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RESEARCH PAPER - EUROPE AND ITALY

Corruption and the political system: some evidence from Italian regions

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Abstract
This paper examines the relationship between the political system and corruption from a novel perspective. The main idea is that the electoral system and competition among political parties have an impact on grand corruption, but not on petty corruption. Using Italian regional data on regional elections and corruption, the paper shows how an increase in the disproportionality outcome of an election, or an increase in the level of competition between parties, reduces grand corruption, while it has no effect on petty corruption. Yet the combined effects of the extent of proportionality in the electoral outcome and political competition may yield different final effects on grand corruption. The paper suggests major policy implications to fight corruption by fostering less distorting political systems.

Keywords Grand corruption · Petty corruption · Political competition · Electoral formula

JEL Classification C23 · D72 · D73 · H57 · K16

1 Introduction

Plenty of anecdotal evidence from all over the world suggests that there is a link between corruption and the political system. The intuition behind this is simple: the two

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are intertwined. The distribution of political power influences government decisions, public spending and the regulatory framework which, in turn, affect the incentives of public officials to bribe or be bribed. Moreover, the political system can also affect corruption via the electoral incentives it creates for the candidates. There are thus two main channels through which the political system may affect corruption. The first is by increasing incentives towards corruption for bureaucrats in charge through their discretionary power; the second by favouring corruption among candidates (and thus by the electoral dynamic, both in terms of votes and accountability). In this work, we use a quantitative analysis to assess the impact of the political system's characteristics on corruption. After all, corruption is deeply rooted in the opportunity bureaucrats and politicians have to extract rent, and hence it is linked to their power to take discretionary and unaccountable decisions on government spending (Aidt 2003; Baldi et al. 2016; Mauro 1998). The political system influences this power and discretion: it allows red tape to be deployed and the regulatory system to be used as a tool to extract rent from firms and private individuals.

Yet it is not easy to determine to what extent the nature of the political system can affect corruption. Problems of identification and measurement can set serious obstacles to investigation. First, the political system is a complex concept, difficult to operationalize into a variable. Second, data on corruption and the political context are often geographically misaligned, which is why local variations may interfere with measuring the effects of the national political system on corruption. Finally, corruption itself is a complex and multifaceted phenomenon, and it is not easy to disentangle which corruption crimes are really linked to the political context. In this work, we model the political system through the interaction between the party system and electoral formula. In most countries, the latter two are combined to achieve specific objectives of incentives and representativeness.

Among all the characteristics that shape political systems, the two most prominent are the degree of competition between parties and the electoral formula (Alfano and Ippolito 2020). Indeed, the level of competition between parties, their number and relative strength (e.g. the party system) strongly influence the attitude of politicians towards the electorate, their choices and government policies. Analogously, the electoral formula defines how much political power competing parties may obtain by running in the election and, ultimately, the political equilibrium in the system. The electoral formula and the party system influence each other, with the result that in reality the political context may take very different configurations. Already Duverger (1972) attempted to identify the cause-effect relationship between these two political factors, and his theory has since been debated and often criticised for lack of empirical feedback. Of course many other factors may affect the impact of the political system on corruption (such as regulations of electoral campaigns, rules on term limits, electoral quotas, size of voting districts, party lists, and so on). Yet the very heart of the political system which strongly influences agents' behaviour lies in the relative strength of potential candidates, on the system of relationship between the different political centres of power, and on the way the power itself is divided. For this reason we choose to focus on these features to analyse the impact of the political system on corruption.

In a democratic environment, electoral rules determine citizens' political representation and candidates' accountability. There are two main families of electoral formulas: the majoritarian and the proportional systems. These involve different voting mechanisms and electoral districts by size. In majoritarian systems, citizens express their preference directly by voting for a specific candidate while the political party with the relative majority of votes obtains the absolute majority of seats. These systems are usually characterised by small electoral districts. In proportional systems, instead, citizens may vote for different lists of candidates which have been pre-filled by political parties. These systems involve larger districts and a proportional correspondence between the votes obtained by a party and the number of seats reserved for it. In reality, no system is perfectly proportional or majoritarian; each system has an electoral formula that can be positioned on the continuum between an ideal proportional and an ideal majoritarian system, judging from the way it transforms votes into legislative seats. As a matter of fact it involves some degree of proportionality (or equivalently of majoritarian premium).

The literature analysing the effects of the political system on corruption has mainly focused on these two features to establish the contours of the political context. It has been suggested (Kunicová and Rose-Ackerman 2005; Persson et al. 2003) that proportional systems, rather than majoritarian, trigger opportunistic behaviour since politicians in the former are less accountable for their choices. However, Myerson (1993) and Ceron and Mainenti (2018) put forward the opposite idea that proportional systems reduce corruption, because they lower barriers to entry in the political arena. Also, the evidence on the effect of the political party system on corruption is mixed and inconclusive. Bardhan and Yang (2004) found that political competitiveness increases the level of corruption since it increases electoral campaign costs. Persson et al. (1997) and Mulligan and Tsui (2006) found, instead, that political competition can reduce corruption since it increases the value of good reputation and politicians' opportunity costs. More recently, Alfano et al. (2013) found that the proportional system may contribute to reduce corruption, both directly and indirectly, through greater political competition.

