A Big Push to Deter Corruption: Evidence from Italy

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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 people to be prosecuted and convicted because of corruption. The impact of Mani Pulite was so much influential that since then many indicators suggest a steadily decreasing path for bureaucratic corruption in Italy. This paper shows that Mani Pulite was mainly effective in deterring corruption as it broke up the feed due to 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

An increase in the stock of infrastructure has the potential to foster economic growth and raise welfare. However, the large amount of funds involved in public investment may be a persuasive motive for corrupt behavior of public officials. 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 in society and a big push will be needed to destroy it. We argue that such circumstances well represent the tale of Italy during 1980-2001; in particular, this paper documents a story of success in fighting corruption fed on public spending.

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 public spending in social security and investment in infrastructure. As capital spending is highly discretionary, the large amount of public expenditure allocated to finance capital projects makes Italy an interesting case-study for investigating the relationship between corruption and public investment. 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.\footnote{Since the level of spending was not constrained by the aggregate level of tax revenues, this mechanism triggered large deficits for many years. See Cassese (1977 and 1983), among others.} Under these circumstances, if the
level of deterrence is relatively low, corruption in the form of bribes and thefts may be particularly lucrative.

A massive anti-corruption investigation, named *Mani Pulite*, started in the beginning 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 around 1994. Since this year many indicators suggest a steadily decreasing path for corruption in Italy.

Indeed, the evidence reported in the paper shows a positive and statistically significant relationship between corruption and infrastructure investment, during the 1980s and the first part of the 1990s. The paper also documents the success of *Mani Pulite* in deterring corruption, showing that in the second half of the 1990s the above relationship is no more statistically significant. A main issue of the empirical investigation 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 bribery and embezzlement, and the number of bureaucrats convicted because of their involvement in embezzlement. Thus, estimates reported constitute a lower bound as the actual amount of corrupt officials may be substantially higher than the recorded one. We also examine which type of public investment is the main fuel of corruption. For both proxies employed, we find that corruption is more likely to be fed on 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 on investments relative to (space-serving goods such as) transportation infrastructure. Since it is realistic to assume that the government raises funds (at least in part) through distortionary taxation, our results implies 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.
Since Becker and Stigler (1974) and Rose-Ackerman (1978), the sources and the consequences of bureaucratic and political corruption have been extensively investigated from a theoretical point of view. The evidence that corruption is a very widespread phenomenon around the world has recently also stimulated empirical investigations. As regards the consequences, although some authors argue that corruption might be efficiency enhancing — by determining competition for government resources and by speeding up administrative procedures — the main empirical evidence is that it is detrimental for an economic system. In particular, corruption is likely to negatively affect output growth as it lowers private investment (Mauro, 1995), distorts the composition of public spending (Tanzi and Davoodi, 1997; Mauro, 1998; Gupta, de Mello and Sharan, 2001), and reduces the quality of public infrastructure (Tanzi and Davoodi, 1997). As concerns what explains the differences in the levels of corruption, the countries’ cultural traditions as well as the long exposure to democracy (Treisman, 2000), 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. In general, the cross-national variation of subjective indexes of perceived corruption by informed observers are investigated. This paper, instead, employs more observable proxies for corruption and looks at the relationship between corruption and public investment before and after a significative event. Thus it is much more related to a growing recent literature that looks at the diffusion of bribes and thefts by comparing measures of the effect 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 well-known example of the successful anti-corruption performance of the Independent Commission Against Corruption in Hong
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 Bureaucratic 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 for 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 administering 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. According to the Italian Institute of Statistics (ISTAT) crimes related to embezzlement, extortion, and bribery involving public officials are part of the crimes against the public administration. In particular, the present paper exploits two panel data sets relative to embezzlement as well as the sum of embezzlement, extortion, and bribery, respectively:

- The number of corruption crimes prosecuted. Data refer to the broad measure of corruption, which includes embezzlement, misappropriation

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2 Recently, Del Monte and Papagni (2006) provide an analysis of the determinants of corruption in Italy, mainly focusing on the role of institutional and cultural factors. They argue that the recent increasing presence of voluntary organizations signals a tendency for decreasing corruption. Although the authors use a different data set than ours and do not address to investigate the impact of Mani Pulite in deterring corruption, their results are consistent with our conclusions.

3 See the appendix for details on the classification of crimes related to corruption in Italy and the source of the data.
tion of yield to the damage of government, extortion and bribery agree-
ments, and are available at provincial level.

- The number of public officials convicted for the crime of embezzlement.

Now data just refer to the crime of embezzlement; the spatial distribu-
tion reflects the region where the crime is effectively committed. In the
following we sometimes refer to this variable simply as Embezzlement.

Each proxy of corruption we employ has some attractiveness. In general,
it is important to stress that, according to the Italian Penal Code, the crime
of corruption (whatever type) only involves public officials and persons in
charge of public offices who abuse of their discretionary power. Hence, we
argue that data employed should satisfactorily proxy for the diffusion of cor-
ruption within the public administration. The main limits of Embezzlement
are that it does not capture all forms of corruption as previously defined
and that, under the assumption of concurrence of charges, an individual is
recorded only for that crime which is punished harsher by the penal code.
The latter feature implies that the extent of corruption in a given region,
as measured by the number of public officials convicted for the crime of
embezzlement, may appear significantly lower than elsewhere if in that re-
gion many crimes are tied to a single public official. Data on corruption
crimes overcome the previous two limits since they refer to the number of
crimes, rather than to the number of public officials, and correspond to a
broad measure of corruption. Moreover, such data are available at level of
province letting us to exploit properly the cross-sectional diffusion of cor-
ruption. This can be of particular relevance in Italy which is characterized
by cross-sectional variations in cultural traditions and social habits. Thus,
a spatial analysis potentially exploits an high information content.\footnote{The main drawback of this variable is that an increase of recorded crimes may be
due to an higher level of deterrence rather than to an increase of effective corruption. We
come back later on this point.}
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 for corruption reported to the judicial authority 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.

