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A Big Push to Deter Corruption: Evidence from Italy

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Antonio Acconcia* **and Claudia Cantabene****

Abstract

During the first half of the 1990s a pool of Italian judges carried out an investigation, named Mani Pulite (literally clean hands), that led many public officials to be prosecuted and convicted because of bribery and embezzlement. The impact of Mani Pulite was so much influential that since then many indicators suggest a steadily decreasing path for corruption in Italy. This paper shows that Mani Pulite was mainly effective in deterring corruption as it broke up the feed due to spending in health and social security as well as infrastructure investments, mainly those related to public buildings, sanitation, and land reclamation.

Keywords: Corruption, Public Investment, Deterrence
JEL classification: D73, H54, K42

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1 Introduction

Public policies have the potential to foster economic growth and raise welfare. However, the large amount of funds usually needed to finance such policies may induce corrupt behaviors of public officials. This has two implications. On the one hand, in a situation where corruption is rampant we should find a positive relationship between corruption and public spending. On the other hand, after a serious attempt at cracking down on corruption, we should see that relationship weakened. Hence, such weakening can be taken as prima facie evidence that the fight against corruption was effective. Those implications are indeed what we find looking at the Italian experience during 1980-2001. Actually this paper documents a story of success in fighting corruption.

Italy has a long tradition of public policies aimed at fostering growth and sustaining social cohesion. During the 1980s and 1990s, these policies were mainly based on large amounts of public expenditure in social security and investments in infrastructure. As most of such spending is highly discretionary at different levels of the public administration, it becomes natural to study its relationship with corruption. For instance, the implementation of a capital project by the central government involves many decisions and a large number of public officials at different layers of the public administration. Moreover, the execution of the project is often contracted out to private enterprises. It follows that some officials are likely to have high discretionary power in the management of public funds. Arguably, this happened in Italy after some laws issued in the 1970s. These laws made the state government responsible for the revenue side of the public budget but, for many subjects, relegated to public officials of local governments and to bureaucrats of other public institutions many decisions regarding the spending side. Under these circumstances, if the level of deterrence is relatively low, corruption in the form of bribes and thefts may be particularly lucrative. Thus Italy comes out as an interesting case-study for investigating the relationship between corruption and public spending.

When a cohort with some corrupt individuals takes up office, the incentive for any individual to be corrupt may increase (Sah, 1988; Tirole, 1996). If this happens, corruption will become a widespread phenomenon and a big push will be needed to destroy it. A massive anti-corruption investigation, named *Mani Pulite*, characterized Italy in the first half of the 1990s. *Mani Pulite* shed light on a widely diffused system of corrupt agreements and determined the prosecutions and convictions of many politicians, bureaucrats,

and entrepreneurs. We document the deterring impact of *Mani Pulite* by showing that the relationship between corruption and public spending was positive and statistically significant during the 1980s and the first part of the 1990s, that is before *Mani Pulite*, while it was no more statistically significant from 1995 through 2001. This finding is robust to different estimators and measures of corruption; whether it implies a permanent regime change is of course difficult to assess given the available data.

A relevant issue of the empirical analysis consists in defining a reliable measure of the extent of corruption itself. This paper is based on two directly observable proxies, that is the number of recorded crimes related to various types of corruption, and the number of bureaucrats convicted because of their involvement in embezzlement. Thus, estimates reported constitute a lower bound as the level of effective corruption may be substantially higher than the measured one. For both proxies, we find that corruption during 1980-1994 was more likely linked to public investments related to (population-serving infrastructure goods such as) various types of public buildings — for instance, schools, museums, theaters, and hospitals — and investments in land reclamation, rather than to investments relative to (space-serving goods such as) transportation infrastructure. Evidence of a positive relationship between corruption and public expenditure in health and social security also arises. Since it is realistic to assume that the government raises funds (at least in part) through distortionary taxation, our results imply that corruption may have turned an otherwise growth-fostering flow of spending into a policy that may have been growth-depressing on net for Italy as a whole.

After Becker and Stigler (1974) and Rose-Ackerman (1978), the sources and the consequences of bureaucratic and political corruption have been extensively investigated. As concerns the sources, the long exposure to democracy as well as the countries' cultural traditions (Treisman, 2000; Del Monte and Papagni, 2008), the civil-service quality as well as the relative wage (Rauch and Evans, 2000; Van Rijckeghem and Weder, 2001), and the extent of the shadow economy (Dreher and Schneider, 2006) appear to be relevant. As regards the consequences, mixed results emerge depending upon the level of analysis (Svensson, 2005, and references therein). Looking at the micro data, corruption clearly depresses firms' growth and reduces the efficacy of redistribution (see, for instance, Fisman and Svensson, 2007; Olken, 2006); moreover, the macro data suggests that corruption is likely to distort the composition of public spending (Tanzi and Davoodi, 1997; Mauro, 1998).

However, using cross-country data no robust evidence emerges that corruption negatively affects long run growth (Mauro, 1995; Svensson, 2005). A plausible explanation for the mismatch between the micro and macro evidence is that some types of corruption may be efficiency enhancing, by determining competition for government resources and by speeding up administrative procedures.

In general, to measure corruption cross-country analyses exploit subjective indexes by informed observers while proxies much more related to the specific contexts have been used in national case studies. This paper looks at corruption in terms of crimes prosecuted and officials convicted and investigates the relationship between corruption and public spending before and after a significative event. Thus it is related to a growing recent literature that infers the presence of corrupt agreements by comparing the effects of public spending at different points in time, one "before" and one "after" corruption takes place (Golden and Picci, 2005; Olken, 2006; Gorodnichenko and Sabirianova Peter, 2006). To the best of our knowledge, the paper presents the first evidence of successful fight against corruption in a large developed country. In this sense it is mostly related to the documented experiences of corruption-crackdowns in Hong Kong (Skidmore, 1996) and in the public hospitals of Buenos Aires (Di Tella and Schargrodsky, 2003).

The rest of the paper is organized as follows. Section 2 illustrates the evolution of corruption in Italy since 1980 while section 3 introduces the empirical analysis. Section 4 shows the results and section 5 concludes.

2 Corruption in Italy and *Mani Pulite*

Corruption can be viewed as a by-product of the mis-governance and is defined as the misuse of public office in order to attain a personal gain. Andvig et al. (2001) identify six forms of corruption: (i) *bribery*, when private people give bribes to bureaucrats as counterparts for avoiding costs or obtaining benefits; (ii) *embezzlement*, defined as the theft of resources by those who have the responsibility of administrating them; (iii) *fraud*, defined as an economic crime involving trickery, swindle or deceit; (iv) *extortion*, concerning money extracted by using coercion, violence or threats; (v) *favoritism*, that is the abuse of power implying a corrupted distribution of resources; (vi) *nepotism*, that is a special form of favoritism in which an office holder (ruler) prefers his proper kinfolk and family members.

In this paper we exploit two different measures of corruption:

- *The number of corruption crimes prosecuted.* Data refer to a rather broad group of illegal activities which includes embezzlement, misappropriation of yield to the damage of government, extortion and bribery agreements; the spatial distribution reflects the province where the crime was effectively committed. In the following we will refer to this variable as *Crime*.

- *The number of public officials convicted for the crime of embezzlement.* Now data just refer to the crime of embezzlement; the spatial distribution reflects the region where the crime was effectively committed. We will refer to this variable as *Embezzlement*.

Note that, according to the Italian Penal Code, corruption (whatever type) only involves public officials and persons in charge of public offices who abuse of their discretionary power, and that, according to the ISTAT, crimes related to embezzlement, extortion, and bribery are part of the crimes against the public administration. Hence, we argue that the data employed should satisfactorily proxy for the diffusion of corruption within the public administration. In particular, both measures we employ have remarkable features. The main advantage of *Embezzlement* is that it relates to officials effectively convicted because of an irreversible provision of sentence, while its main limit is that it does not capture all forms of corruption as previously defined. Moreover, under the assumption of concurrence of charges, an individual is recorded only for that crime which is punished harsher by the penal code. Hence the level of corruption in a given region, as measured by *Embezzlement*, may appear significantly lower than elsewhere if in that region many crimes are tied to a single public official. The variable *Crime* overcomes the previous limits as it refers to the number of crimes, rather than to the number of public officials, and it captures the different ways through which corruption may arise. *Crime* is also available at level of province letting us to look at the cross-sectional diffusion of corruption across a large number of units. Its main limit emerges by noting that some acts prosecuted might not correspond to crimes committed.

