main town of the region (only the region of Valle d'Aosta, which belongs to the Court of Appeal of Torino, is an exception). However, in Italy there are 10 additional sub-regional courts of Appeals (three of them are detached sections of other courts) and 62 additional sub-provincial First Instance Courts which are settled out of the main towns.

[20] Judges remuneration and thir career concerns could also represent valid instruments for trials delay (Schneider, 2005). However, these information is not available for all Italian judicial districts, particularly at a first instance level.

[21] This could be endogenous for first instance delays. In fact, even if a first instance sentence can interrupt prescription, the overall length of a proceeding (from the day the crime has been committed until the final sentence) cannot exceed the term indicated by the law for each crime plus a pre-determined share of this term (generally a half). Thus, if a first instance trial lasts long, it is possible that it induces a higher incentive to try and bet on prescription in the Appeal in order to exhaust the overall time available for judges to pronounce the final verdict.

high number of proceedings at hand. However, the rate of appeal could again be correlated to unmeasurable determinants of crime, such as the ability of judges and general compliance with Courts of Appeals' sentences. Hence, our exogenous measure of the presence of peripheral (perceived as more inefficient) first intance courts might help explaining second instance delays through an increasing rate of appeal[22]. Hence it seems plausible to use use the complete vector of our instruments in each duration regression to capture possible cross-effects.

7 Results

Estimation results are presented in Tables 4-8[23]. The second and third column of each table report estimates obtained via Model 1 (all equations are separately estimated) and Model 2 (trials and appeals duration equations are jointly estimated) respectively[24].

Predictions concerning the positive impact of trial duration on crime rates seem to hold, at least as far as first instance is concerned. In fact, first instance delays are always positive and significant in explaining the number of crimes against property in the Italian framework.

Parameters associated to first instance delays in the equation for thefts (Table 5) and robberies (Table 6) are 5.25 and 0.22 respectively[25] with 1 per cent level of confidence. Estimates suggest that a one-year additional delay implies 5.24 more thefts every 100,000 inhabitants, which means 18 per cent increase in thefts and 23 per cent increase in robberies[26].

[22] The idea is that, when trials register abnormal delays, punishment could be less precise. Many factors can drive this outcome. For example, judges misrecall past information (Sherrod, 1985), they get retired and other (less informed) take their place, documents might be lost, etc. In this case of either victims or offenders may end up to be unsatisfied with sentences. This may induce a higher probability of appealing.

[23] Each table reports outputs for the Hausman test performed comparing fixed and random effects estimation techniques. Hausman always rejects the null hypothesis of no correlation between fixed effects and the error at 1 and 5 per cent level of confidence.

[24] We also tried different specifications. In particular, we excluded observations relative to two autonomous provinces (Bolzano and Aosta) that have different ethnic origins. However, results remain almost unchanged in terms of parameters magnitude and standard errors.

[25] These are averages computed from Models 1 and 2.

[26] This represents the computed ratio between average estimated parameters and per capita thefts in the period 1999-2002.

First instance delays positively affect frauds (Table 7) and racketeering (Table 8) as well, although with a lower level of significance (10 and 5 per cent respectively). Increasing delay by one year implies 11 per cent increase in the former type of crime and 19 per cent increase in the latter.

Conversely, the duration of appeals seems not to play any role in determining crime rates. The reason might be that people involved in micro-crimes do not often reach the appeal judgement stage. Or it is even possible that those for crimes against property are, in most cases, such small punishments —as compared to the expenditure required to access an appeal— that convicted prefer to accept sentences and abstain from going further. It might also be the case that, due to prescription rules, criminals are not concerned about the appeal duration because first instance delays are enough to prescribe their actions.

The probability of detection is instead a very important component for the determination of the willingness to commit thefts and robberies, but it is not meaningful as far as racketeering and frauds are concerned. This path suggests that criminals are more aware of a marginal increase in the probability of being caught when this is lower.

This phenomenon should be quite intuitive. In fact, thinking in terms of marginal costs and benefits of committing illegal actions, a marginal increase in the probability of detection when this is low (see Table 3) has a stronger impact on the willingness to commit a crime than the same marginal increase occurring in case of a high probability of detection.