Hence, we can conclude that the literature offers mixed results in this respect. A possible explanation for this ambiguity lies in the fact that disentangling the effects of political competition and the electoral formula on corruption is far from straightforward. One influences the other, and both affect corruption. For instance, more competition between parties may exert different effects on corruption in majoritarian and proportional systems. Also, the operationalization of corruption might be misleading in this empirical contributions. Corruption is a composite and complex phenomenon, for which data measuring corruption often include crimes of quite diverse nature: crimes against the public administration, fraud, bribery by high-ranking officials or small corruption, just to mention a few. If the investigation focuses on the analysis of the relationship between broad-spectrum variables, it is not important to distinguish between the types of corruption crimes. However, this is not the case if one seeks to investigate the effects of the political system on corruption. Indeed, only specific types of corruption crimes by their inner nature are linked to the political framework. Notably, we believe that only crimes that the literature has identified as

"grand corruption", as opposed to "petty corruption", are intimately linked to how political power is distributed.

Transparency International[1] defines quite clearly grand and petty corruption: *grand corruption* occurs at a high level of the State apparatus (e.g. at a political level), while *petty corruption* refers to the everyday abuse of public power by low- and mid-level public servants. Evidently, the distinction hinges on the public power of the civil servant involved in the crime: grand corruption mainly requires the involvement of bureaucrats occupying higher positions in the public apparatus, and with relatively great power, while petty corruption refers to crimes committed by officers occupying marginal positions. This distinction has had some success in the literature, especially in qualitative and descriptive studies (Lambert-Mogiliansky et al. 2007; Rose-Ackerman 1999), but very few empirical studies explicitly address this difference, possibly due to the challenge constituted by having such specific data.

Our notion is that the political system is strongly linked to grand corruption, rather than petty corruption. By influencing the distribution of political power among competing parties and individuals, the probability of incumbent parties being replaced and the value of reputation in electoral competitions, the political system can influence the ability of politicians and bureaucrats to extract rent. We can infer that the political system influences grand corruption, rather than petty, since it is the former that mainly refers to the power and ability to extract rent and to divert public resources. Higher-ranking officials and politicians can modify rules, influence laws, inflate the volume of government expenditure and, most importantly, produce red tape. And red tape is, indeed, one of the most important channels to artificially produce and extract rent (Guriev 2004; Mauro 1995). Petty corruption, instead, concerns the everyday abuse of public power by low- and mid-level public servants in their provision of basic goods or services, such as care services in hospitals or simple authorisation in municipalities.

In light of the above considerations, the present contribution aims to assess via a quantitative analysis the impact of the political system on grand and petty corruption. We expect the political system to affect the former type of corruption, but not the latter, by establishing a system of incentives more or less favourable to grand corruption (both due to the possibility afforded to those in power in terms of degree of discretionary power, and to the effects on the selection of these people created by the electoral dynamics, the candidates' quest for votes, and their accountability toward the electorate).

In order to study this relationship in an empirical perspective, we exploit the Italian criminal code to build a dataset with regional data, which allows us to distinguish between grand and petty corruption in the years from 2000 to 2015, which also includes operationalization of Italian regional political systems. The novelty of this work is at least twofold. First, unlike previous similar studies (Alfano et al. 2013), we rely on regional (rather than national) elections. This provides us with a closer link to corruption-related crimes committed at regional level. Indeed, it is reasonable to argue that corruption often entails relationships between local firms and individuals with politicians of the same region rather than with a member of the national parliament both because of a closer relationship between voters and elected representatives and

[1] https://www.transparency.org/what-is-corruption.

also because of a looser control over the transparency of public decisions at a local level. This applies especially to Italy, a country where public expenditure at a regional level is very significant. Second, although several theoretical works deal with grand and petty corruption, few empirical studies attempt to measure it and, to the best of our knowledge, there is no work that singles out the interaction between the nature of the political system and grand corruption and petty corruption. We believe that, through this approach, we are able to distinguish between the two kinds of corruption, better measuring the one which the political system should theoretically affect, and potentially offering an explanation for the heterogeneity of results we find in the literature.

The results, obtained through different generalised methods of moments (GMM) estimation procedures, confirm our hypothesis: the electoral formula and the party system affect grand corruption and not petty corruption. Moreover, it is worth pointing out that the effect of the political system on overall corruption is negligible. Specifically, we find that both higher political competitiveness and higher disproportionality in electoral outcomes have a dampening effect on grand corruption. Yet the relationship between the political system and grand corruption is more complex than this: the electoral formula interacts with the party system and, in the presence of greater political competition, the effect of the electoral formula may be reversed. In other words, a more disproportional electoral outcome may lead to an increase in grand corruption. This is likely to happen since, as competition between parties increases, the power of the party which has the majority of votes decreases, as does the need to win over the electorate (e.g. by bribing and increasing pork-barrel spending) with the result that corruption increases.

The rest of the paper is organised as follows. The next section presents a brief literature review on the subject in question. Section 3 describes the data and Sect. 4 the estimation strategy. Section 5 shows and discusses the results. Section 6 concludes.