Table 1 reports a summary of statistics relative to corruption for Italy as a whole. During the period 1980-2001 the overall number of crimes recorded was 34,238, with roughly the same shares for embezzlement and other types of corruption. Public officials convicted for corruption (as a whole) were 13,251, that is roughly 0.2% of the (mean) public sector employment; now embezzlement accounts for roughly 40% of the total. The evolution of *Crime*

shows an upward trend from 1980 to 1994 and a steadily reduction afterward (figure 1). *Embezzlement* fluctuates around 100 until 1989, when it began to rise sharply towards 350 in 1991 and up to 441 in 1998 (figure 2).[1] However, it is suggestive to note that the pattern of the number of public officials convicted for embezzlement, by the year when the crime was effectively committed, is very similar to that of *Crime* (figure 3). In particular, more than 400 public officials prosecuted for crimes committed in 1994 were successively convicted. Finally, table 2 reveals that *Crime* and *Embezzlement* feature both cross-section variation, measured by the "between standard deviation", and time-series variation, measured by the "within standard deviation".

Self-reinforcing theories of corruption as well as those looking at the incentive structures embodied in institutions provide a wide set of explanations for the diffusion of corruption (see Aidt, 2003, and references therein). In particular, self-reinforcing theories do not require that a particular event happens to explain why corruption starts to increase in a given year. In the presence of dynamic strategic complementarity, due for instance to collective reputation (Tirole, 1996), the appearance of a number of corrupt individuals, for whatever reason, may increase the expected benefit of corruption thus further increasing corruption and having long-lasting effects. At least three distinctive circumstances, however, may also be pointed to explain the present case.

First, during the 1970s a number of laws were issued in Italy which determined a large increase in the number of politicians and bureaucrats and a peculiar type of federalism. In particular, on the basis of two laws — Law No. 281/1970 and Law No. 382/1975 — since the mid of the 1970s decisions relative to the inflow of the public budget are up to the state government, while a large number of decisions relative to the outflow are up to the local administrations and other public institutions. It is a widely shared opinion that the decentralization of important decisions just in terms of spending — for instance, relative to some forms of public pensions or to the tender approval and contracting process for undertaking a capital project — increased the temptation for corrupt behavior mainly because institutional controls were weak.[2]

[1] The pattern observed for *Embezzlement* does not change when considering the number of public officials convicted either relative to the number of people employed in the public sector or relative to the population. Moreover, a similar evolution characterizes public officials convicted for corruption.

[2] Since the level of spending was not constrained by the aggregate level of tax revenues,

Second, historically Italian governments have made large use of public spending with the aim of fostering growth and sustaining social cohesion. In particular, since 1980 public investment in infrastructure and public spending in social security have been the two main policy instruments.[3] Since the implementation of a capital project usually involves many public officials at different layers of the public administration and its execution is often contracted out to private enterprises, the above two circumstances determined that huge amounts of public funds were allocated across provinces and that a large number of public officials had high discretionary power in the management of the funds, mainly those allocated to finance capital projects. Thus, corruption might have been particularly lucrative.

Third, according to Golden (2003) during the period from about 1948 through 1994 the deliberate behavior of the parliamentary officials, who were concerned to enhance their own re-election prospects through a patronage-induced votes system, was to determine the excessive bureaucratization as well as the bureaucratic inefficiency in the Italian context. "The provision of services to individual constituents was provided by the system of political patronage that legislator constructed, where patronage consisted of concrete individual benefits [...] and help in negotiating the complex legal regulations affecting daily life." As such mechanism for amassing votes gradually became inadequate, after a 1974 law that prohibited public companies from donating money to political parties the Italy's patronage system lurched into becoming a system of political corruption, and politicians turned to extracting illegal kickbacks from firms as part of the process of bidding out public works contracts. Thus, bureaucratic and political corruption coexisted.

After the 1994 *Crime* displays a persistent reduction. In principle, this might have been due to a reduction in the fraction of crimes that end up being uncovered and/or to a drop in the diffusion of corruption itself. There are two indirect evidence, however, suggesting that the fall of *Crime* reflects a regime switch and not just a change in the attention that is paid to corruption. First, the subjective indexes of perceived corruption — usually employed in previous work on corruption across countries — signal a lower level of corruption after 1994. For instance, the Transparency International

this mechanism triggered large deficits for many years. See Cassese (1977 and 1983), among others.

[3] As Loddo (2004) points out, during the 1950s and the 1960s the prevailing form of government intervention to promote growth was in terms of financial incentives both to firms and households; after the 1980, however, infrastructure investment was the main policy instrument.

index assesses the perception of corruption on a scale of 0 to 10: the value 10 refers to a corruption free country. Looking at the index for 1995, 1996, 1997 across 54 countries it follows that "countries normally hold their positions over the period. The largest positive swing in the three years available is shown by Italy": 2.99 in 1995; 3.42 in 1996; 5.03 in 1997 (Tanzi, 1998); the average value of the index during 1998-2001 (2002-2007) was 4.85 (5.06). Second, Transparency International reports anecdotical evidence related to the sensible reduction of the cost of public projects after 1994, supporting the idea that corruption dropped.

A reliable explanation for the drop in the level of corruption hinges on the effect of *Mani Pulite*, the most important anti-corruption investigation ever realized in Italy. Limited to the city of Milan at the beginning, *Mani Pulite* quickly extended to the whole country and became very popular in 1992 because of the arrest of a public official who was detected while receiving a bribe.[4]. During the period 1992-1994, 70 Italian district attorneys investigated on roughly 12.000 persons; about 5.000 individuals were arrested. The inquiries revealed a diffused system of corrupt practices involving entrepreneurs, bureaucrats, judges, and representatives of all political parties; according to one of the public prosecutors at that time it was custom paying bribes in Italy.[5] After *Mani Pulite* some politicians retired and some political parties dissolved; the most prominent cases are those of *Partito Socialista Italiano* and *Democrazia Cristiana*.

3 Empirical strategy

Following Becker and Stigler (1974), most economic studies on corruption have been developed within a principal-agent framework, where corruption relates to the misbehavior of a public official (the agent) who takes bribes from private individuals interested in buying from, or selling to the government (the principal) some good. More in general, our empirical analysis hinges on two basic assumptions which are consistent with many types of

[4] Mario Chiesa was arrested on 2/17/1992 while receiving a bribe for the awarding of a public procurement. The investigation started one year before.

[5] Antonio Di Pietro argued that "Più che di corruzione o di concussione, si deve parlare di dazione ambientale, ovvero di una situazione oggettiva in cui chi deve dare il denaro non aspetta più nemmeno che gli venga richiesto; egli, ormai, sa che in quel determinato ambiente si usa dare la mazzetta o il pizzo e quindi si adegua." (see *Mani Pulite - anno zero* available at http://www.societacivile.it and http://www.cronologia.it/storia/a1992a1.htm.)

corruption (Rose-Ackerman, 1996; Acemoglu and Verdier, 2000):

1. Public intervention requires the use of agents (public officials) to collect information and implement policies.

2. Public officials are self-interested, possess superior information, and are hard to monitor perfectly.

The risk of corruption is especially high for infrastructure investment because the discretionary power of public officials in charge of managing this type of public funds can be remarkable. Figure 4 displays the time series of infrastructure investment per capita at national level and broken down geographically. During 1980-1992 the level of investment in Italy ranged in the interval 150-210 euros. After the currency crises in 1992 a sharp reduction followed and a steady increment later on. In 1999 the investment per capita reached roughly the same value as during the second half of the eighties. The figure also shows that the difference in the level of investment across regions was not constant, implying that geographical disparities changed a lot. For instance, in 1980 the amount of spending per capita in the South was higher than that in the North, that is roughly 174 euros in the North and 192 in the South, while the converse was true in 1999, that is 155 and 123 respectively. In our panel regression framework, variability of investment among different years and different provinces is crucial to identify its effect on corruption.

In the following we test the efficacy of *Mani Pulite* by looking at whether it weakened the causal impact of public spending, mainly infrastructure investment, on corruption. In doing so we take into account (i) the lag between measured corruption and public spending; (ii) the difference between effective and measured corruption; (iii) the spatial correlation among provinces when *Crime* is considered; (iv) the possibility of reverse causality.

It seems reasonable to conjecture that eventually crimes end up being uncovered with some lags respect to the date they are perpetuated and that crimes committed at different times may be detected in the same year. At the same time, note that once a crime has been notified to the person who might be responsible for it, the judicial authority will begin the penal action after a period of investigation. Thus, our basic equation consists in a distributed lag model where corruption $C_{i,t}$ is regressed on past values of infrastructure investment $IG_{i,t-j}$. In particular, we will report evidence considering $j = 2, 3, 4$ as different time lags do not have any relevance for all estimated equations and our results suggest that the lag 2 of IG is the

relevant one. In order to evaluate whether the fight against corruption was effective, we compare the dynamic causal effects on C of a change in IG before and after *Mani Pulite*. A rolling procedure provides information on the timing of the structural break.