Probability of conviction is acts a deterrent for every type of crime, except for robberies. The sign of the relationship between this crime and the probability of conviction is negative anyway (Table 6) and standard errors as well are not disproportionately high.

An interesting feature is that punishment, represented by the number of months of jail, seems not to affect the willingness to commit crimes. In fact, this variable is not significant in almost all cases. An exception is represented by racketeering, where the parameter is positive[27].

[27] However, this result might be partially driven by endogeneity. In fact, when a certain crime is very widespread in some area, judges tend to be relatively more severe with those committing it. This evidence emerges from our data. For example, racketing, which is a typical crime occurring in the Southern regions is punished with 29 months of jail in the South, while months are 22 in the North. However, due to the paucity of available instruments we could not treat punishment as endogenous in our estimates.

The probability of inflicting fines is never significant in determining the willingness to commit crimes. This suggests that fines are perhaps not an effective instrument of deterrence, possibly in view of the fact that micro-crimes are generally committed by relatively poor individuals with scarce options in terms of income flows and employment possibilities and that consequently cannot be expropriated. However, when criminals are likely to be richer, as in the case of frauds, the mechanism of application of fines is close to be effective[28].

Social and economic variables also provide interesting insights. The unemployment rate, conditional on other controls, has a positive impact only on the incentive to commit thefts, suggesting that this crime tends to spread over poor settlements where the labor market does not grant the opportunity of a continuous income flow.

Net per-capita income of each province shows the other side of the story, that is an augmenting presence of crimes against property where people can assure higher rents to illegality. This relationship holds in the case of all crimes but racketeering. Frauds are instead the most sensitive to higher incomes[29].

Bank deposits, which may represent a stock measure of wealth, show the same path of income, at least as far as thefts and robberies are concerned. An interesting evidence is instead the strong reduction of robberies and, to a lesser extent thefts, where facilitated credit is more available. This has clear implications in terms of the effectiveness of promoting policies that reduce interest rates spreads between Northern and Southern regions of the country[30].

Estimates for the index of infrastructures are —although weakly— significant and negative in explaining thefts and robberies, indicating that the presence of the public sector can actually play a role in reducing the rate of criminality. However, the impact of this variable on crime rates should be taken cautiously due to possible endogeneity. In fact, on the one hand, the level of infrastructures may induce higher welfare and consequent lower criminality. On the other hand, there may be some unexplained factor (corruption, for example) that is correlated to both infrastructures and crimes, and which gives biased estimates

[28] As opposite to what occurs for other types of crimes, the standard errors associated to fines in Table 7 are quite below the estimated parameters.

[29] Moreover, income is also a good proxy of the rate of illegal immigration. However, data are available for legal immigrants only and are highly correlated with income. For reasons of collinearity with this variable immigration has not been included among the regressors.

[30] Interest rates differentials of 3 percentage points were not difficult to observe during the period of our analysis.

for the impact of the former on the latter.

Almost all types of crimes are not sensitive to population density. We expected that people living in major towns and highly populated areas were those subject to the highest risk of being involved as victims of crimes. However, our estimates suggest that income —and not population density, which is positively correlated to income— captures all the significance in the explanation of crime rates. High school dropout rates are instead nowhere significant.

In Table 4 we report estimates of the first stage Least Squares[31]. Here something interesting emerges from the role of instrumental variables in determining trials and appeals duration.

In the upper part of the table, we observe that our exogenous proxy of the presence of peripheral first instance courts increases trials duration and has no significant effect on appeals. This result is in line with the statement that smaller peripheral courts cannot achieve sufficient scale economies and/or benefit less from knowledge spillovers that are instead frequent in larger courts.

Conversely (see the lower part of the table), our proxy of the presence of peripheral Courts of Appeals reduces appeals duration[32]. Here, the positive effects deriving from increasing the number of second instance courts[33] —and consequently reducing their dimension— suggests that larger courts may also suffer dimensional problems. These, for example, can be due to scarce monitoring on staff's work and an excess of organizational tasks that drive judges far from their jurisdictional activity (Senate of the Italian Republic, 2002).