2 Literature Review

The evidence on the nature of the interrelationship between the political system and corruption is mixed and fuzzy. According to Myerson (1993), proportional systems with large electoral districts and small entry barriers entail a reduction in corruption, since proportionality increases competition and the value of reputation. Focusing on the effect of corruption on the distribution of votes among parties, Ceron and Mainenti (2018) found that in a system with the indirect appointment of politicians, such as the proportional system, corruption has a greater negative impact on political parties' electoral performance. For this reason, party leaders should pay more attention when they fill the party closed-list to avoid the possibility of corrupt candidates damaging the party image and the electoral result. Similarly, Chang and Golden (2007) found that a closed-list system, in which the selection of candidates is controlled by the party leadership at national level, results in a lower level of corruption than an open-list system, but only if the size of the electoral district exceeds a threshold level.

Other empirical evidence points in the opposite direction (Persson et al. 2003; Kunikova and Rose-Ackerman, 2005; Gagliarducci et al. 2011) and suggests that corruption tends to be higher in proportional systems. Since majoritarian systems allow the direct selection of candidates, elected politicians are inclined to show greater responsibility towards their constituency and to display less opportunistic behaviour. Such arguments are corroborated by Ferraz and Finan (2011) who argue that electoral rules which increase political accountability reduce politicians' rent-seeking behaviour. The theme of political accountability is strictly connected with the emergence of corruption crimes among politicians. Tavits (2007) finds that countries with institutions that enable clearer identification of political responsibilities show greater political accountability and hence lower levels of corruption. The key role of political accountability in reducing corruption is also confirmed by the cross-country panel study by Lederman et al. (2005), which suggests that countries with stronger political institutions that increase accountability, such as democracies and parliamentary systems, face lower levels of corruption.

Yet the nature of the interrelationship between the political system and corruption is even more complex. Not only, in reality, are electoral systems neither completely majoritarian nor totally proportional and hence the evidence is influenced by the "degree" of proportionality of the electoral rules, but also the effects of the electoral system on corruption depend on the degree of political competition among political parties: stronger political competition increases incumbent politicians' accountability and hence their effort to abide by the law to increase the likelihood of being reappointed (Persson et al. 1997) or to avoid being removed or replaced (Mulligan and Tsui 2006). Similarly, Nyblade and Reed (2008) find that political experience and electoral security boost the likelihood of corruptive acts of politicians. By contrast, Bardhan and Yang (2004) argue that political competition may be so excessive as to reduce the likelihood of re-election with the result that incumbent politicians may display short-sighted behaviour and maximise rent-seeking opportunities. Along these lines, Heywood (1996) had already pointed out that excessive political competition might produce greater incentives for corruption. Indeed, more competitive elections demand more funds which, in turn, may lead politicians to misuse their public power to better finance their electoral campaign. Furthermore, a strong political competition could foster the role of some interest groups to whom politicians may turn in exchange for political support. For example, Accardo et al. (2021) find that, in the presence of higher political competition, the Italian areas with organized crime show higher shares of votes cast for the political party usually promoted by criminal organizations. Similarly, Solé-Ollé and Viladecans-Marsal (2012) find that higher political competition reinforces the power of land developer lobbies and hence reduces government grants of new land for rural development. On the other hand, lower political competition may hinder economic growth. In this respect, Besley et al. (2010) find that the US states with lower levels of political competition face anti-growth policies, such as a higher level of taxation and lower public investments.

Despite the fuzzy evidence and the bulk of arguments on the complex interaction between the political system and corruption, the literature has mainly neglected the possible joint effects of electoral rules and political competition on corruption. To the best of our knowledge, the only attempt in this direction comes from Alfano et al.

(2013) who analyse the combined impact of electoral rules and degree of political competition on corruption offences. Using Italian data, the authors found that a proportional system may contribute to reduce corruption also in the presence of political competition, depending on the direction of variation and the magnitude of both these features of the political system. Still, the results are somewhat unclear, with the sign of the impact of the political system on corruption depending on the degree of proportionality combined with the level of competition among parties.

As suggested above, we believe that the ambiguity in the evidence mainly depends on two factors, which also help to understand the main differences that distinguish our contribution from Alfano et al. (2013). First, the operationalization of the dependent variable, i.e. how corruption crimes are defined and measured. Corruption is a complex phenomenon and the kind of crimes that are strictly related to the structure of the political system mainly refer to the type of corruption defined as "grand corruption". Such crimes, as opposed to petty corruption, often require bureaucratic power at high level. On these grounds, we take into account this possibility and, unlike the previous literature, we operationalize corruption by distinguishing between grand and petty corruption. Moreover, our analysis focuses on regional elections, and not on the regional outcome of national elections, as in other contributions (see for instance, Alfano et al. 2013). Regional data allow spending decisions at the local level to be linked more closely to local corruption rather than to incentives coming from national elections.

In recent decades, some studies have attempted to investigate corruption by distinguishing between grand and petty. Bohn (2013) analysed the nexus between inflation, on the one hand, and grand and petty corruption, on the other. The author found that grand corruption allows the dangerous effect of inflationary bias to be weakened, both in developing countries and in advanced Western economies. Kenny (2009) examined the impact of corruption in infrastructures and concluded that corruption perception indexes are just proxies for petty corruption, rather than grand corruption, at least in the context of infrastructures. More recently, Sommer (2017) studied the link between grand and petty corruption and deforestation in a cross-section analysis of many different nations. The author employed the public sector indicators from the V-Dem dataset (Coppedge et al. 2016) and thus explicitly proxied the two different kinds of corruption, which may lead to deforestation and a loss of environmental quality through different channels. The results show that grand and petty corruption have a different impact on deforestation.