Variations in *Crime* and *Embezzlement* do not necessarily imply that actual corruption varied, as the formers may also be due to changes in the fraction of crimes that end up being uncovered because of changes in the enforcement effort. It is useful to distinguish between purely time variations in the level of enforcement and variations in space and time. The former may be a reasonable possibility when political or media pressures affect the priorities of the law enforcers or the effort that judges and prosecutors exert.[6] These factors would mainly trigger off variations of enforcement whose effects are to a large extent captured by calendar year dummies, γ_t.[7] The strength of enforcement may also be different in space and time because of differences in the number of judges employed or in their productivity.[8] If variations in the probability of detecting corruption were positively correlated with public investment, than neglecting the former might induce to erroneously conclude that a raise of public investment determines an increase in the level of actual corruption when the correct conclusion is simply that an higher level of judicial input determines an increase in measured corruption. Further, the omission of the same variable when it is negatively correlated with public investment might determine the result that public investment would not be statistically significative in explaining variations in corruption. Unfortunately disaggregate data relative to the judicial input used against corruption are not available, thereby we cannot properly take into account this issue. However, in order to mitigate the consequence of the omission of a variable eventually relevant, we merge data for corruption with an indicator of judicial efficiency relative to the broad aggregate of all penal cases for the 27 Italian judicial districts. Such indicator, *Trial*, measures the average length of penal trials and it is obtained as the ratio of the

[6] In general the effect of the probability of detection on the level of measured corruption is ambiguous. For instance, a low level of enforcement may imply high incentives to misbehave, and thus an high level of actual corruption; it also implies however a low number of crimes detected, for a given stock of crimes achieved.

[7] Of course, such dummies also correct for possible spurious correlation between corruption and public spending due to common time-series factors.

[8] Note that measures of judicial input relative to all penal cases show that during the 1990s in Italy both the number of judges per inhabitants and their productivity did not reduce (ISAE, 2001), suggesting that the strength of the fight against penal crimes did not reduce during those years.

sum of the stock of trials pending at the beginning and the end of each year, over the sum of trials started and completed in the same year.[9] Finally, we also take into account the possibility that the level of enforcement is serially correlated thus inducing serial correlation of measured corruption.

Italy is divided into 20 administrative regions. Each region has its own feature and differentiates from others mainly in terms of economic and social characteristics. Hence, data on *Crime* may be thought as a cluster sample where each unit, the province, is part of a cluster, the region. In this case observations within a region may be correlated as a result of an unobserved cluster effect. In order to allow for such correlation we consider the variable $IGPE_{i,t-j}$ which indicates, for any $t-j$, the average investment across provinces which are part of the same region as i (excluding province i). In this way we also look at whether the diffusion of corruption in a given province is affected by the level of investment (and thus by the diffusion of corruption) which characterizes other provinces within the region. Ex-ante, we argue that the sign of such peer (or cluster) effect is ambiguous for at least two reasons. One may assume that a capital project crosses the border of a single province and thus it is managed by public officials of adjacent provinces within the region. In such a case we may expect that the diffusion of corruption in province i is positively correlated with the diffusion of corruption in the rest of the region and thus we should estimate a positive peer effect. However, it can also be the case that the detection of corruption in a given province may discourage public officials of other provinces to become corrupted, thus determining a negative peer effect.

Finally, we also recognize time constant unobserved effects, α_i, affecting corruption. Treisman (2000) shows that different values of subjective index of corruption across the world appears to be correlated with country differences related to religion, institutional environment, and those aspects which characterize the social and cultural origins of a country. In general, it is appropriate to assume that such factors are time-invariant but heterogeneously distributed among areas within a country. This is mainly true in Italy which is traditionally characterized by large social and cultural differences.[10]

[9] In the following we report results relative to the first degree of judgement (*Istruttoria* and *Primo Grado*). The main conclusion however holds by also considering the second degree of judgement (*Appello*).

[10] Cross-country data show significative correlations between the level of income and some proxies for institutional environment and cultural origin. Thus, allowing for unobserved heterogeneity we also control for inequality in terms of income.

Thus, when *Crime* measures corruption the basic equation we deal with is

$$C_{i,t} = \gamma_t + \sum_{j=2}^{4} \left(\beta_j IG_{i,t-j} + \delta_j Trial_{i,t-j} + \lambda_j IGPE_{i,t-j} \right) + \alpha_i + \varepsilon_{i,t}$$

while $IGPE$ is removed when *Embezzlement* is considered. Depending upon the assumptions concerning the correlation between α_i and the explanatory variables $x_{i,t}$, the serial correlation of $\varepsilon_{i,t}$ and the exogeneity of public investment, different estimators will be considered.

4 Corruption and public spending: Evidence from Italy

As a benchmark the first two columns of table 3 show estimates of β_j when we either exclude all controls or simply allow for γ_t.[11] In both circumstances the regression coefficient of $IG_{i,t-2}$ is positive and highly statistically significant; the null hypothesis that the calendar year effects (not reported) are jointly zero is rejected at the 1-percent significance level.

Let assume the explanatory variables are strictly exogenous conditional on the unobserved effect α_i. Since public investment has been a main policy instrument for reducing inequalities in Italy, it follows that α_i may be correlated with IG due to the correlation between α_i and the level of income. Under this assumption the so-called Fixed-Effects (FE) estimator would produce unbiased estimates. A formal Hausman test, however, does not strongly support such hypothesis; thus, we report results relative to both the FE and Random-Effects (RE) estimators. Looking at FE, coefficients related to public investment are substantially the same as before: those relative to lags two and three are positive while the coefficient of $IG_{i,t-4}$ is roughly zero; the total effect of IG is estimated positive and statistically significant at the 1-percent significance level. Moreover, the F-test clearly suggests to reject the null hypothesis that the unobserved effects are jointly zero. The RE estimate corroborates the positive and significant impact of infrastructure investment on corruption; the slight difference between the FE and RE results is consistent with the result of the Hausman test.

As concerns the peer effect, we do not estimate any effect at all for the variables relative to lags -2 and -3; we estimate, instead, a negative and statistically significant effect for $IGPE_{i,t-4}$, under both estimators. Since

[11] In general all variables but *Trial* are always expressed per thousand of inhabitants.

the direct impact of infrastructure investment on corruption is (positive and) statistically significant mainly at lag two, while the indirect impact through the peer effect is estimated (negative and) statistically significant at lag four, we argue that the variable $IGPE$ might capture the deterring effect on corruption which is due to the detection of corruption itself. *Trial* does not appear to be relevant in explaining our measure of corruption, mainly because of the correlation with the time dummies which also control for variations in law enforcement. In fact, when the dummies are removed from the estimated equations *Trial* tends to become statistically significant; at the same time, removing the time dummies does not affect at all the relationship between corruption and investment (eventually the t-ratios increase).

In general, lags of the dependent variable may alleviate the possible mispecification induced by the omission of relevant variables. In the present framework, if the level of enforcement is serially correlated then lags of *Crime* may also control for such correlation.[12] Thus, we extend the basic equation considering $C_{i,t-1}$ and $C_{i,t-2}$ and apply the Arellano-Bond estimator to

$$\Delta C_{i,t} = \gamma_t + \rho_1 \Delta C_{i,t-1} + \rho_2 \Delta C_{i,t-2} + \sum_{j=2}^{4} \Delta \left(\beta_j IG_{i,t-j} + \delta_j Trial_{i,t-j} + \lambda_j IGPE_{i,t-j} \right) + \Delta \omega_{i,t} \qquad (1)$$

Again the impact of IG on *Crime* is positive and significant; the point estimates of β_2 and β_3 are higher than before and more precisely estimated (see table 3, last column). As expected, the test of autocorrelation (not reported) suggests to reject the null hypothesis of second order autocorrelation of disturbances implying consistency of estimates.[13] Hence, our results formally corroborate the idea of a causal impact of public investment on corruption in Italy.

In order to investigate on the impact of *Mani Pulite* we now split the sample into two parts assuming that a structural break in the linkage between corruption and investment realized in 1994, that is when the most popular trials related to *Mani Pulite* ended.[14] Moreover, we also consider separately the investments in Buildings, Transports, and Sanitation-Energy-Reclamation (SER) to look at whether a specific type of investment was

[12] Actually, a standard test of autocorrelation between errors at t and $t-1$ suggests that observations for the same province are correlated over time.

[13] Further lags of the dependent variable do not alter at all our results. Moreover, our conclusions are not affected by correcting the standard errors for the presence of heteroschedasticity.