Figure 1 shows the evolution of corruption in Italy, in terms of the number of crimes prosecuted from 1980 to 2001. Clearly, the series shows an upward trend from 1980 to 1994 and a steadily reduction afterward. Figure 2 shows, instead, the evolution of the number of public officials convicted because of embezzlement; such a number fluctuates around 100 until 1989, when it began to rise sharply towards 350 in 1991 and up to 441 in 1998. More useful information on the evolution of embezzlement emerges looking at Figure 3, where it is shown the number of public officials convicted for the crime of embezzlement, by the year when the crime was effectively committed. In other words, the value relative to a given year measures the number of public officials who committed at least one offense in that year (given that they have been subsequently prosecuted and convicted). It is suggestive that a similar pattern as the number of crimes for corruption emerges, that is an increasing path for a while and a sharp reduction successively; more than 400 public officials prosecuted for crimes committed in 1994 were successively convicted.

5 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, similar evolution characterizes public officials convicted for corruption (in the broad sense): a steadily increasing path starts in 1989 and follows up until 1996; later on people condemned reduced.

6 Since data for embezzlement are homogeneous up to 2000 we construct this variable adding up, for each year, public officials condemned in any year between that of committed offense and the 2000. Thus, we stop the figure at 1997 as later on it becomes meaningless. Note that such data are only available for Italy on aggregate.
Self-reinforcing theories of corruption as well as those theories which look 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 complementarities, 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 two distinctive circumstances, however, may be also pointed to explain the present case. First, 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. Second, during the 1970s a number of laws were issued which determined a large increase in the number of politicians and bureaucrats and a peculiar type of federalism in Italy. 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 the tender approval and contracting process for undertaking a capital project — increased the temptation for corrupt behavior mainly because institutional controls were weak.

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.
As regards the steadily reduction in corruption since the half of the 1990s, a reliable explanation hinges on the effect of the most popular investigation ever realized in Italy, *Mani Pulite*. This investigation started at the beginning of the 1990s by a group of judges located in Milano, who imposed themselves to the popular attention in 1992 after the arrest of an important public official detected while receiving a bribe.\(^8\) This event is still referred to as the start of the most important anti-corruption campaign ever realized in Italy and it has become a synonymous for struggle against corruption. Limited to the city of Milano at the beginning, *Mani Pulite* quickly extended to the whole country. The inquiries shed light on a diffused system of corrupt practices involving entrepreneurs, bureaucrats, judges, and representatives of all political parties. Corruption was so much spread that one of the judges involved in the investigations argued that it was custom paying bribes.\(^9\) During the period 1992-1994, 70 Italian district attorneys investigated on 12,000 persons and arrested 5,000 individuals; among those under investigation 1069 were politicians.\(^10\) After *Mani Pulite* some politicians retired and some political parties dissolved. The most prominent cases are those of *Partito Socialista Italiano* and *Democrazia Cristiana*.

Summarizing, during 1993-94 a regime switch seems to have characterized the diffusion of corruption in Italy, which was increasing before those years and decreasing later on. In the following we exploit the two above measures of corruption to investigate both the role of public spending, mainly infrastructure investment, as a fuel for corruption and the impact of *Mani Pulite* in deterring it. Our main hypothesis is that *Mani Pulite* broke down

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\(^8\) Mario Chiesa, chairman of a public rest-home, was arrested on 2/17/1992 while receiving 7 millions of Italian Lira. That amount was part of a bribe for the awarding of a public procurement. The investigation started one year before.

\(^9\) Antonio Di Pietro argued that “Pìù 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)

the diffusion of corruption fed on public investment and determined an increase in the perceived level of deterrence in society.

3 Empirical strategy: Corruption and public investment

Following Becker and Stigler (1974), most theoretic economic studies of bureaucratic 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. This framework is well suited to rationalize the present analysis. In particular, our empirical investigation hinges on two basic presumptions (Rose-Ackerman, 1996; Acemoglu and Verdier, 2000):

1. Government intervention requires the use of agents, namely bureaucrats, to collect information and implement policies.

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

For instance, consider what may happen after the decision of a government to carry out an investment project. To be executed, the project usually needs to be contracted out to a private firm, that needs to be chosen by the government. Thus, let us assume, for example, that the government implements an auction mechanism in which the contract to execute the project is awarded to the firm that offers the lowest price. The auction is managed by an official, to whom the government assigns the tasks of collecting information about the cost of the project and of choosing which firm will execute it. Insofar as bureaucrats have discretion over the process that leads to the selection of a particular firm, they can collect bribes from an entrepreneur.
Moreover, it may be shown that the level of corruption, which can be measured by the number of bureaucrats or crimes prosecuted, increases as the level of public investment increases, for a given level of deterrence.\textsuperscript{11}