Mashali (2012) analysed the relationship between perceived grand and petty corruption in Iran, finding that they are strongly and positively correlated. Nystrand (2014) studied the dynamics of conflict caused by petty and grand corruption in northern Uganda. His study highlights the fact that different kinds of corruption affect conflict dynamics in different ways. The work shows that in northern Uganda grand corruption is related to conflict dynamics, while petty is generally not.

3 Data

We build a panel dataset of 20 Italian regions in the time interval 2000–2015. Table 1

Table 1 Variable definitions, sources and summary statistics

Variable	Description	Sources	Obs	Mean	Std. Dev	Min	Max
General corruption	Number of crimes reported under Artt. 317 and 321 of the Italian criminal code per 100,000 inhabitants	Criminal justice statistic yearbook (ISTAT)	320	0.993	1.174	0.000	13.555
General corruption 2 (alternative measure)	Number of crimes reported under Artt. 317, 318, 319, 319ter, 320 and 321 of the Italian criminal code per 100,000 inhabitants	Criminal justice statistic yearbook (ISTAT)	320	1.626	1.444	0.000	14.186
Grand corruption	Number of crimes reported under Artt. 318 and 319 of the Italian criminal code per 100,000 inhabitants	Criminal justice statistic yearbook (ISTAT)	320	0.565	0.428	0.000	2.770
Petty corruption	Number of crimes reported under Art. 320 of the Italian criminal code per 100,000 inhabitants	Criminal justice statistic yearbook (ISTAT)	320	0.032	0.066	0.000	0.789
INHHI	Inverted Herfindahl–Hirschman Index, Normalized between 0 and 1	Authors' calculation from: - Historic Archive of Elections (Ministry of the Interior—Department for Internal and Local Affairs) - Regional Councils and Special Constitution regions website	320	0.889	0.048	0.779	0.971
GDI	Gallagher Disproportionality Index	Same sources of INHHI	320	0.055	0.026	0.019	0.172
Rae	Rae disproportionality index	Same sources of INHHI	320	1.406	0.605	0.589	4.440
Econ. Backwardness	Share of agricultural added value on GDP	Archive of the Regional Economic Accounts (ISTAT)	320	2.690	1.313	0.860	5.985

Table 1 (continued)

Variable	Description	Sources	Obs	Mean	Std. Dev	Min	Max
Publ. Investment	Public investment as percentage of GDP	Department of the General Accounting of the State of the Ministry of Economics and Finance (MEF)	320	1.651	1.140	0.172	8.351
Women	Women in regional government over men	Same sources as INHHI	320	0.282	0.308	0.000	2.000
Ln Population	Natural logarithm of the annual resident population at 1st January	Demographic Statistics (ISTAT)	320	14.464	1.062	11.686	16.118
Cooperativism	Percentage of employees of cooperative companies on total employees	Archive of local indicators for development policies (ISTAT)	320	4.305	1.086	2.715	7.248
Mafia infiltration	Number of local councils dismissed over mafia infiltration per 100,000 inhabitants	Authors' calculation from Archive of Department for Internal and Local Affairs (Ministry of the Interior)	320	0.160	0.576	0.000	0.511

summarises and describes the sources and presents a summary statistic of each of the variables in question.

We extracted the judicial data on charges of corruption-related crimes from the Criminal Justice Statistics Yearbook (CJSY), published by the Italian National Institute of Statistics (ISTAT).[2] The above data convey information on several crimes against the Public Administration (Book II, Title II of the Italian Criminal Code) and have already been exploited by previous empirical studies (Acconcia and Cantabene 2008; Alfano et al. 2013; Del Monte and Papagni 2001), in a form, however, that stretches beyond the boundaries of strictly-related corruption crimes. For example, these works include embezzlement and misappropriation which, we think, only marginally involve some form of corruption.

In an attempt to better define the contours of the offences that can be related to corruption, we only select some specific crimes from those listed in the Italian Criminal Code. Hence, in this specific form, the dataset we build is unique and different from those used by previous studies. More specifically, to delimit corruption crimes sensu stricto and to identify grand and petty corruption, we employ a regional breakdown of national data on charges related to offences falling under Articles 318 ("Corruption for performing act related to the official's office") and 319 ("Corruption in the performance of acts in breach of official duties") of the Italian Criminal Code as a proxy for grand corruption, and offences falling under Article 320 ("Corruption of a party in charge of a public service") as a proxy for petty corruption.[3] The difference between Articles 318 and 319, on the one hand, and 320 on the other, is not the nature of the offence but rather the public position of the bureaucrat committing the offence. Indeed, while Articles 318 and 319 stipulate the punishment for the "public official" who exercises deliberative, authoritative and certifying powers, and the politician who has legislative power when they receive or attempt to receive a bribe, Art. 320 is more general and stipulates, for the same crime, the punishment for a "person in charge of a public service". Evidently, with this distinction, the legislator aims to attach crucial importance to the role played by the bureaucrat in the public apparatus, and on the subsequent power he/she can exert. A public official or a politician may have more power to impose a bribe than an official entrusted with a public duty both because the power they exert is strictly related to their public position, and not simply to the specific duty, and because they can also increase the level of red tape, and hence rent extraction, by introducing new regulations and laws.