[14] A symbol of *Mani Pulite* has been the prosecution against Sergio Cusani, who was arrested on 7/23/93. The trial against him started on 10/13/93 and ended — with the condemn — on 4/28/94 (see, among others, *Europeo*, various issues).

mainly relevant for corruption. Results give strong credit to our hypothesis. When total investment is considered, it turns out that after *Mani Pulite* the coefficient of $IG_{i,t-2}$ is still positive but not statistically significant while that relative to $IG_{i,t-3}$ becomes negative (table 4). Overall, the sum of the two coefficients is estimated positive and significant before *Mani Pulite*; it becomes instead negative and not significant for the following years. This conclusion is strengthened considering Buildings and SER: the impact of $IG_{i,t-2}$ is positive and strongly significant before *Mani Pulite* while it becomes not statistically different from zero later on.[15] In particular, before *Mani Pulite* the total effect of investment in Buildings on corruption equals 0.33, which implies a long-run effect roughly equals to 0.40, that is 4 times as larger as that relative to total investment. According to this estimate, an increase of public spending in Buildings which equals to one standard deviation feeds a number of corruption crimes prosecuted which is about 50% of its standard deviation. We do not find instead any effect on *Crime* of Transport in both sub-periods considered.

A rolling procedure supports our choice about the breaking year. Table 5 shows how the effect on corruption of IG changes by removing or adding up one or more years to the each sub-period previously considered. For instance, looking at Buildings it comes out that, as expected, β_2 is increasing and statistically significant adding up years up to 1994, while it drops down when the 1995 is also considered. A similar path holds for $\beta_2+\beta_3+\beta_4$ which becomes not statistically different from zero looking at 1985-95. Similarly, when we extend backward the second sub-period than the sum of coefficients increases and, in the case of SER, it also becomes statistically significant. Finally, note that results relative to sub-samples before 1992 are consistent with the main evidence and provide further support to our conclusions; for instance, restricting to the five years before *Mani Pulite*, that is 1987-1991, β_2 for Buildings (SER) is 0.0872 (0.0436) while the corresponding t-ratio is 2.36 (2.53).

Although it is plausible that higher public spending leads to more corruption we cannot rule out the possibility of reverse causality. For a given amount of total spending, the distribution of investment across provinces may be distorted by differences in corruptibility: provinces characterized by an higher level of corruptibility tend to force for an higher level of investment in order to collect higher bribes and thus end up with more corruption. At

[15] In general, the same results hold when the three types of public investment are entered the estimated regression simultaneously.

the same time, more corruptibility may also induce higher level of spending for a given project, as public officials might inflate the amount they spend to increase their illegal yields.[16] Arguably, it is plausible to rule out contemporaneous correlation between corruptibility and investment because the distorted or inflated level of spending would be realized with some delay respect to its decision; hence, eventually public spending should be considered predetermined, conditional on α_i, rather than strictly exogenous. If measured corruption in t is a proxy for effective corruption in t or $t-1$, then the GMM evidence reported above satisfy the sufficient condition for consistency, that is $E(\Delta\omega_{i,t}\Delta x_{i,t-j}) = 0$ with $x = IG, Trial, IGPE$. If $C_{i,t}$ would measure instead corruption in $t-2$, then $\Delta\omega_{i,t}$ and $\Delta IG_{i,t-2}$ (or $\Delta IGPE_{i,t-2}$) might be correlated, through the correlation between $IG_{i,t-2}$ and $\omega_{i,t-1}$, determining inconsistent estimates. In order to investigate on this possibility, let consider a reduced version of equation (1) by dropping IG and $IGPE$ in $t-3$ and $t-4$. In this case, under the assumption $E(\Delta\omega_{i,t}\Delta x_{i,t-j}) = 0$ the GMM estimate of β_2 for Buildings before *Mani Pulite* would be 0.1320 (t-ratio 3.17). If we assume instead $E(\Delta\omega_{i,t}\Delta x_{i,t-j}) \neq 0$ then a consistent estimator is delivered by instrumenting investment in $t-2$ with its past values. The implied estimate of β_2 is however very similar to the previous one: 0.1322 (t-ratio 2.25); moreover, it follows again that the positive effect of IG on *Crime* disappears after *Mani Pulite*.[17] Thus, our main conclusion is robust to the possibility of feedback from corruptibility to investment.

Finally, note that a version of the Granger-causality test provides further support to our conclusion. We have tested the overall significance of the coefficients of lagged *Crime* in a regression of IG on lags of *Crime* and IG itself up to 5 (as well as on year and province dummies). For both Buildings and SER and applying the FE and GMM estimators it follows that *Crime* does not Granger-cause investment. Although Granger-causality differs from causality, we speculate that this finding corroborates the causal interpretation suggested in this paper.

[16] Note that previous evidence is not affected by reverse causality if its effect on the cross-sectional distribution of investment is constant through time.

[17] Note that we are forced to drop investment in $t-3$ and $t-4$ to get a consistent estimate of β_2, under the assumption of reverse causality, as otherwise instruments would be very weak and thus our results not reliable. Details are available from the authors upon request.

4.1 Further results

There are some reasons for arguing that the relation between corruption and public spending might be non-linear, weakening or strengthening for either low or high investment volumes. For instance, the shortage of public funds may be accompanied by heightened controls within the public administration, thereby forcing public officials to be more cautious when handling with low amounts of investment. At the same time, it may happen that the relation weakens for large amounts of spending when very costly projects induce greater attention of everyone in the economy. Thus, we introduce a quadratic term of the level of investment in the specification of table 4, but its impact proves to be not statistically different from zero.

Using a sample of 80 democracies during the 1990s, Persson, Tabellini and Trebbi (2003) find evidence that corruption is affected by electoral rules; in particular, countries adopting a "majoritan system" tend to have less corruption than countries voting under "proportional system". Since a proportional electoral rule is more likely to lead to a coalition government while a majoritan one is more likely to lead to a single-party government, voters may more easily identify the responsible of a bad performance under the latter form of government than under the former. Thus, in a "majoritan system" the electoral outcome is more sensitive to the performance of the incumbent reducing the incentive for corruption. During the 1990s Italy adopted a new electoral rule characterized by a lower degree of proportionality than before. Thus, the slowdown of corruption in the second half of the 1990s may be at least in part related to the new electoral rule.[18] In order to allow for such possibility we measure for each province and each electoral competition in the period of interest the Herfindhal index relative to the distribution of the number of votes that each party received (as a ratio respect to the total number of valid votes in the election). By including such index into the set of regressors does not affect, however, previous conclusions at all. In general, the impact of the concentration of political power is estimated negative but not statistically significant.

Until now we have exploited the total variability of the data. Evidence reported in table 6 is obtained by regressing the time-average of *Crime* on the averages of *IG*, *IGPE*, and *Trial*, controlling for the initial level of value added, *VA*, as a proxy for inequalities among provinces previously

[18] Note that Del Monte and Papagni (2008) recognize, however, that the new electoral rule have increased political stability in Italy which, in turn, may actually have increased the incentives for corruption.

captured by the province effects. In this way only the "between variation" of the variables becomes relevant. Results again show a positive relationship between corruption and investment before *Mani Pulite* — whose statistical significance does not depend on the set of control variables — and that such relationship is not statistically significant later on. In particular, note that the impact of investment in Buildings on corruption before *Mani Pulite* turns out to be very similar to the FE and GMM panel estimates previously considered.

4.1.1 Embezzlement across Italian regions

Our main conclusion on the deterring effect of *Mani Pulite* also holds when corruption is measured by regional data on *Embezzlement*.[19] Results in table 7 refer to an extended version of equation (1) which also takes into account the *GDP*, a further proxy for the rate of deterrence, namely *Police*, and the public spending for consumption, the latter being available at regional level.[20] In particular, public consumption is considered looking at its three main components separately: General and Economic Services as well as National Defence, *CG1*; Houses Services and Education, *CG2*; Health and Social Security, *CG3*. Arguably, there is no clear presumption on the sign of the relationship between corruption and public consumption. A positive relationship might emerge if the same argument raised for public investment applies. However, in general much of current government spending reflects previous commitments as it consists of salaries paid to public employees; of course for such type of expenditure we do not expect any relationship at all with corruption.[21]

The main evidence supports previous finding: public investment relative to Buildings, Sanitation and Reclamation, explains corruption before Mani Pulite while its effect is not significant in the last part of the sample. Again, we do not find any relationship between corruption and public investment

[19] Note that we consider Valle D'Aosta and Piemonte as an unique region; thus, the total number of regions we refer to is 19.