Arguably, the risk of corruption is especially high for infrastructure investments, because the discretionary power of public officials in charge of managing this type of public funds can be remarkable, implying high incentives to become corrupt. Given that, a main issue of the econometric strategy attains at properly identifying the timing of the supposed relationship between corruption and public investment. We are aware, of course, that this could be an arduous task. In general, it seems reasonable to conjecture both that bribery agreements or thefts perpetuated in a given year may be eventually detected contemporaneously or with lags, and that crimes committed at different times could be detected contemporaneously.\textsuperscript{12} Thus, the empirical model should allow for lags between the year the crime is committed and that of the prosecution (or the sentence). We may assume that at any time $t$ the economy is characterized by a given number of crimes for corruption $KC_t$ committed until $t$, where $KC_t$ is composed of crimes which have not been detected and crimes under preliminary investigations by the police.\textsuperscript{13} Given the stock of corruption in the economy, the judicial authority begins the penal action with respect to a number of crimes $NC_t$, where $NC_t = f (KC_t, \cdot )$. As we investigate the effect of public investment on corruption, the former is the main determinant of $KC$. Prosecution starts in $t$, after a period of investigation, for that crime detected by, or reported to the police at $t - s$, with $s \geq 0$; of course, the crime detected in $t - s$ was committed in $t - s - r$, with $r \geq 0$. Thus, we base our empirical investigation relating corruption to public investment on a distributed lags model. In particular, in the following we will report results relative to 2, 3, and 4.

\textsuperscript{11} Of course, this is just one example, among many others, to illustrate the rationale of our empirical investigation.

\textsuperscript{12} Actually, it is also the case that some crimes are not detected.

\textsuperscript{13} A similar argument holds true with respect to the number of corrupt bureaucrats.
lags of infrastructure investment, as further lags do not have any relevance at all and our results are strongly conclusive for suggesting that the lags 2 and 3 are the relevant ones. On this point, we remember that the investigation Mani Pulite started in 1991 and determined many imprisonments of politicians and entrepreneurs during 1992-93, most of them convicted during 1994-95. Hence, the basic equation we start with is

\[ NC(i, t) = \beta_1 + \beta_2 IG(i; -2) + \beta_3 IG(i; -3) + \beta_4 IG(i; -4) + \varepsilon(i; t) \]

where \( NC(\cdot, \cdot) \) denotes corruption per capita, \( IG(\cdot, \cdot) \) denotes infrastructure investment per capita, \( i \) denotes either 95 Italian provinces or 19 regions, depending upon the proxy for corruption we use, and \( t = 1980, ..., 2001 \) refers to the year. In particular, different specification of the basic equation will be estimated depending upon the assumptions on the term \( \varepsilon(i; t) \). The aim is twofold: (i) verifying if the huge amount of public investment realized in Italy during the 1980s and the 1990s determined, at least in part, the diffusion of corruption; (ii) verifying if Mani Pulite had a significative impact in deterring corruption.

4 Results

Proxies of corruption employed are the number of recorded crimes which determined prosecutions for corruption and the number of public officials prosecuted and convicted because of embezzlement. Table 2 reveals corruption features both cross-section variation, measured by the “between standard deviation”, and time-series variation, measured by the “within standard deviation”, and that the latter exceeds the former.

4.1 Corruption crimes across Italian provinces

As a first instance we investigate the correlation between corruption and public investment by exploiting data on crimes for corruption, which allow to estimate such correlation by means of the largest number of cross-sectional
units, that is 95 Italian provinces. In particular, we report estimates of the
coefficients relative to the three lags of infrastructure investment as well as
their sum. As usual with economic time-series data, successive values of
public investment appears to be correlated and this feature of the data may
leads to imprecise estimates of any single coefficient, as the standard errors
tend to be large in relation to the estimated coefficients. In particular, we
may erroneously conclude that a lagged coefficient is statistically insignifi-
cant. Hence, in order to mitigate this problem, we also report the \( t \)-statistics
relative to the sum of the coefficients. The first column of table 3 reports an
OLS regression estimated with the pooled data for the entire panel, while in
the second column we also allow for calendar year dummies. The latter are
meant to correct for the possible spurious correlation between corruption
and investment due to common time-series factors. In both circumstances
the regression coefficient relative to \( IG(-2) \) is positive and highly statisti-
cally significant; the null hypothesis that the calendar year effects (not
reported) are jointly zero is rejected at the 1-percent significance level.

There are two important arguments which motivate us to add further
regressors. First, 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,
such factors, which allows to cluster a large set of heterogeneous people into
subsets featuring high degree of homogeneity inside each one, can be con-
sidered invariant with respect to time but, of course, not necessarily among
areas within a country. By far this is the case of Italy which is character-
ized by large social and cultural differences among areas of the country. As
unobserved heterogeneity across provinces may induce spurious correlation
between corruption and public investment, if it is not properly taken into
account, we extend the set of regressors allowing for unobserved province
effects. Second, since at a more aggregate level than that of our analysis Italy is divided into regions, a matter of interest is to see whether the diffusion of corruption in a given province $i$ is affected by the level of investment (and thus by the diffusion of corruption) which characterizes other provinces within the region. Hence, in order to estimate such peer (or cluster) effect we also expand the set of regressors by including the variable $IG_i$ which indicates, for each province $i$, the average of infrastructure investment across all other provinces which are part of the same region as $i$. Ex-ante, we argue that the sign of the peer effect is ambiguous for (at least) two reasons. One can 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 $i$ 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. Thus, in principle it is not clear the sign of such an effect.