[2] We employ data on charges rather than on convictions for two main reasons. First, convictions for corruption are often pronounced many years after the crime occurred. This indeterminacy makes it difficult to determine a good lag structure of the variables, whereas charges of corrupting usually arise one year after the occurrence of the related crimes. Second, data on convictions are even more under-reported than those on corruption charges, given that in Italy many crimes are often time-barred or there is no conviction for procedural errors. This is in line with the literature showing that conviction rates are a feeble tool to curb corruption (Capasso et al. 2019).

[3] One could argue that the new anti-corruption measures adopted in Italy under Law no. 190/2012 could affect our estimates, at least starting from 2013 when the law came into force. Yet we do not believe this is the case for different reasons. First, Article 318 was renamed "corruption to perform the duties", but the legal bases of the crime have not been changed. Moreover, the penalties required by the reformed Articles 318 and 319 have been increased, but at the same rate of proportionality. Finally, the new anti-corruption law does not change the legal provisions of the crime or the underlying sentence which the Law requires under Article 320.

A corollary of this distinction is that Articles 318 and 319 cover corruption-related crimes generally committed by more "powerful" public officials which may usually involve larger levels of bribes (e.g. large public procurement contracts), while 320 refers to everyday abuse of public power by low- and mid-level public servants in implementing their public duties which may usually entail the provision of basic goods or services (e.g. hospitals, schools, etc.) or the simple issuing of public authorisations or documents. For such features, we believe that 318 and 319 may detect offences which can be labelled as grand corruption, while 320 covers offences usually labelled as petty corruption. It should be noted that corruption is based on the relative power of public officers (deliberative, authoritative and certifying powers in the case of grand corruption and merely executive functions in the case of petty corruption) rather than by the relevance and magnitude of the object of the corruption agreement. It is obviously possible that a large public project is affected by grand and petty corruption simultaneously or by petty alone rather than by grand corruption. Nevertheless, our measure of grand corruption seems a good proxy to represent the misuse of public power at high levels of public apparatus or in the political spheres. In this respect, our data on the distribution of grand corruption among the 20 Italian regions (see Fig. 1) are corroborated by the study of Sciarrone (2017) that shows that in the time span of our analysis the regions with the highest rate of political corruption are Campania, Sicily, Calabria, Puglia and Lazio.

Finally, to test the impact of the political system on corruption as a whole we employ a proxy for general corruption previously adopted by Capasso and Santoro (2018). This proxy is given by the sum of the offences falling under Article 317-

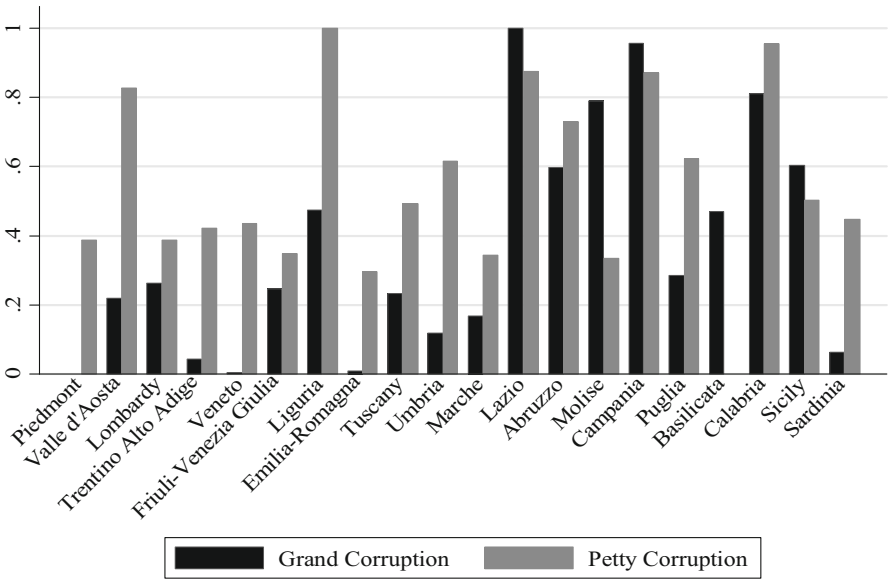

Fig. 1 Grand and petty corruption in Italy (average by region). Source: authors' calculations based on ISTAT data related to corruption crimes reported per 100,000 inhabitants (Annals of Judicial Statistics). All values are normalized between 0 and 1

which punishes only the bureaucrats– and offences falling under Article 321 which summarises the punishments against the private corruptor. The main reason why we do not use the sum of Articles 318–320 as a proxy of general corruption is that the above-mentioned articles do not encompass all types of corruption, such as Art. 317 "extortion committed by a public servant", Art. 319-ter. "corruption in judicial deeds", Art. 322 "Incitement to corruption". Article 321 encompasses all the crimes under Articles 318, 319, 320, 319-ter, and 322, that punish the private counterpart of the corruption agreement, whereas Article 317 only punishes the public counterpart. In this respect, the sum of Articles 317 and 321 largely encompasses all the corruption crimes rather than the sum of Articles 318–320. Nevertheless, as a further robustness check, we also employ an alternative measure of general corruption which is given by the sum of Articles 317, 318, 319, 319-ter, 320 and 321 (the estimation results are reported in Table 4 in the Appendix).