[20] *Police* is entered with linear and quadratic terms to allow for its potential non-linear impact on measured corruption. To save on degrees of freedom we report results considering lags -2 and -3. Conclusions are not altered when we allow for further lags.

[21] Results are based on the FE estimators due to the correlation between the unobserved heterogeneous effects and the other regressors. A formal Hausman test documents such correlation. Moreover, for all the estimated regressions the F-test suggests to reject the null hypothesis that the regional dummies are jointly equal to zero, at the conventional levels of confidence.

in roads, railroads, and other transportation infrastructure. Some type of public consumption comes out to have induced bureaucrats' misbehavior. In fact, we estimate a positive (and statistically significant) effect of public expenditure in health and social security on corruption; again, however, after *Mani Pulite* we do not find any evidence of such relationship. We believe this finding to be suggestive because, differently from other types of current spending, the social security expenditure increased substantially during the 1980s and in general its management is in part appointed to local bureaucrats who thus entail substantial discretionary power. Hence, we interpret this outcome as supporting the hypothesis that the discretionary power of public officials in the management of public funds encouraged corruption in Italy before *Mani Pulite*.

Looking at the rest of regressors it follows that the coefficient of *Income* is estimated negative, as expected; all other variables do not seem to affect corruption in a relevant way.[22]

5 Conclusions

Looking at Italy since the 1980, this paper documents that a big push can significantly reduce corruption in a society otherwise characterized by a diffused system of bribes and thefts. In particular, the paper provides evidence on the deterring impact of *Mani Pulite*, an anti-corruption investigation which was carried out by a pool of Italian judges in the first half of the 1990s. Two main conclusions are achieved: (i) during the 1980s and the first half of the 1990s corruption in Italy, at least in part, fed on the huge amounts of public spending in social infrastructure, such as buildings, swamp and land reclamation, as well as public spending in social security; (ii) the perverse relationship between corruption and public spending collapsed just after the prosecutions and convictions related to *Mani Pulite*. Evidence reported is robust to different types of estimators and measures of corruption. Of course, whether these findings imply a permanent regime change induced by *Mani Pulite* or a transitory effect is difficult to assess given the data available.

[22] An important qualification holds, however, for the variable *Police*. Both coefficients measuring its impact on corruption are estimated significantly different from zero if we remove the regional dummies from the set of regressors, suggesting that this variable is indeed effective in deterring corruption but the most of its variability is across regions.

References

[1] Acemoglu, D., Verdier, T., 2000. The Choice between market failures and corruption. American Economic Review 90, 194-211.

[2] Aidt, T. S., 2003. Economic analysis of corruption: A survey. The Economic Journal 113 (November), 632-652.

[3] Andvig, J. C., Fjeldstad, O. H., Amundsen, I., Sissener, T., Soreide, T., 2001. Corruption: a review of contemporary research. CMI Report R 2001: 7.

[4] Becker, G., Stigler, G., 1974. Law enforcement, malfeasance and compensation of enforcers. Journal of Legal Studies 3, 1-18.

[5] Cassese, S., 1977. Regionalizzazione del 1977: Un primo bilancio. Politica ed Economia 8(5), 37-40.

[6] Cassese, S., 1983. Espansione e controllo della spesa pubblica: Aspetti istituzionali. Rivista di Politica Economica 73, 153-171.

[7] Del Monte, A., Papagni, E., 2008. The determinants of corruption in Italy: Regional panel data analysis. European Journal of Political Economy, forthcoming.

[8] Di Tella, R., Schargrodsky, E., 2003. The role of wages and auditing during a crackdown on corruption in the city of Buenos Aires. Journal of Law & Economics 46, 269-92.

[9] Dreher, A., Schneider, F., 2006. Corruption and the shadow economy: An empirical analysis. CESIFO Working Paper, 1653.

[10] Fisman, R., Svensson, J., 2007. Are corruption and taxation really harmful to growth? Firm level evidence. Journal of Development Economics 83, 63–75.

[11] Golden, M., 2003. Electoral Connections: The Effects of the Personal Vote on Political Patronage, Bureaucracy and Legislation in Postwar Italy. British Journal of Political Science 33(2), 189-212.

[12] Golden, M. A., Picci, L., 2005. Proposal for a new measure of corruption illustrated with Italian data. Economics & Politics 17, 37-75.

[13] Gorodnichenko, Y., Sabirianova Peter, K., 2006. Public sector pay and corruption: Measuring bribery from micro data. IZA DP Discussion Paper, 1987.

[14] ISAE, 2001. Rapporto Trimestrale, April.

[15] Loddo, S., 2004. Old and new intervention policy: a survey of the empirical studies for the Mezzogiorno. Crenos Working Paper, 2004/01.

[16] Mauro, P., 1995. Corruption and growth. Quarterly Journal of Economics 110, 681-712.

[17] Mauro, P., 1998. Corruption and the composition of government expenditure. Journal of Public Economics 69, 263-279.

[18] Olken, B. A., 2006. Corruption and the cost of redistribution: Micro evidence from Indonesia. Journal of Public Economics 90, 853-870.

[19] Persson, T., Tabellini, G., Trebbi, F., 2003. Electoral rules and corruption. Journal of the European Economic Association 1(4), 958-989.

[20] Rauch, J. E., Evans, P. B., 2000. Bureaucratic structure and bureaucratic performance in less developed countries. Journal of Public Economics 75, 49-71.

[21] Rose-Ackerman, S., 1978. Corruption: A study in political economy. New York: Academic Press.

[22] Rose-Ackerman, S., 1996. When is corruption harmful?. Background paper for the World Bank's 1997 World Development Report, The State in a changing world. Washington: The World Bank (August).

[23] Sah, R. K., 1988. Persistence and pervasiveness of corruption: New perspectives. Yale Economic Growth Center Discussion Paper 560.

[24] Skidmore, M. J., 1996. Promise and peril in combating corruption: Hong Kong's ICAC. Annals of the American Academy of Political and Social Science 547, 118-130.

[25] Svensson, J., 2005. Eight questions about corruption. Journal of Economic Perspectives 19 (5), 19-42.

[26] Tanzi, V., Davoodi, H., 1997. Corruption, public investment and growth. IMF Working Paper 97/139, Washington DC: International Monetary Fund.

[27] Tanzi, V. 1998. Corruption around the world: Causes, consequences, scope, and cures. IMF Working Paper 98/63.

[28] Tirole, J., 1996. A theory of collective reputations (with applications to the persistence of corruption and to firm quality). Review of Economic Studies 63, 1-22.

[29] Treisman, D., 2000. The causes of corruption: a cross-national study. Journal of Public Economics 76, 399-457.

[30] Van Rijckeghem, C., Weder, B., 2001. Bureaucratic corruption and the rate of temptation: Do wages in the civil service affect corruption, and by how much? Journal of Development Economics 65, 307-331.

6 Appendix: Data sources

According to the Italian Institute of Statistics (ISTAT) crimes related to corruption, embezzlement and extortion are part of the crimes against public administration. In particular, ISTAT classified this kind of crimes at the numbers 286 to 294bis of its analytical classification which, in turn, correspond to the articles 314 to 322 of the Italian Penal Code. In details, ISTAT classification is as follows:

286	embezzlement
287	embezzlement by drawing profit from another's error
287bis	embezzlement to the damage of government
287ter	misappropriation of yield to the damage of government
289	extortion
290	corruption for official deeds
291	corruption for deeds contrary to official duties
291bis	corruption in judicial deeds
292	corruption of a party in charge of a public service
293	corruptor's liability
294	incitement to corruption
294bis	others

The Italian Penal Code states that crimes from 286 to 292 of ISTAT classification may be committed only by public officials and persons in charge of a public service, whereas crimes recorded at number 293 can involve only individuals not engaged in the public sector, and that recorded at number 294 involve both public officials and individuals in the private sector.

Crime: The number of (recorded) crimes which determined the penal actions. All crimes comprised in the above classification are considered. The spatial distribution of the variable is given by the province where the crime is effectively committed.

Embezzlement: **The number of public officials convicted for the crime of embezzlement**. It comprises the crimes recorded with the numbers 286-287 of the above classification. In general, ISTAT records a conviction in case of an irreversible provision of sentence, whatever is the phase or the degree of judgment. "*La statistica degli imputati condannati riguarda l'insieme degli individui condannati in qualsiasi fase o tipo di giudizio, con riferimento al momento in cui, divenuto irrevocabile il provvedimento di condanna, viene iscritto al Casellario giudiziario centrale*" (ISTAT; *Statistiche giudiziarie penali*, 2001, p. 29). Moreover, in the hypothesis of concurrence

of charges, the individual is recorded only for the crime harsher punished by the Italian Penal Code and other laws; while if the individual committed various crimes non in concurrence between them, he is recorded as many times as many irreversible provisions of sentence he experienced. The spatial distribution of the variable is given by the region where the crime is effectively committed while the year refers to when the condemn is pronounced. Data are available homogeneously up to 2000, as afterward ISTAT changed the way of assembling the crimes against public administration.