Allowing for unobserved heterogeneity across provinces a key issue arises. Since many indicators show that economic inequalities across Italian provinces still persist nowadays and given that Italian governments has usually looked at public investment as the main policy instrument for reducing such inequalities, it follows that the unobserved specific effects may be correlated with infrastructure investment as a consequence of the correlation between unobserved heterogeneity and the level of income. Under this assumption the so-called Fixed Effects (FE) estimator would produce unbiased estimates. Since, however, a formal Hausman test does not strongly support

\footnote{Note that at country level variables related to institutional environment and cultural origins appear to be correlated with the level of income. Thus, allowing for unobserved heterogeneity should be an alternative way to take into account of inequality in terms of income.}
such assumption, we report results relative to the FE estimator and to its main alternative, that is the (so-called) Random Effects (RE) estimator, which should be preferred in the absence of correlation between effects and the rest of regressors as it produces efficient estimates. Looking at the FE estimates (third column), coefficients related to the public investment within the province are substantially the same as before: coefficients relative to lags two and three are positive while that related to \( IG(-4) \) is roughly zero; the total effect of public investment, \( IG \), 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 estimates (fourth column) confirm the positive and significant impact of infrastructure investment on corruption; moreover, the slight difference between estimates under the FE estimator and those under the RE one justifies the result of the Hausman test mentioned above. 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 \( IG(i)(-4) \), under both the FE and RE estimators. Since 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 \( IG(i)(\cdot) \) could capture the deterring effect on corruption which is due to the detection of corruption itself.

Observations for the same province may be correlated over time, even after conditioning for public investment, mainly because our measure of corruption reflects, for each year, crimes for which the judicial authority begin the penal action. Thus, let assume that at time \( t \) police starts to investigate on some given crimes, committed before \( t \), which are related to each other. In this case it may be reasonable to presume that not all crimes will be reported in the same year after \( t \), at least because a crime detected in a given year can direct towards further detections in later years. Under such
circumstance, although we estimated a distributed lags model the regression may fail to capture lags in detection, implying inefficient estimates because of autocorrelated errors.\footnote{A formal test of autocorrelation between errors at $t$ and $t-1$ confirms this conjecture.} One way to overcome this problem is addressed in the fifth and sixth columns of the table which show both FE and RE estimates assuming $AR(1)$ disturbances; as shown, our main findings are not altered at all.

A more general way to deal with the problem of serial correlation of the error terms, which also deals with the possibility that our specification is not dynamically complete, however, is reported in the last column of the table. The omission of the lagged dependent variable from the regressors may be a possible source of inconsistency of previous estimates if this variable is correlated with public investment. To handle with this problem in presence of province-specific effect, we re-estimate the regression with the Arellano-Bond estimator adding two lags of the dependent variable.\footnote{Noting that the lagged dependent variable and the province-specific effect are correlated and that the FE estimator would produce biased and inconsistent estimates, due to the contemporaneous correlation arising between the lagged dependent variable and the error after the within transformation, we employ the Arellano-Bond estimator.} The resulting estimates clearly show that the point estimates of the coefficients of infrastructure, relative to lags two and three and that relative to the sum of the three estimated coefficients, are positive and much higher than before, and that they are more precisely estimated. Moreover, differently than before, the coefficient relative to lag 3 is now statistically significant at 5-percent significance level. Adding up the values of the three lags of investment considered it follows that the overall coefficient is 0.0684 with a $t$-value of 3.92. Further, the Arellano-Bond procedure is warranted by the results of the test of autocorrelation (not reported), which suggests to reject the null hypothesis of second order autocorrelation of disturbances implying consistency of estimates.\footnote{Further lags of the dependent variable entered as regressors in the estimated equation do not alter at all our results and, as expected, the test of autocorrelation suggests to reject the null hypothesis of first order autocorrelation of disturbances.} Finally, again a negative sign is estimated for
the peer effect.\textsuperscript{18}

Previous estimates tend to support the common hypothesis that public investment in infrastructure has been one of the determinants of the diffusion of corruption in Italy during the 1980s and the 1990s. Given that, we turn now to investigate more deeply the linkage between public spending and bureaucratic corruption by answering two questions: which types of public investment were the main fuel of bureaucratic corruption during the time span considered? What was the impact, if any, of \textit{Mani Pulite} in deterring corruption in Italy? About the latter question, we split the time span considered into two parts relative, respectively, to the years before and after the 1994. We refer to the 1994 as the year of the presumed break in the linkage between public spending and corruption as in that year ended the most popular trials related to \textit{Mani Pulite}.\textsuperscript{19} Moreover, in order to disentangle which types of public investment were mainly relevant for corruption, we also consider separately the public investment in Buildings, Transports, and Sanitation-Energy-Reclamation (SER). Table 4 reports the main results.

Our estimates give strong credit to the hypothesis that \textit{Mani Pulite} determined a structural break in the Italian economy dismantling the perverse relationship between public investment and corruption which was effective for at least fifteen years. Looking at the results with total investment for the period after \textit{Mani Pulite}, it turns out that the coefficients relative to the lag 2 is still positive but not statistically significant while those relative to lags 3 and 4 are negative. Overall, the sum of the coefficients relative to the first two lags considered is estimated positive and strongly significant before \textit{Mani Pulite}; it becomes instead negative and not significant for the following years. This conclusion is fully confirmed considering Buildings and SER;

\textsuperscript{18}Note that our main conclusions are not affected by correcting the standard errors for the presence of heteroschedasticity.