Furthermore (see again the lower part of Table 4) our exogenous measure of the presence of peripheral first intance courts induces higer second instance delays. As we discussed above, this phenomenon seem to operate through an increasing rate of appeal which originates from a general unsatisfaction produced by excessive trials delays.

Finally, combining the results mentioned above we can conclude that there

[31] Sargan statistics have been computed to jointly test the hypothesis of correct model specification and validity of instruments. Results support our choice of exogenous measures of distance and area in order to avoid possibly inconsistent estimates.

[32] This is not incompatible with the fact that peripheral courts of Appeal are less efficient than main ones in a given region. What is likely to occur is that peripheral Courts of Appeal tend to reduce total workload for main courts, with the final result of lowering average trial duration in those regions where they are set up.

[33] This is also suggested by Buscaglia and Ulen (1997) in the case of Latin American countries.

are pros and cons in increasing the number of courts and reducing their dimension. In other words, there should be an optimal court dimension that balances these effects. At the moment, as far as first instance courts are concerned, cons overcome pros, while the opposite occurs in the appeal.

[Insert Tables $4-8$ about here]

8 Conclusions

In this paper we empirically estimated the impact of trials and appeals duration on some types of crimes which cause damages to property, like thefts, robberies, racketeering and frauds. Those on property are the most part of crimes committed and typically are subject to lower punishment relatively to more violent crimes.

As compared to other countries, Italy is going towards a situation where those who are considered "minor crimes" are going to disproportionately increase due to the presence of a vicious circle between judicial delays and incentives to commit crimes.

Furthermore, the legislative process currently taking place in this country (i.e. the reduction of prescription terms, which are proportional to the severity of punishment), implies that the willingness to commit crimes is particularly sensitive to trial duration, since the discount factor attached to punishment becomes negligible when the expected time required to complete a judicial proceeding is higher than prescription terms.

Being concerned with the possible endogenous nature of trials and appeals delay, we implemented estimates where instrumental variables help disentangling reverse causality problems. In particular, we use exogenous measures of distance in order to capture the probability that some districts fall under the jurisdiction of peripheral courts, which are often considered less efficient than main ones.

In the period 1999-2002, estimates of the impact of the average length of trials in Italy show a significant positive effect on crimes against property, possibly validating the hypothesis that some —rational— criminals are either sensitive

to the discounting process of the burden of punishment or aware of the high probability of prescription, or both. As opposite, according to our results, punishment *per se* is rarely significant.

As a side-result, we also find that there are negative effects in terms of trials duration from an excessive fragmentation of first instance courts, while the opposite occurs in the appeal. This indicates that there is possibly an optimal dimension of courts, which policy makers should take into consideration while designing the jurisdictional geography of the Country.

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Appendix

[Insert Figures $A1 - A4$ about here]

[Insert Tables $A1 - A2$ about here]

TABLES

Table 1
Crimes Against Property every 1,000 inhabitants
Italy (1999-2002)

	Mean	% total crimes	Std.Dev.	Min	Max
Total Crimes/1,000 inhab.	50.69	100			
Crimes Against Property:	37.21	73.4			
Thefts	28.11	55.5	11.90	1.41	74.81
Robberies	0.93	1.8	0.55	0.07	5.39
Frauds	3.31	6.5	1.29	0.79	12.77
Racketeering	0.13	0.3	0.11	0.01	0.91
(Others)	(4.73)	(9.3)			

Source: Italian National Institute of Statistics (ISTAT)

Table 2
Length of Trials and Rate of Proceedings Accruing to the Court of Appeal, Italy (1999-2002)

Variable	Mean	Std.Dev.	Min	Max
First Instance +Preliminary Inv.	2.96	1.07	0.92	7.10
Court of Appeal	1.73	0.88	0.53	3.74
Rate of Appeal[†]	27%	11%	11%	75%

[†] Ratio between the number of proceedings accruing to the Court of Appeals and the number of trials extinguished