The source of both variables concerning corruption is ISTAT, *Annuario delle statistiche giudiziarie* (various issues).

Public investment in infrastructure. The source of the data on infrastructure investments is ISTAT, *Annuario delle Opere Pubbliche*, (various issues). The types of infrastructure are: Transports (roads and airports, railroads and other kinds of transportation, ports and rivers, telecommunications); Sanitation-Energy-Reclamation (hospitals, electric and hydroelectric plants, swamps, land reclamation, other categories); Buildings (public buildings and schools; public spending devoted to private buildings)**.** The data are recorded in current price. We use a deflator obtained considering investment by region in the construction sector in order to express them as millions of euro at 1995 price.

Police. The data concern the number of people engaged in the "*Guardia di Finanza*", "*Carabinieri*" and "*Polizia di Stato*". The source is CRENoS. Data are available at regional level from 1980 to 1997.

Public spending for consumption. The source of this variable is ISTAT (various issues). For the period 1980-1995, ISTAT presents data according to the classification SEC79; later on according to the classification SEC95. Total consumption has been divided into three groups. For 1980-1995: CG1 (general services and undivided expenses, national defense, economic services); CG2 (houses, recreational, cultural and religious services, education); CG3 (health, social security). For 1995-2001: CG1 (general services, national defense, public order and security, businesses); CG2 (environment safety, houses and territorial order, recreational, cultural and religious activities, education); CG3 (health, social security). Slight differences arise for CG1 and CG3 between the two classifications. Values are expressed as millions of euro at 1995 price.

Gross domestic product. The gross domestic product is measured in millions of euro at 1995 price; data are available by regions and the source is ISTAT (various issues).

Population. The source is ISTAT, *Statistiche Demografiche* (various issues).

Trials. This variable measures the average length of judicial proceedings relative to penal crimes. The average length of judicial process is the ratio of the number of pending judicial proceedings, at the beginning and the end of each year, to the number of judicial proceedings started and completed in the same year. The average length of judicial process is computed according to the degree of judgement: the index is calculated separately for First Degree (*Istruttoria and Primo Grado*) and for Second degree (*Appello*). The sources of data are CRENoS and ISTAT, *Annuario delle statistiche giudiziarie* (several issues).

Herfindhal. This variable measures, for each party and each election from 1979 to 2001, the Herfindhal index relative to the distribution of the number of votes that each party received (expressed as a ratio respect to the total number of valid votes in the election).

Table 1 - Bureaucratic Corruption in Italy over 1980 - 2001

	Embezzlement			Overall Corruption			
	Total	Per capita	Per employee	Total	Per capita	Per employee	Ratio
Crimes recorded	17,769	311	3,207	34,238	598	6,179	0.52
Public officials convicted	5,146 (0.24)	90	929	13,251 (0.28)	232	2,391	0.39

Notes: Crimes recorded refer to the number of corruption crimes for which the judicial authority has begun the penal action. Public officials convicted are those who experienced an irreversible provision of sentence (whatever the phase and the degree of judgment). Values per capita or per employee are measured per thousand of inhabitants or per thousand of employees in the public sector, respectively. Ratio denotes the ratios of embezzlement (total) over overall corruption (total). Values in parenthesis are ratios between total public officials convicted and those reported.

Table 2 – Descriptive Statistics: Corruption and public investment

Variable	Mean	Standard Deviation (Overall)	Standard Deviation (Within)	Standard Deviation (Between)	Time Span	Number of Cross-section Units
Crime	0.028	0.0340	0.0313	0.0132	1980-2001	95
Embezzlement	0.003	0.0035	0.0033	0.0009	1980-2000	19
Total Investment	0.195	0.1446	0.0896	0.1140	1980-1999	95
Buildings	0.045	0.0398	0.0246	0.0314	1980-1999	95
SER	0.090	0.0875	0.0614	0.0625	1980-1999	95
Transports	0.060	0.0593	0.0464	0.0371	1980-1999	95

Notes: *Crime* is the number of overall corruption crimes per thousand of inhabitants, by province. *Embezzlement* is the number of public officials convicted for embezzlement per thousand of inhabitants, by region. Total Investment is public infrastructure investment at constant price (million of 1995 euro) per thousand of inhabitants, by province. Buildings is investment in public buildings, schools, and public spending devoted to private buildings; SER refers to (public investment in) sanitation, energy, and reclamation; Transports is public investment in roads, airports, and railways.

Table 3 – Corruption and Infrastructure Investment

	Pooling-OLS		FE	RE	GMM
IG (–2)	0.0234* (2.33)	0.0217* (2.21)	0.0258* (2.57)	0.0236* (2.46)	0.0442** (3.72)
IG (–3)	0.0116 (1.00)	0.0158 (1.39)	0.0182 (1.67)	0.0166 (1.55)	0.0222* (1.96)
IG (–4)	–0.0057 (–0.57)	–0.0015 (–0.16)	–0.0007 (–0.07)	–0.0013 (–0.14)	0.0030 (0.26)
IGPE (–2)			–0.0018 (–0.10)	0.0084 (0.50)	–0.0046 (–0.21)
IGPE (–3)			0.0016 (0.08)	0.0084 (0.43)	–0.0088 (–0.42)
IGPE (–4)			–0.0479** (–2.65)	–0.0340* (–1.99)	–0.0459* (–2.03)
Trial (–2)			0.0035 (0.39)	0.0021 (0.24)	0.0076 (0.69)
Trial (–3)			0.0025 (0.19)	0.0013 (0.10)	0.0090 (0.67)
Trial (–4)			–0.0161 (–1.39)	–0.0127 (–1.11)	–0.0343* (–2.48)
NC (–1)					0.2431** (8.58)
NC (–2)					0.1097** (4.39)
N. Obs.	1710	1710	1710	1710	1615
R^2 within			0.14	0.14	
R^2 overall	0.02	0.11	0.11	0.12	

Notes: The definitions and data sources of the variables are in the appendix. All regressions, but that reported in the first column, contain calendar year dummies (results not reported); the time span is 1985-2001. FE stands for fixed effects; RE stands for random effects; GMM is the Arellano-Bond estimator. The *t*–values are in parentheses; significant coefficients are indicated by * (5% level) and ** (1% level).

Table 4 – Corruption and Infrastructure Investment: The Impact of *Mani Pulite*

	Total		Buildings		SER		Transports	
	1985–1994	1995–2001	1985–1994	1995–2001	1985–1994	1995–2001	1985–1994	1995–2001
IG (–2)	0.0402** (2.77)	0.0150 (0.92)	0.1805** (2.91)	0.0019 (0.05)	0.0462** (3.05)	0.0402 (1.55)	0.0017 (0.06)	–0.0161 (–0.64)
IG (–3)	0.0357 (1.60)	–0.0536 (–1.41)	0.1000 (1.61)	–0.1620 (–0.99)	0.0562* (2.15)	–0.0533 (–1.45)	–0.0030 (–0.11)	–0.0314 (–1.05)
IG (–2; –3)	0.0759* (2.29)	–0.0386 (–1.03)	0.2805* (2.44)	–0.1601 (–0.86)	0.1024** (2.82)	–0.0131 (–0.28)	–0.0013 (–0.03)	–0.0475 (–1.48)
N. Obs.	950	665	950	665	950	665	950	665
Zero residuals autocovariance of order 1: test	–3.00 (0.00)	–4.83 (0.00)	–3.21 (0.00)	–4.69 (0.00)	–2.97 (0.00)	–4.54 (0.00)	–3.02 (0.00)	–4.41 (0.00)
Zero residuals autocovariance of order 2: test	0.25 (0.81)	–1.28 (0.20)	0.33 (0.74)	–1.96 (0.05)	0.38 (0.70)	–1.99 (0.05)	0.35 (0.73)	–1.33 (0.18)

Notes: Estimation is by Arellano and Bond method for dynamic panel, with heteroskedasticity-robust standard errors. All regressions contain year dummies, NC (–1), NC (–2), Trial (–2), Trial (–3), Trial (–4), IGPE (–2), IGPE (–3), IGPE (–4), IG (–2), IG (–3), IG (–4). The table only reports results relative to the coefficients of IG(–2) and IG(–3) as well as their sum. The *t*–values are in parentheses; significant coefficients are indicated by * (5% level) and ** (1% level).