\textsuperscript{19}A symbol of \textit{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, \textit{Europeo}, various issues).
in both cases the coefficients of interest are positive and strongly significant before Mani Pulite while they are not statistically different from zero later on. In particular, during the 1980s and the first half of the 1990s it emerges an high point effect of public investment in Buildings on corruption, whose total impact is 0.34 which implies a long-run effect roughly equals to 0.48, that is 4 times as larger as that relative to total investment.\footnote{In general, the same results hold when the three types of public investment are entered the estimated regression simultaneously.} According to this estimate, an increase of infrastructure investment in public buildings equals to one standard deviation feeds a number of corruption crimes prosecuted which is about 60\% of its standard deviation.

4.1.1 Cross-sectional variation of corruption crimes

Previous estimates fully exploits the total variability of our data set. However, in some circumstances, mainly those related to the FE estimates, the estimated impact of public investment on corruption relies only on the “within variations” of the data. Thus, we close this part of the analysis looking at a set of results which only rely on the cross-sectional variability of the data. In particular, we regress the average number of per capita corruption crimes, over the period of interest, on the average value of per capita infrastructure investment; in this way only the “between variation” of the variables becomes relevant. Moreover, we also allow for the average value over time of $IG(i) \cdot \cdot$, the initial level of value added per capita, $VA_{t0}$. The latter is introduced as a proxy for the level of inequalities among provinces.\footnote{Note that if we assume that low income areas receive more in terms of public investment than other areas, then by omitting to control for per capita income we may infer a positive relationship between corruption and public investment, eventually only because of the exclusion of a relevant variable.}

Table 5 again shows that a positive relationship between corruption and public investment emerges 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. This conclusion is fully confirmed looking at the three categories of public investment (results not reported).

4.2 Embezzlement across Italian regions

In this section we investigate the relationship between corruption and public investment by measuring corruption as the number of public officials convicted for the crime of embezzlement; the spatial dimension is now represented by 19 Italian regions since data at a more disaggregated level are not available. Moreover, in this case we also control for public consumption and other determinants of corruption as suggested by the literature on the topic.

Public Consumption. The key assumption of the analysis is that corruption may feed on infrastructure investment mainly because of the high discretionary power that public officials in charge of managing this type of funds entail. There is no clear presumption, instead, on the sign of the relationship, if any, between corruption and public consumption. A positive relationship might emerge if the same argument raised for public investment applies to a large share of such expenditure. However, in general much current government spending reflects previous commitments as it consists of salaries paid to public employees; as regards this type of expenditure we do not expect any relationship at all with corruption. In any case, public consumption is likely to be correlated with public investment so that to ascertain the impact of the latter on corruption it may be worthwhile to control for the former.

Income measures the per capita gross domestic product. This variable

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22Table 5 also reports results allowing for the average value of public consumption per capita, \( CG \), the average value of police per capita, \( police \), and its squared value, \( police^2 \) among the regressors. Note, however, that the cross-sectional variability of these variables is regional.

23As usual in regional analysis of Italy, we consider Valle D’Aosta and Piemonte as an unique region; thus, the total number of regions we refer to is 19. See the appendix for further details on the definitions of the variables.
is considered for at least two reasons. First, the theoretical literature points out that income has a discouraging effect on corruption; such negative correlation has been recently documented with cross-country regressions (Treisman, 2000). Second, since in Italy public investment represents a main policy instrument to promote convergence within the country, a negative correlation between income and public investment, across regions, applies. Thus, controlling for regional income is a way to reduce the risk of spurious correlation between corruption and investment.

Police is a proxy of the rate of deterrence which attains to the probability of crime detection. This variable is entered the estimated equation with linear and quadratic terms to take into account its potential non-linear impact on corruption. In general, given that it is reasonable to assume that the number of crimes committed is higher than the number of crimes detected, it follows that an increase in the probability of detection both determines more people arrested and lower incentive to misbehave. Hence, an U-relationship between crime detection and the rate of deterrence could emerge.\footnote{Remember that the number of condemned public officials refers to the region where the crime was effectively committed and the year considered is that in which the condemn is pronounced.}

\textit{Trial}. A peculiar feature of the Italian judicial system is the difference in the length of trials across regions. Hence, we also add to the set of regressors two measures of the duration of the trials, that is \textit{Trial-F} and \textit{Trial-S}, which are relative, respectively, to the first degree and second degree levels of judgement. We expect a negative effect on the dependent variable since the longer is the duration of a trial the lower is the number of public officials convicted per year.

Finally, we also control for unobserved heterogeneous effects at regional levels and allow for calendar year dummies.

Table 6 presents the results of estimating a parsimonious specification for both periods of interest, that is before and after the shock of \textit{Mani Pulite}.\footnote{To save on degrees of freedom we report results based on regressions where the vari-}
All results are based on the FE estimators due to the correlation between unobserved heterogeneous effects and the other regressors. In general, coefficients estimates confirm the main conclusion entailed before that public investments in infrastructure, in particular those relative to Buildings, Sanitation, and Reclamation, positively affect corruption before the condemnns related to Mani Pulite and that such relationship breaks down after Mani Pulite. No significative relationship, instead, is detected between corruption and public investment in roads, railroads, and other transportation infrastructure. Moreover, the table also suggests that some type of public consumption may have tempted bureaucrats to be corrupted. 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, too. We believe to be suggestive that, differently from other types of current spending, the social security expenditure increased substantially during the 1980s and its management is in part appointed to local bureaucrats entailing substantial discretionary power. Thus, we interpret this finding as supporting the hypothesis that eventually corruption is tied to those types of government intervention characterized by discretionary power of public officials in the management of public funds.

Looking at the rest of regressors it follows that the coefficient of Income is estimated negative, as expected, and statistically significant while all other variables do not seem to affect corruption in a relevant way.  