Source: Italian National Institute of Statistics (ISTAT)

Table 3
Probability of detection, conviction, and punishment
Italy (1999-2002)

	Mean	Std. Dev.	Min	Max
Probability of detection:				
thefts	0.06	0.05	0.01	0.36
robberies	0.27	0.11	0.05	0.71
frauds	0.36	0.15	0.03	0.86
racketeering	0.55	0.18	0.00	0.96
Probability of conviction:				
thefts	0.76	0.41	0.31	4.01
robberies	0.79	0.26	0.28	2.00
frauds	0.08	0.04	0.02	0.32
racketeering	0.49	0.19	0.00	1.52
Months of jail:				
thefts	4.99	0.77	3.18	7.86
robberies	24.75	3.42	16.90	31.37
frauds	6.63	1.07	3.83	11.99
racketeering	24.93	6.17	0.00	45.24
Probability of fines:				
thefts	0.08	0.10	0.00	1.01
robberies	0.00	0.00	0.00	0.02
frauds	0.01	0.01	0.00	0.12
racketeering	0.31	0.65	0.00	3.00

Source: Italian National Institute of Statistics (ISTAT)

Table 4 – Determinants of Trials and Appeals duration (2SLS-First Stage)

Dependent variable: *Trials duration (years)*	Model 1	Model 2
Province area (th. Kmq)	0.316**	0.314**
	(0.144)	(0.124)
Distance from the main town in the region (Km)	-0.006	-0.006
	(0.010)	(0.008)
Observations	412	412
R-squared	0.87	0.93

Dependent variable: *Appeals duration (years)*	Model 1	Model 2
Province area (th. Kmq)	0.542*	0.546*
	(0.289)	(0.291)
Distance from the main town in the region (Km)	-0.003**	-0.003**
	(0.001)	(0.001)
Observations	412	412
R-squared	0.91	0.93

Standard errors in parentheses
significant at 10% level; ** significant at 5% level; *** significant at 1% level
Other regressors: time trends, constant, provincial dummies

Table 5 – Determinants of Thefts (2SLS-Second Stage)

Dependent variable: *Thefts/10,000 inhabitants*	Model 1 †	Model 2 ††
Length of trials (1st instance)	5.054***	5.426***
	(1.580)	(1.683)
Length of trials (Appeal)	-11.736	-14.078
	(11.673)	(12.453)
Probability of detection	-83.630***	-83.754***
	(9.839)	(9.834)
Probability of conviction	-2.580***	-2.562***
	(0.916)	(0.912)
Years of jail	-0.444	-0.439
	(0.775)	(0.774)
Probability of fine	3.023	2.989
	(4.699)	(4.681)
Unemployment	115.355*	122.831**
	(60.525)	(61.666)
Unemployment^2	-3.250*	-3.566*
	(1.827)	(1.896)
Per capita income	3.837**	4.022**
	(1.836)	(1.856)
Per capita income^2	-0.101**	-0.109**
	(0.045)	(0.047)
Facilitated credit	-10.020*	-11.111*
	(5.643)	(5.905)
Per capita bank deposits	-0.694	-0.673
	(0.792)	(0.793)
School dropout rate	-0.502	-0.575
	(0.433)	(0.447)
Degree of infrastructures	-62.307*	-66.126
	(36.469)	(36.994)
Population density	0.012	0.006
	(0.045)	(0.046)
Constant	31.262	36.066
	(29.144)	(30.164)
Observations	412	412
R-squared	0.84	0.84

Standard errors in parentheses
* significant at 10% level; ** significant at 5% level; *** significant at 1% level
† Hausman chi2(14) = 23.75 Sargan chi2 (2)=3.060
†† Hausman chi2(14) = 24.07 Sargan chi2 (2)=3.345
Other regressors: time trends, provincial dummies

Table 6 – Determinants of Robberies (2SLS-Second Stage)