Table 5 – The Impact of *Mani Pulite*: Sensitivity Analysis

		1985–1992	1985–1993	1985–1994	1985–1995	1992-2001	1993-2001	1994-2001	1995-2001
Buildings	IG (–2)	0.1111**	0.1241**	0.1805**	0.1258**	0.2005	0.1730	0.1332	0.0019
		(3.12)	(3.57)	(2.91)	(2.80)	(1.73)	(1.32)	(1.08)	(0.05)
	IG (–3)	0.0271	0.0387	0.1000	0.0272	0.0308	0.0448	–0.0009	–0.1619
		(0.58)	(0.99)	(1.61)	(0.55)	(0.65)	(0.85)	(–0.02)	(–0.99)
	IG (–2; –3)	0.1382*	0.1628**	0.2805*	0.1530*	0.2313	0.2178	0.1323	–0.1600
		(2.21)	(2.85)	(2.44)	(2.00)	(1.67)	(1.54)	(1.13)	(–0.86)
SER	IG (–2)	0.0376*	0.0390*	0.0462**	0.0604**	0.1132**	0.0878*	0.0743	0.0402
		(2.46)	(2.30)	(3.05)	(3.31)	(4.28)	(2.47)	(1.95)	(1.55)
	IG (–3)	0.0325	0.0421	0.0562*	0.0481*	0.0905*	0.0902*	0.0328	–0.0533
		(1.62)	(1.74)	(2.15)	(2.00)	(2.49)	(2.43)	(0.91)	(–1.45)
	IG (–2; –3)	0.0701*	0.0811*	0.1024**	0.1085**	0.2037**	0.1780**	0.1071	–0.0131
		(2.27)	(2.16)	(2.82)	(2.75)	(3.48)	(2.85)	(1.67)	(–0.28)

Notes: Estimation is by Arellano and Bond method for dynamic panel, with heteroskedasticity-robust standard errors. All regressions contain year dummies, NC (–1), NC (–2), Trial (–2), Trial (–3), Trial (–4), IGPE (–2), IGPE (–3), IGPE (–4), IG (–2), IG (–3), IG (–4). The table only reports results relative to the coefficients of IG(–2) and IG(–3) as well as their sum. The *t*–values are in parentheses; significant coefficients are indicated by * (5% level) and ** (1% level).

Table 6 – Corruption and Infrastructure Investment in Buildings

	Before *Mani Pulite*		After *Mani Pulite*
	1980 – 1989	1980 – 1994	1995 – 2001
IG-Buildings	0.1548** (2.89)	0.1662** (2.72)	–0.0038 (–0.10)
IGPE-Buildings	–0.0193** (–2.68)	–0.0093 (–1.96)	0.0047 (0.85)
VA_{81}	–0.0004 (–0.80)	–0.0008 (–1.15)	
VA_{95}			–0.0011* (–2.33)
Trial	0.0100 (0.73)	0.0104 (0.42)	–0.0267** (–2.63)
Constant	0.0191* (2.37)	0.0276 (1.96)	0.0630** (7.64)
N. Obs.	95	95	95
R^2	0.09	0.08	0.10

Notes: OLS regressions with heteroskedasticity-robust standard errors. The *t*–values are in parentheses; significant coefficients are indicated by * (5% level) and ** (1% level). IG, IGPE and Trial refer to the time averages relative to 1980-87 and 1980-92 before *Mani Pulite* and to 1993-99 after *Mani Pulite*. VA_{81} and VA_{95} refer to the value added per capita in 1981 and 1995, respectively. (Note that the value added in 1980 is not available).

Table 7 – Embezzlement and Infrastructure Investment

	1984–1994			1995–2000
IGB	0.0193** (2.59)	0.0162* (2.09)	0.0167* (2.07)	0.0544 (1.74)
IGS	0.0127* (2.44)	0.0134* (2.54)	0.0130* (2.43)	–0.0262 (–0.95)
IGT	–0.0023 (–0.35)	–0.0013 (–0.19)	–0.0013 (–0.19)	0.0002 (0.01)
CG1	0.0070 (0.95)	0.0064 (0.87)	0.0058 (0.73)	–0.0080* (–2.35)
CG2	–0.0023 (–0.24)	–0.0058 (–0.59)	–0.0090 (–0.85)	–0.0026 (–0.38)
CG3	0.0187** (2.91)	0.0196** (3.02)	0.0202** (3.06)	0.0066 (1.32)
GDP		–0.0005 (–1.46)	–0.0007 (–1.67)	–0.0015 (–1.35)
Police and Trial	No	No	Yes	No
N. Obs.	228	228	228	114
R^2 within	0.65	0.65	0.66	0.31
R^2 overall	0.30	0.42	0.44	0.04
Zero residuals autocovariance of order 1: test	0.0734 (0.98)	0.0607 (0.81)	0.0593 (0.79)	–0.2211 (–1.80)

Notes: Results are relative to the FE estimator. The *t*–values are in parentheses; significant coefficients are indicated by * (5% level) and ** (1% level). All regressions contain year and regional dummies, infrastructure investment in Buildings (IGB), infrastructure investment in Sanitation-Energy-Reclamation (IGS), infrastructure investment in Transports (IGT), public consumption in General and Economic Services as well as National Defence (CG1), public consumption in Houses Services and Education (CG2), and public consumption in Health and Social Security (CG3) with lags –2 and –3. GDP and Trial also are entered with lags –2 and –3. Regression reported in the third column contains police and police squared with lags –2. Coefficients reported are always relative to the sum of lags –2 and –3. Coefficients relative to each lag of the regressors as well as those relative to year and regional dummies are not reported.