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.  

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. As the FE estimator implies that it is solely the temporal variability that accounts for estimating the impact of any variable, the effect of Police does not point out.
5 Conclusions

Looking at Italy since the 1980, this paper provides strong support to the hypothesis that corruption — defined as the misuse of public office for private gain — is eventually tied to those types of government intervention characterized by high discretionary power of public officials in the management of public funds. At the same time, the 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 investigates the impact in deterring bureaucratic corruption of the massive anti-corruption campaign named *Mani Pulite*, which was carried out by a pool of Italian judges during the 1990s. Actually, after an increasing trend culminated in the prosecutions related to *Mani Pulite*, corruption in Italy decreased steadily. 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 amount of public spending allocated by the governments among the Italian provinces. In particular, investment in social infrastructure such as various types of public buildings, swamp, and land reclamation as well as public spending in social security appear to have tempted bureaucrats to become corrupt; (ii) the prosecutions and convictions following *Mani Pulite* were effective in deterring corruption, mainly by breaking up its perverse relationship with public spending. The main evidence reported is robust to different types of estimators and measures of corruption.
References


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 corrptor’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.

The number of recorded (corruption) crimes for which the judicial authority has begun the penal action. All crimes comprised in the above classification are considered. Data are available at provincial level.

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. 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 in constant price, 1995.

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 classifica-
tion 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.

Gross domestic product. The gross domestic product is measured in millions of euro at constant prices 1995; 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 judicial proceedings pending in the regional courts, at the beginning and the end of each year, to the number of judicial proceedings, started and completed in the same year, times 365. 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).
Figure 1 – Corruption: Crimes prosecuted
Figure 2 – Embezzlement: Public Officials Convicted
Figure 3 – Embezzlement: Public officials convicted (in terms of the year when crimes were committed)
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Per capita</th>
<th>Per employee</th>
<th>Total</th>
<th>Per capita</th>
<th>Per employee</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimes reported</td>
<td>17,769</td>
<td>311</td>
<td>3,207</td>
<td>34,238</td>
<td>598</td>
<td>6,179</td>
<td>0.52</td>
</tr>
<tr>
<td>Public officials condemned</td>
<td>5,146</td>
<td>90</td>
<td>929</td>
<td>13,251</td>
<td>232</td>
<td>2,391</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Notes: Crimes reported refer to the number of corruption crimes for which the judicial authority has begun the penal action. Public officials condemned are those who experienced an irreversible provision of sentence, whatever is the phase and the degree of judgment. Values per capita or per employee are measured per million of inhabitants or per million 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 condemned and those reported.
## Table 2 – Descriptive Statistics: Corruption and public investment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation (Overall)</th>
<th>Standard Deviation (Within)</th>
<th>Standard Deviation (Between)</th>
<th>Time Span</th>
<th>Number of Cross-section Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corruption</td>
<td>0.028</td>
<td>0.0340</td>
<td>0.0313</td>
<td>0.0132</td>
<td>1980-2001</td>
<td>95</td>
</tr>
<tr>
<td>Embezzlement</td>
<td>0.003</td>
<td>0.0034</td>
<td>0.0033</td>
<td>0.0009</td>
<td>1980-2000</td>
<td>19</td>
</tr>
<tr>
<td>Total Investment</td>
<td>0.166</td>
<td>0.1292</td>
<td>0.0849</td>
<td>0.0978</td>
<td>1980-1999</td>
<td>95</td>
</tr>
<tr>
<td>Buildings</td>
<td>0.045</td>
<td>0.0398</td>
<td>0.0246</td>
<td>0.0314</td>
<td>1980-1999</td>
<td>95</td>
</tr>
<tr>
<td>Sanitation</td>
<td>0.090</td>
<td>0.0875</td>
<td>0.0615</td>
<td>0.0625</td>
<td>1980-1999</td>
<td>95</td>
</tr>
<tr>
<td>Transports</td>
<td>0.060</td>
<td>0.0593</td>
<td>0.0464</td>
<td>0.0371</td>
<td>1980-1999</td>
<td>95</td>
</tr>
</tbody>
</table>

*Notes:* Corruption is the number of overall corruption crimes for which the judicial authority has begun the penal action per thousand of inhabitants, by province. Embezzlement is the number of public officials condemned for embezzlement per thousand of inhabitants, by region. 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