Dependent variable: *Robberies/10,000 inhabitants*	Model 1 †	Model 2 ††
Length of trials (1st instance)	0.206***	0.229***
	(0.043)	(0.045)
Length of trials (Appeal)	0.863	-1.013
	(0.821)	(0.941)
Probability of detection	-0.257**	-0.251**
	(0.116)	(0.116)
Probability of conviction	-0.041	-0.040
	(0.045)	(0.044)
Years of jail	-0.002	-0.002
	(0.004)	(0.004)
Probability of fine	0.119	0.133
	(2.542)	(2.532)
Unemployment	2.023	2.500
	(1.596)	(1.621)
Unemployment^2	-0.110**	-0.130***
	(0.048)	(0.050)
Per capita income	0.104**	0.114*
	(0.046)	(0.046)
Per capita incombe^2	-0.003***	-0.004***
	(0.001)	(0.001)
Facilitated credit	-0.519***	-0.589***
	(0.150)	(0.157)
Per capita bank deposits	0.035*	0.036*
	(0.020)	(0.020)
School dropout rate	-0.042***	-0.046***
	(0.011)	(0.012)
Degree of infrastructures	-1.978*	-2.226**
	(1.046)	(1.054)
Population density	-0.001	-0.001
	(0.001)	(0.001)
Constant	2.102***	2.419***
	(0.784)	(0.808)
Observations	412	412
R-squared	0.95	0.95

Standard errors in parentheses
* significant at 10% level; ** significant at 5% level; *** significant at 1% level
† Hausman chi2(14) = 44.03 Sargan chi2 (2)=1.255
†† Hausman chi2(14) = 44.67 Sargan chi2 (2)=1.459
Other regressors: time trends, provincial dummies

Table 7 – Determinants of Frauds (2SLS-Second Stage)

Dependent variable: *Frauds/10,000 inhabitants*	Model 1 †	Model 2 ††
Length of trials (1st instance)	0.372*	0.366*
	(0.197)	(0.210)
Length of trials (Appeal)	0.965	1.006
	(1.068)	(1.168)
Probability of detection	-0.576	-0.580
	(0.461)	(0.461)
Probability of conviction	-4.762***	-4.747***
	(1.623)	(1.622)
Years of jail	-0.085	-0.085
	(0.052)	(0.052)
Probability of fine	7.058	7.010
	(4.690)	(4.686)
Unemployment	11.053	10.924
	(7.565)	(7.712)
Unemployment^2	-0.223	-0.218
	(0.226)	(0.235)
Per capita income	1.279***	1.277***
	(0.221)	(0.224)
Per capita income^2	-0.028***	-0.028***
	(0.005)	(0.006)
Facilitated credit	0.366	0.385
	(0.710)	(0.744)
Per capita bank deposits	0.061	0.061
	(0.097)	(0.097)
School dropout rate	-0.050	-0.049
	(0.054)	(0.056)
Degree of infrastructures	-3.292	-3.206
	(4.692)	(4.761)
Population density	0.005	0.005
	(0.006)	(0.006)
Constant	-13.954***	-14.059***
	(3.667)	(3.802)
Observations	412	412
R-squared	0.79	0.79

Standard errors in parentheses
* significant at 10% level; ** significant at 5% level; *** significant at 1% level
† Hausman chi2(14) = 30.91 Sargan chi2(2)= 4.262
†† Hausman chi2(14) = 31.00 Sargan chi2(2)= 4.035
Other regressors: time trends, provincial dummies

Table 8 – Determinants of Racketeering (2SLS-Second Stage)