To allow comparison between different regions, data on crime are expressed per 100,000 inhabitants. Figure 1 shows data on corruption averaged by region. Somewhat surprisingly, Liguria is the region with the highest level of petty corruption, followed by Calabria. A plausible reason behind such data could be the presence in these two regions of the main Italian seaports, Genoa and Gioia Tauro, and hence by possible corruptive behaviour among the port operators (petty corruption) on a large scale. This evidence is also confirmed in a report on organised crime and corruption in seaports (Sergi 2020) which, amongst other things, supplies some anecdotal evidence about widespread misuse of public power of seaport operators in Genoa and Gioia Tauro.

However, it comes as no surprise that Lazio is the region with the most *grand corruption*. The latter is the region hosting the biggest share of political and bureaucratic power: Rome is home to almost all Government bodies, including Ministries and public agencies, and hence most of the more influential government representatives and politicians in Italy. Campania emerges as the region with the second most *grand corruption*. This is no coincidence, since the number of corruption complaints is related to the regional jurisdiction of the judicial system where the crime takes place and anecdotal evidence depicts Campania as the place of political and high sphere bureaucratic malfeasance. Furthermore, widespread political corruption in Campania is also confirmed by Sciarrone (2017) who specifically analyses corruption offences involving politicians, i.e. persons holding political-administrative positions at local, regional and national level, and finds that in recent decades Campania holds the primacy for political corruption. By contrast, Emilia-Romagna is the region with the lowest level of grand corruption and petty corruption. This is in line with anecdotal and scientific evidence that depicts Emilia-Romagna as the region with very high social capital and civic virtues, and with a history of very efficient local government.

In the light of the above considerations, we focus on regional governments under the idea that public servants in these bodies manage large amounts of public resources and hence may have greater incentives to adopt corrupt behaviour. A further reason we focus on regional data is related to the 2001 Italian constitutional reform. Indeed, the latter introduced an amendment to Title V of the Italian Constitution which radically modified the public spending mechanism, transferring the spending decision-making power (previously handled exclusively by the national government) to regional governments. As a consequence, starting from 2001 comparatively large flows of public

money are managed by regional governments in areas such as healthcare, transportation, education and road maintenance. And it is no coincidence that in very recent years the greatest corruption scandals involved regional levels of government: for instance, the famous healthcare corruption scandal in the Lombardy region related to the *San Raffaele* Hospital, and the corruption investigation in the Veneto region related to the *Mose*, a huge infrastructure built in the Venice lagoon to combat high tides.

It is important to point out that anti-corruption policies are decided by politicians, and thus the relationship between corruption and electoral results may potentially be affected by this bias. Indeed, some may argue that electoral results may be affected by the anti-corruption policies themselves. In this respect, it should be borne in mind that our analysis takes into consideration regional elections, and that politicians in regional institutions do not have the power to produce local laws influencing the legislation on corruption which, instead, is a national matter. Thus, with respect to previous literature employing data on national elections (such as Alfano et al. 2013 and 2015), our results are less affected by this bias.

We collect data on the local councils dismissed over mafia infiltration from the Archive of the Department for Internal and Local Affairs (Ministry of the Interior). These data are expressed per capita (100,000 inhabitants) and allow us to control for the infiltration of criminal organizations in the local governments, mainly in Southern Italy.[4] In light of the rising infiltration of mafia-type organizations in the Italian economy and public administration some anti-mafia measures were introduced in the early 1990s. Among such measures, the Italian legislators introduced a law (D.L. 31/05/1991 no. 164) allowing the national government to remove the elected local council and appoint independent special commissioners to temporarily govern the local council. The condition for dissolution is the existence of concrete and relevant links between mafia-type criminal organizations and local public officials (such as mayors, presidents of provincial authorities, and municipal and provincial councillors) or forms of influence and pressure of the same organizations on local public officials such that the functionality of the elective bodies is adversely affected.

From the Historic Archive of Elections of the above department, we extract data on regional elections for Regional Councils.[5] These data allow us to calculate an index of political competition and different measures of disproportionality.

The degree of political competition among the Italian political parties at regional levels is given by the Inverted Normalized Herfindahl–Hirschman Index (INHHI). In formal terms:

[4] The main criminal organizations recognized as "Mafia" in Italy are: Camorra, 'Ndrangheta, Sacra Corona Unita and Cosa Nostra.