<table>
<thead>
<tr>
<th></th>
<th>Pooling</th>
<th>Pooling</th>
<th>FE</th>
<th>RE</th>
<th>FE–AR(1)</th>
<th>RE–AR(1)</th>
<th>GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG (−2)</td>
<td>0.0234* (2.33)</td>
<td>0.0217* (2.21)</td>
<td>0.0255* (2.53)</td>
<td>0.0234* (2.25)</td>
<td>0.0259* (2.55)</td>
<td>0.0231* (2.53)</td>
<td>0.0428** (3.60)</td>
</tr>
<tr>
<td>IG (−3)</td>
<td>0.0116 (1.00)</td>
<td>0.0158 (1.39)</td>
<td>0.0184 (1.69)</td>
<td>0.0168 (1.57)</td>
<td>0.0201 (1.94)</td>
<td>0.0143 (1.52)</td>
<td>0.0226* (1.99)</td>
</tr>
<tr>
<td>IG (−4)</td>
<td>−0.0057 (−0.57)</td>
<td>−0.0015 (−0.16)</td>
<td>−0.0007 (−0.07)</td>
<td>−0.0013 (−0.14)</td>
<td>0.0049 (0.49)</td>
<td>0.0012 (0.14)</td>
<td>0.0030 (0.25)</td>
</tr>
<tr>
<td>IG₀ (−2)</td>
<td>−0.0026 (−0.15)</td>
<td>0.0079 (0.47)</td>
<td>0.0039 (0.22)</td>
<td>0.0110 (0.69)</td>
<td>0.0110 (0.69)</td>
<td>−0.0018 (−0.08)</td>
<td></td>
</tr>
<tr>
<td>IG₀ (−3)</td>
<td>0.0017 (0.09)</td>
<td>0.0086 (0.44)</td>
<td>−0.0017 (−0.09)</td>
<td>0.0068 (0.39)</td>
<td>0.0068 (0.39)</td>
<td>−0.0074 (−0.35)</td>
<td></td>
</tr>
<tr>
<td>IG₀ (−4)</td>
<td>−0.0476** (−2.64)</td>
<td>−0.0336* (−1.97)</td>
<td>−0.0373* (−2.01)</td>
<td>−0.0265 (−1.64)</td>
<td>−0.0265 (−1.64)</td>
<td>−0.0445* (−1.97)</td>
<td></td>
</tr>
<tr>
<td>NC (−1)</td>
<td>0.2424** (8.56)</td>
<td>0.1109** (4.45)</td>
<td>0.0293** (4.87)</td>
<td>0.0360** (6.21)</td>
<td>0.0432** (4.63)</td>
<td>0.0389** (3.47)</td>
<td>0.0509** (2.49)</td>
</tr>
<tr>
<td>IG (i)</td>
<td>0.0293** (4.87)</td>
<td>0.0360** (6.21)</td>
<td>0.0432** (4.63)</td>
<td>0.0389** (3.47)</td>
<td>0.0509** (2.49)</td>
<td>0.0386** (3.47)</td>
<td>0.0684** (3.92)</td>
</tr>
</tbody>
</table>

| N. Obs.         | 1710     | 1710     | 1710     | 1710     | 1615     | 1710     | 1615     |
| R² within       | 0.14     | 0.14     | 0.10     | 0.14     | 0.10     | 0.14     |
| R² overall      | 0.02     | 0.11     | 0.12     | 0.11     | 0.12     |

Notes: The definitions and data sources of the variables are in the appendix; IG and IG₀ refer to the sum of the coefficients relative to the three lags of public investment considered. All regressions, but that reported in the first column, contain year dummies (results not reported). FE stands for fixed effects; RE stands for random effects; GMM refers to the Arellano and Bond estimator for dynamic panel. The t–values are in parentheses; significant coefficients are indicated by * (5 percent level) and ** (1 percent level).
Table 4 – Corruption and Infrastructure Investment: The Impact of Mani Pulite

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IG (–2)</td>
<td>0.0400** (2.90)</td>
<td>0.1837** (3.48)</td>
<td>0.0092</td>
<td>0.0456* (2.35)</td>
<td>0.0413</td>
<td>0.0018</td>
<td>–0.0144</td>
</tr>
<tr>
<td></td>
<td>0.0171 (0.64)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>IG (–3)</td>
<td>0.0389** (3.14)</td>
<td>–0.0527* (–2.07)</td>
<td>0.1001*</td>
<td>–0.1597* (–2.15)</td>
<td>0.0578** (3.33)</td>
<td>–0.0534</td>
<td>0.0067</td>
</tr>
<tr>
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</tr>
<tr>
<td>IG (–4)</td>
<td>–0.0012 (–0.09)</td>
<td>–0.0099 (–0.40)</td>
<td>0.0527</td>
<td>–0.0647 (–0.80)</td>
<td>–0.0103 (–0.57)</td>
<td>–0.0500</td>
<td>0.0095</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG (–2; –3)</td>
<td>0.0789** (4.50)</td>
<td>–0.0356 (–1.08)</td>
<td>0.2838**</td>
<td>–0.1505 (–1.30)</td>
<td>0.1034** (4.46)</td>
<td>–0.0121</td>
<td>0.0085</td>
</tr>
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<tr>
<td>IG (–3)</td>
<td>0.0777** (3.59)</td>
<td>–0.0455 (–1.07)</td>
<td>0.3365**</td>
<td>–0.2152 (–1.47)</td>
<td>0.0931** (3.24)</td>
<td>–0.0621</td>
<td>0.0180</td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Obs.</td>
<td>950</td>
<td>665</td>
<td>950</td>
<td>665</td>
<td>950</td>
<td>665</td>
<td>950</td>
</tr>
<tr>
<td>Zero residuals</td>
<td>–10.03 (0.00)</td>
<td>–6.65 (0.00)</td>
<td>–10.10</td>
<td>–6.65 (0.00)</td>
<td>–10.05</td>
<td>–6.35 (0.00)</td>
<td>–9.83 (0.00)</td>
</tr>
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<td>autocovariance</td>
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<td></td>
</tr>
<tr>
<td>of order 1: test</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Zero residuals</td>
<td>0.32 (0.75)</td>
<td>–0.72 (0.47)</td>
<td>0.41</td>
<td>–1.01 (0.31)</td>
<td>0.58</td>
<td>–1.04 (0.29)</td>
<td>0.35</td>
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<tr>
<td>autocovariance</td>
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<td></td>
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<td></td>
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<tr>
<td>of order 2: test</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Estimation is by Arellano-Bond method for dynamic panel. All regressions contain year dummies, province dummies, two lags of the dependent variable, and the variable IG (results not reported); IG (–2; –3) refers to the sum of the coefficients relative to lags 2 and 3, while IG refers to the sum of all three lags considered. Buildings: public buildings, schools, etc.; SER: Sanitation, Energy, and Reclamation; Transports: roads and airports, railroads and other kind of transportation, ports and rivers, telecommunications.
Table 5 – Corruption and Infrastructure Investment: Between estimates