Dependent variable: Racketeerings/10,000 inhabitants	Model 1 †	Model 2 ††
Length of trials (1st instance)	0.025**	0.025**
	(0.011)	(0.012)
Length of trials (Appeal)	-0.049	-0.048
	(0.059)	(0.064)
Probability of detection	-0.023	-0.023
	(0.018)	(0.018)
Probability of conviction	-0.060***	-0.060***
	(0.018)	(0.018)
Years of jail	0.002***	0.002***
	(0.001)	(0.001)
Probability of fine	0.104	0.111
	(0.677)	(0.677)
Unemployment	-0.449	-0.453
	(0.424)	(0.433)
Unemployment^2	0.009	0.009
	(0.013)	(0.013)
Per capita income	0.009	0.011
	(0.013)	(0.013)
Per capita income^2	-0.002	-0.002
	(0.002)	(0.003)
Facilitated credit	-0.018	-0.017
	(0.040)	(0.042)
Per capita bank deposits	0.012*	0.012*
	(0.006)	(0.006)
School dropout rate	0.012	0.011
	(0.013)	(0.011)
Degree of infrastructures	0.293	0.296
	(0.259)	(0.264)
Population density	-0.012	-0.016
	(0.005)	(0.007)
Constant	0.061	0.059
	(0.207)	(0.214)
Observations	412	412
R-squared	0.91	0.91

Standard errors in parentheses
* significant at 10% level; ** significant at 5% level; *** significant at 1% level
† Hausman chi2(14) = 40.40 Sargan chi2(2)=1.759
†† Hausman chi2(14) = 40.12 Sargan chi2(2)=1.684
Other regressors: time trends, provincial dummies

Table A1 – Independent Variables: by Province, Italy 1999-2002

Variable	Obs.	Mean	Std. Dev.	Min	Max
Unemployment Rate*	412	0.10	0.08	0.02	0.32
Per-capita Income (Th. EUR.) ††	412	18.43	4.63	9.42	32.07
Per-capita Facil. Credit (Th. EUR.)†	412	0.67	0.37	0.18	2.00
Per-capita Bank Loans (Th. EUR.) †	412	12.84	7.30	2.72	53.76
High School Dropout Rate*	412	4.00	1.57	0.70	9.80
Degree of Infrastructures*	412	0.11	0.04	0.04	0.25
Population Density (per SqKm)*	412	243.27	330.32	36.63	2646

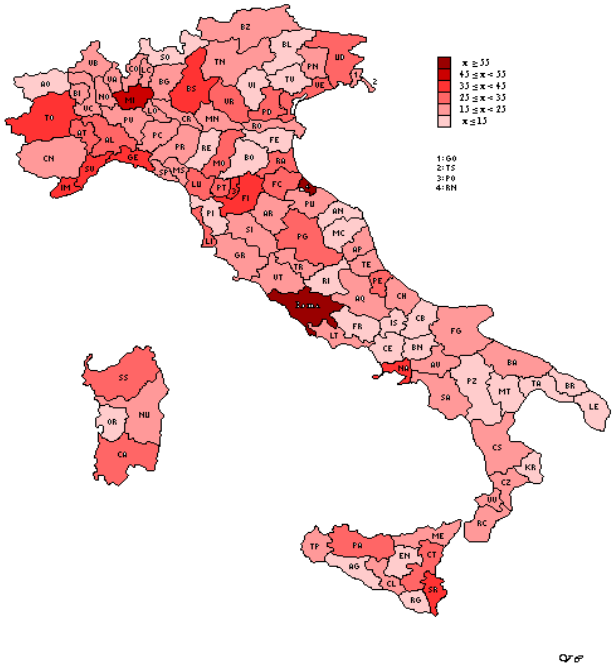
Source: Italian National Institute of Statistics (ISTAT)*, the Bank of Italy†, and Tagliacarne Institute††

Table A2
Length of Trials and Rate of Proceedings Accruing to the Court of Appeal, Italy: North-Center-South (1999-2002)

Variable	North	Center	South
First Instance+Preliminary Inv.	2.38	3.01	3.58
Court of Appeal	1.98	1.87	1.31
Rate of Appeal	25%	26%	30%