[5] For the five Special Constitution Regions of Italy (*Valle d'Aosta*, *Trentino Alto Adige*, *Friuli Venezia Giulia*, Sardinia and Sicily), data are extracted from the institutional website of each Regional Council.

$$INHHI = 1 - \frac{HHI - \frac{1}{n}}{1 - \frac{1}{n}} \tag{1}$$

where $HHI = \sum_{i=1}^{n} v_i^2$ is the Herfindahl–Hirschman Index, v represents the share of votes, expressed as a percentage, that each political party obtains with respect to total valid votes, and n is the number of political parties in a given poll. The index in Eq. (1) is normalized to 1 and varies between 0 (absence of political competition) and 1 (perfect competition with n parties of equal size). This is a measure of the competition (or, in other words, of the concentration) of the political power per each region and year. Following the literature, we replicate the value for the years following an election, and before the next one. The basic idea behind this operationalization is that the share of votes a party gets represents its strength in the electorate, and thus arguably its political power. Indeed, in a system with many parties, this operationalization is to be preferred to the distance between the first and second party, which makes sense in a two-party system, but not in a system with a coalition of parties that often merge and split. A representation of the trend of INHHI for all the Italian regions, in all the years examined, is reported in Fig. 2. The latter shows that the INHHI values are very different (due to different local dynamics of political parties) both across regions and through years. This variance is further evidence that Italian regional elections are a very good case to analyse the interplay between corruption and the political system. In general, Italian regions show on average very high levels of INHHI, suggesting that there is always a certain degree of competition among the parties in the regional elections.

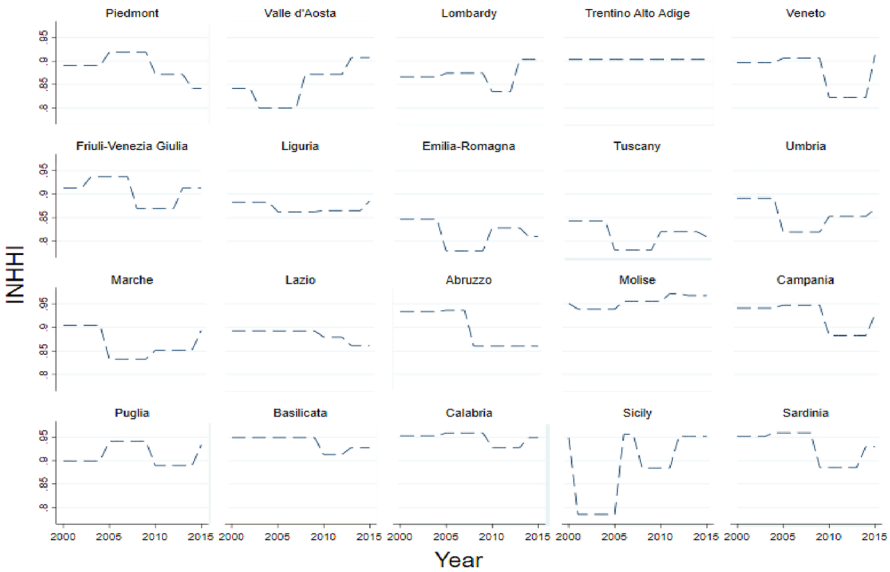

Fig. 2 INHHI in Italian regions (year by year)

To describe the political system, we also use a normalized Gallagher index. Gallagher (1991) developed this index to measure disproportionality in a political election. By definition, any electoral formula transforms votes into seats. This transformation can be done in a more or less proportional way: the Gallagher index measures how many seats each party obtains per the shares of the votes it got. In other words, this index allows the overall (dis)proportionality of a given election to be assessed by comparing the outcome (in terms of seats obtained) with the input (in terms of votes obtained). In formal terms, the Gallagher Dis(proportionality) Index is equal to

$$GDI = \sqrt{\frac{1}{2}\sum_{i=1}^{n}(v_i - s_i)^2} \tag{2}$$

where v is the share of votes obtained by each party i, and s is the share of seats obtained by the same party (and thus v-s is the difference among votes and seats). Hence the Gallagher index ranges between 0 (perfect proportionality, achieved when each party gets a share of seats exactly equal to the share of votes obtained) and 100 (complete disproportionality in the assignment of seats). For the sake of comparison with the INHHI, we also normalize this index to 1; as a consequence, the GDI ranges between 0 (perfect proportionality) and 1 (maximum disproportionality). Please notice that Italian regions use different electoral formulas, but, more importantly, the outcomes of such formulas may differ greatly according to the specific political situation in each given year and region. In contrast to previous studies (e.g. see Persson et al. 2003) which used a dummy variable to observe the effect of different electoral systems, a continuous index of disproportionality allows us to detect subtler differences in the electoral system through years and between regions. At the same time, using data from the same country, our comparison is *ceteris paribus* per many other underlying variables that may affect this relationship, if compared to a cross-country analysis. Figure 3 depicts a representation of the trend of GDI for all Italian regions across the interval we consider. Once again, this figure indicates the relatively high variability in GDI values (due to the different influence of parties at local level) across regions and through years. In general, Italian regions show a low level of disproportionality in the elections, suggesting that outcomes are often fairly proportional.