<table>
<thead>
<tr>
<th></th>
<th>Before Mani Pulite</th>
<th></th>
<th>After Mani Pulite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>0.0168**</td>
<td>0.0199**</td>
<td>0.0217**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5.41)</td>
<td>(5.50)</td>
<td>(4.56)</td>
</tr>
<tr>
<td></td>
<td>IG</td>
<td>0.0404*</td>
<td>0.0443*</td>
<td>0.0456*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.33)</td>
<td>(2.18)</td>
<td>(2.31)</td>
</tr>
<tr>
<td>IG(i)</td>
<td>−0.0014</td>
<td>−0.0015</td>
<td>−0.0012</td>
<td>0.0078</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(−0.98)</td>
<td>(−1.11)</td>
<td>(−1.25)</td>
</tr>
<tr>
<td>VA&lt;sub&gt;81&lt;/sub&gt;</td>
<td>−0.0006</td>
<td>−0.0006</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(−1.34)</td>
<td>(−1.22)</td>
<td></td>
</tr>
<tr>
<td>VA&lt;sub&gt;95&lt;/sub&gt;</td>
<td></td>
<td></td>
<td>−0.0010</td>
<td>−0.0010</td>
</tr>
<tr>
<td>CG</td>
<td></td>
<td></td>
<td>0.0005*</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.56)</td>
<td>(−1.68)</td>
</tr>
<tr>
<td>Police</td>
<td>−0.0004**</td>
<td>0.0001</td>
<td>0.0100</td>
<td>0.0090</td>
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<tr>
<td></td>
<td></td>
<td>(−3.00)</td>
<td>(0.93)</td>
<td>(1.75)</td>
</tr>
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<td>Police&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td>9.29e-07**</td>
<td></td>
<td>−1.28e-07</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.27)</td>
<td>(−0.40)</td>
<td></td>
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<tr>
<td>N. Obs.</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
<td>0.25</td>
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</table>

Notes: OLS regressions with heteroskedasticity-robust standard errors. T-statistics are reported in parenthesis; * and ** denote statistical significance at 5 and 1 percent level, respectively. The time span before (after) Mani Pulite is 1980-94 (1995-2001), IG refers to the time average of total infrastructure investment per capita; a similar definition applies for IG<sub>(i)</sub> CG and Police. VA<sub>81</sub> and VA<sub>95</sub> refer to the value added per capita in 1981 and 1995, respectively. (Note that for the regression before Mani Pulite we use data on value added in 1981 because data relative to 1980 are not available).
Table 6 – Embezzlement and Infrastructure Investment

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<tr>
<td></td>
<td>IGB</td>
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<td>IGT</td>
<td>GDP</td>
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<td>0.0193**</td>
<td>0.0162*</td>
<td>0.0175*</td>
<td>0.0541</td>
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<td></td>
<td>(2.59)</td>
<td>(2.09)</td>
<td>(2.18)</td>
<td>(1.74)</td>
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<td>0.0127*</td>
<td>0.0134*</td>
<td>0.0122*</td>
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<td>(2.54)</td>
<td>(2.32)</td>
<td>(1.05)</td>
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<td>–0.0013</td>
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<td>0.0000</td>
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<td>(–0.35)</td>
<td>(–0.19)</td>
<td>(–0.08)</td>
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<td>0.0070</td>
<td>0.0064</td>
<td>0.0052</td>
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<td>(0.95)</td>
<td>(0.87)</td>
<td>(0.67)</td>
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<td>–0.0058</td>
<td>–0.0071</td>
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<td>(–0.24)</td>
<td>(–0.59)</td>
<td>(–0.67)</td>
<td>(–0.46)</td>
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<tr>
<td></td>
<td>0.0187**</td>
<td>0.0196**</td>
<td>0.0214**</td>
<td>0.0072</td>
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<tr>
<td></td>
<td>(2.91)</td>
<td>(3.02)</td>
<td>(3.27)</td>
<td>(1.46)</td>
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<tr>
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<td>–0.0005</td>
<td>–0.0008</td>
<td>–0.0014</td>
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<tr>
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<td>(–1.46)</td>
<td>(–1.93)</td>
<td>(–1.08)</td>
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<tr>
<td>Police and Trials</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>N. Obs.</td>
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<td>228</td>
<td>114</td>
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<tr>
<td>R² within</td>
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<td>0.66</td>
<td>0.30</td>
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<td>R² overall</td>
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<td>0.42</td>
<td>0.41</td>
<td>0.03</td>
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<td>Zero residuals</td>
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<td>0.0607</td>
<td>0.0252</td>
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<td>autocovariance of order 1: test</td>
<td>(0.98)</td>
<td>(0.81)</td>
<td>(0.33)</td>
<td>(–1.86)</td>
</tr>
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</table>

Notes: Results are relative to the FE estimator. All regressions contain 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. Regressions reported in the second and fourth columns also contain GDP with lags –2 and –3. Regression reported in the third column also contains police and police squared with lags –2 and the contemporaneous values of Trials–F and Trial–S. Coefficients reported are relative to the sum of lags –2 and –3. Coefficients relative to each lag of public consumption and GDP as well as those relative police, trials, and year and regional dummies are not reported.