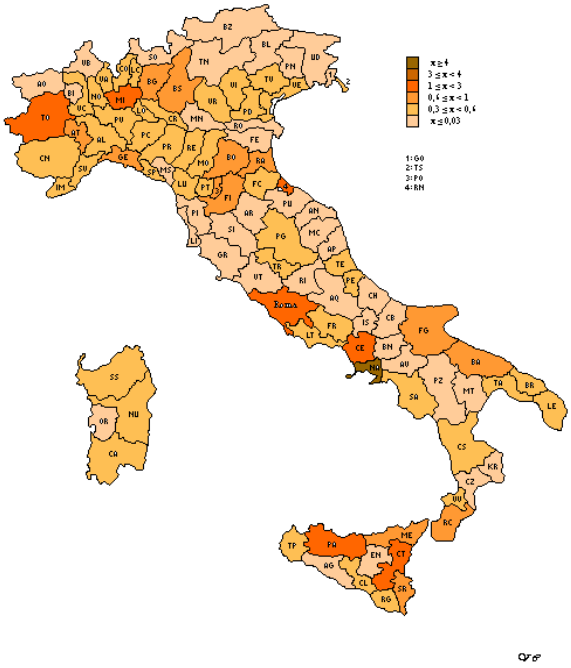
Source: Italian National Institute of Statistics (ISTAT)

Figure A1 – Distribution of Thefts every 1,000 inhabitants in Italy, 1999-2002



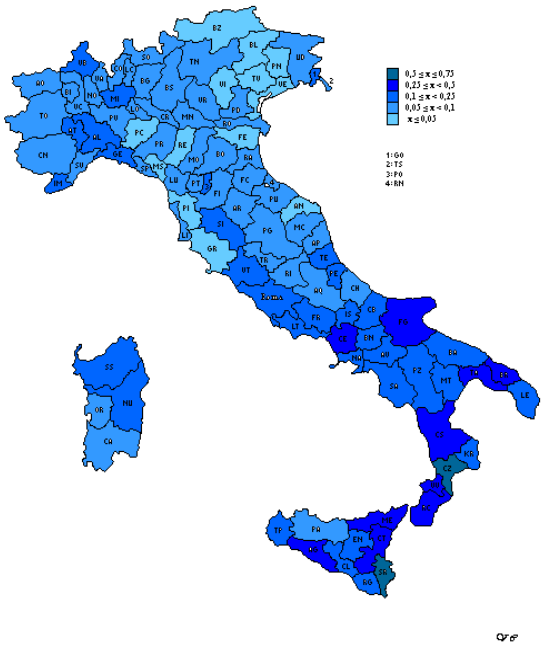
Source: Author's elaboration on data provided by the Italian National Institute of Statistics (ISTAT).

Figure A2 – Distribution of Robberies every 1,000 inhabitants in Italy, 1999-2002



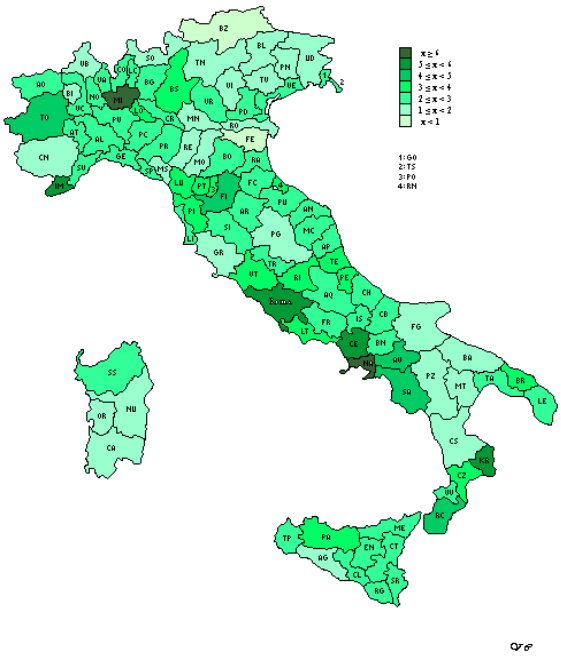
Source: Author's elaboration on data provided by the Italian National Institute of Statistics (ISTAT).

Figure A3 – Distribution of Racketeering every 1,000 inhabitants in Italy, 1999-2002



Source: Author's elaboration on data provided by the Italian National Institute of Statistics (ISTAT).

Figure A4 – Distribution of Frauds every 1,000 inhabitants in Italy, 1999-2002



Source: Author's elaboration on data provided by the Italian National Institute of Statistics (ISTAT)