Figure 1 – Corruption: Crimes prosecuted

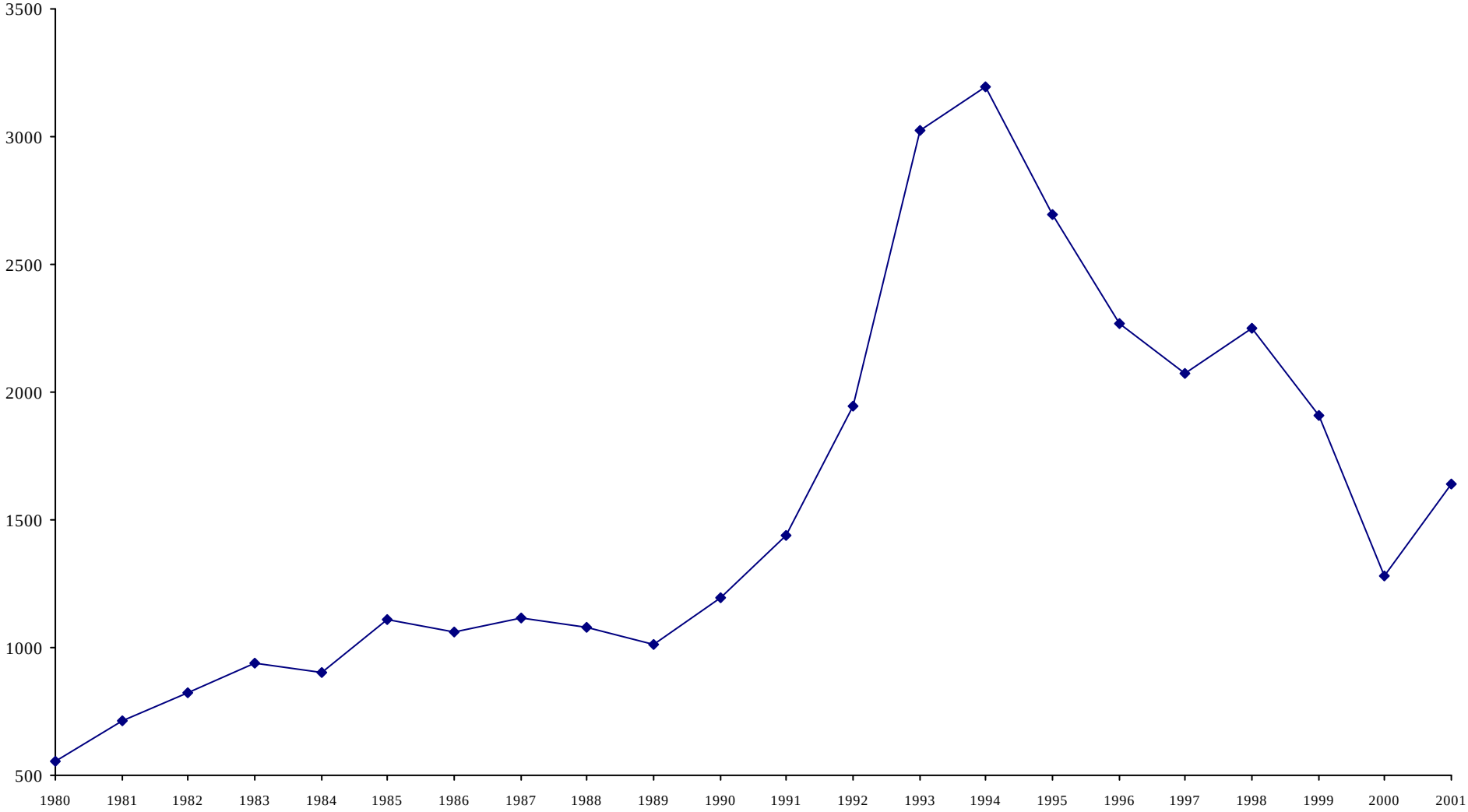

Figure 2 – Embezzlement: Public Officials Convicted

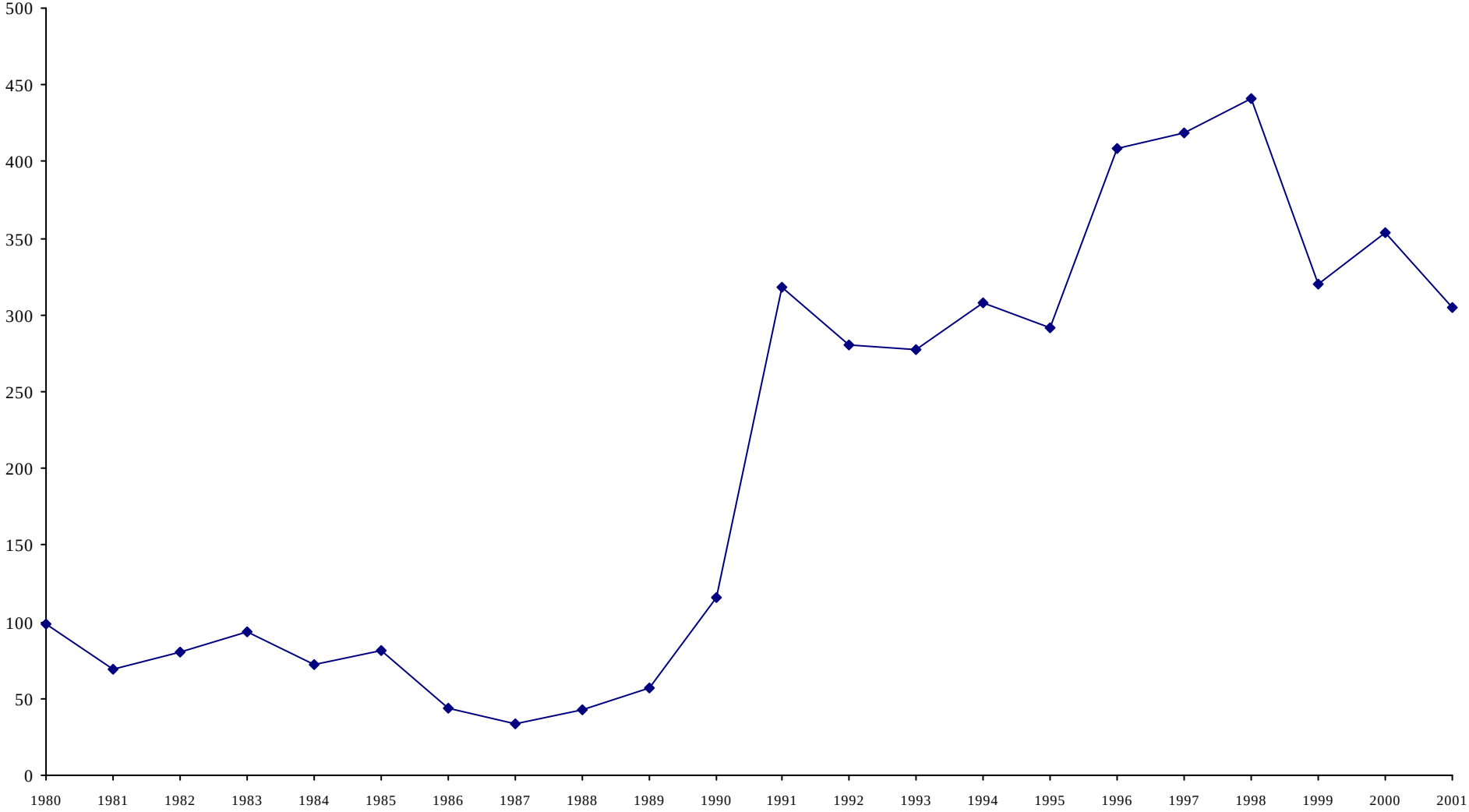

Figure 3 – Embezzlement: Public officials convicted (in terms of the year when crimes are committed)

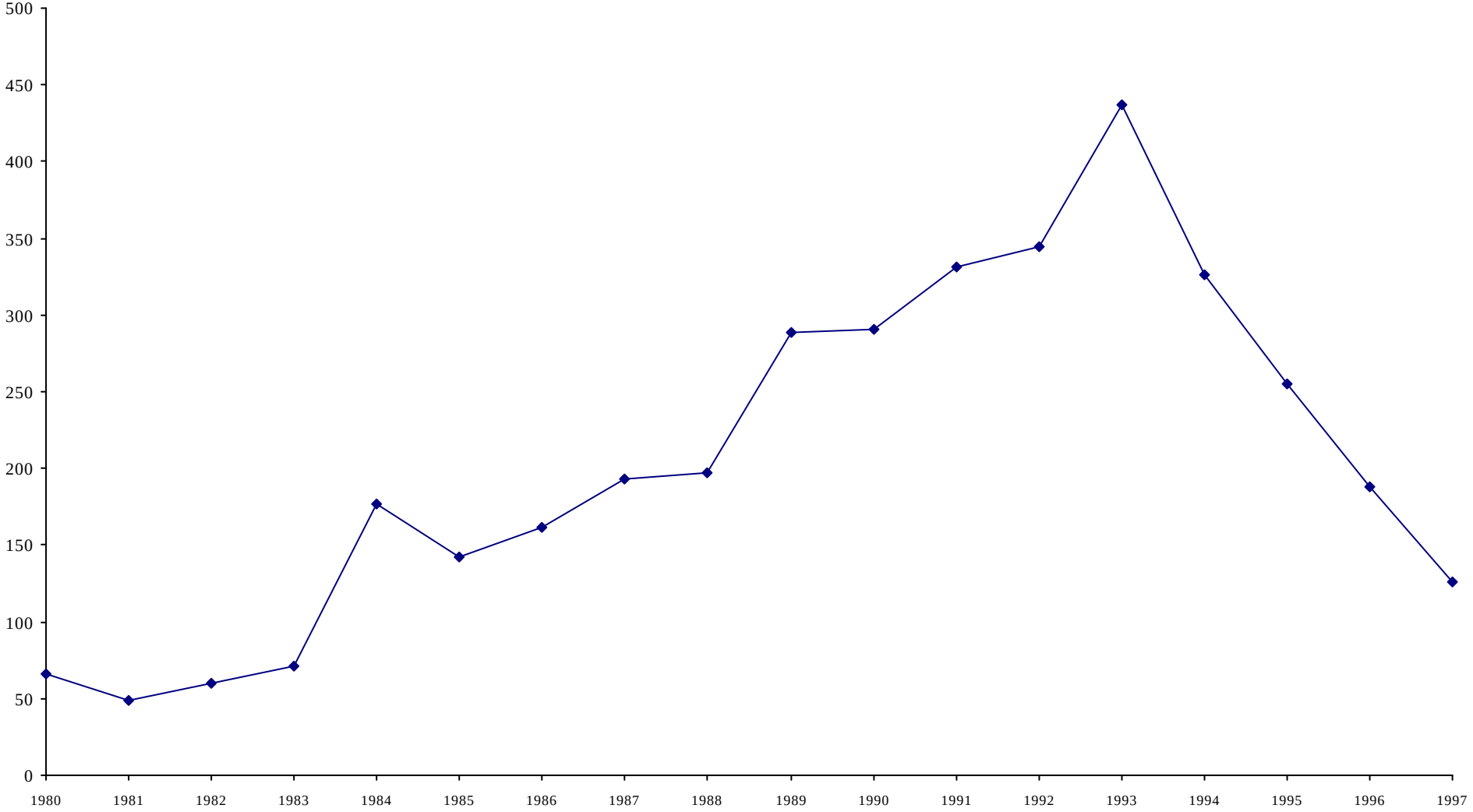

Figure 4: Infrastructure investment (per capita)