As a robustness check for the (dis)proportionality outcome of the electoral formula, we also calculate a further measure, the Rae index (Rae, 1967). This is calculated as follows:

$$RAE = \frac{1}{n}\sum_{i=1}^{n}|v_i - s_i| \tag{3}$$

where v is the share of votes and s the number of seats obtained by each party i. This index is more sensitive than the GDI to the presence of small parties, with the result that it is usually less efficient than GDI in discriminating between a few large deviations among votes and seats rather than many small deviations. Since the Constitutional reform in 1999, the Italian regional elections have been ruled by a national electoral formula, which can nonetheless be amended by each region. Because of this law, the

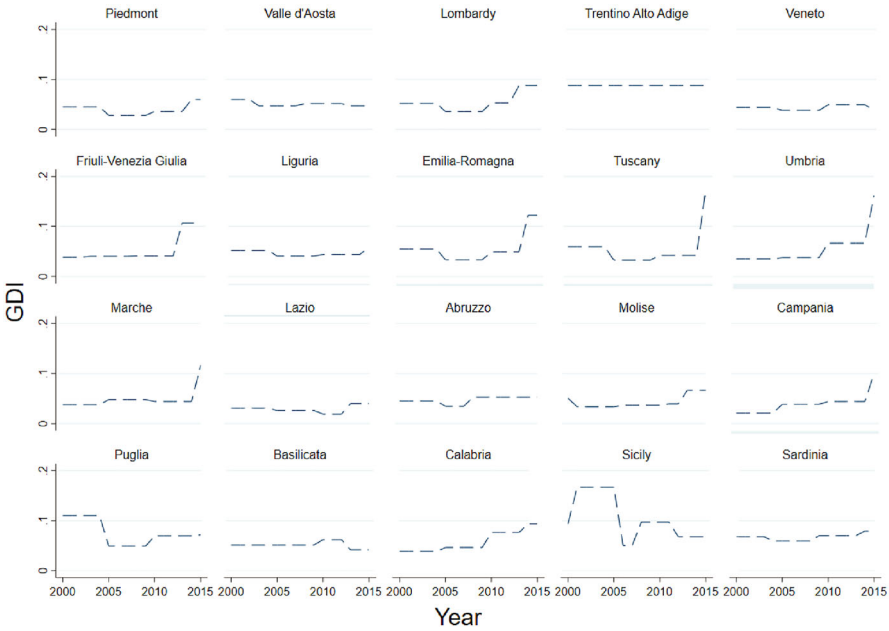

Fig. 3 Gallagher in Italian regions (year by year)

President of each region is directly elected by the voters. All the Italian ordinary (i.e. not Special) regions have chosen to elect their President through a single-turn election, with the exception of Tuscany (which instead allows the possibility of a second turn). The legislative chamber is elected contextually, with a proportional system that gives a majority prize to ensure governability of the winner. Four-fifths of the seats are assigned proportionally, and the voters have the possibility to express two preferences, of different gender. Moreover, a fifth of the seats are assigned via the so-called blocked list, a list of candidates chosen by the party rather than by the voters. This system has been amended in 13 of the 20 Italian regions. Describing each of the 20 systems lies beyond the scope of this article, but it is important to highlight that this system is very likely to impact the results of the electoral formula, and hence the heterogeneity in the Gallagher Index.

We also consider a measure of the presence of women in the election. The presence of women in regional government is expressed as the number of women in regional government over the number of men.

Data on public investment were provided by the State General Accounting Department (Dipartimento della Ragioneria Generale dello Stato) of the Ministry of Economics and Finance (MEF) and are measured as a percentage of regional GDP.

The Italian National Institute of Statistics (ISTAT) is our source for data on all other control variables: regional economic development (the Economic Backwardness variable) is calculated as a share of agricultural value-added in total GDP while as a measure of "cooperativism" in each region we calculate the percentage of employees in cooperative companies out of the total number of employees.

The use of regional data, instead of a cross-country sample, allows us to better address a potential source of estimation bias: interpretation of estimates based on cross-country data is usually affected by unobserved time-invariant heterogeneity. This happens because countries differ greatly in many aspects related to corruption, such as culture, government efficiency, socio-economic variables and effectiveness of economic policies. In light of such considerations, using data from Italian regions enables us to analyse a much more homogeneous sample and it is easier to control for unobserved heterogeneities in regressions based on within-country data, rather than cross-country analysis.

4 Estimation Strategy

Our hypothesis is that the political system can have an impact on the level of corruption. However, we believe that this impact is noticeable only on a form of corruption, grand corruption, while other forms of corruption such as petty corruption are unaffected. This explains why the literature has found conflicting results when analysing the impact of the political system on corruption as a whole. The direction in which the political system influences grand corruption is also a matter of complex investigation which we seek to achieve by distinguishing different features of the political context, such as competitiveness among parties and the electoral formula.

To ascertain whether and to what extent the political system influences the level of corruption we define the following Autoregressive Distributed Lag (ADL) model:

$$Y_{jt} = \beta_0 + \sum_{t=1}^{n} \beta Y_{jt-1} \sum_{t=1}^{n} d_i \beta Y_{jt-1} + f_i + u_{jt} \tag{4}$$

where $\boldsymbol{j}$ and $\boldsymbol{t}$ refer respectively to the twenty Italian regions and time (2000–2015); $\boldsymbol{f_i}$ is a vector of region-specific unobserved effects; $\boldsymbol{u_{jt}}$ is the vector error term; the dependent variable $\boldsymbol{Y_{jt}}$ represents, alternatively, grand and petty corruption, as well as a measure of general corruption.

The specification in Eq. (4) allows us to describe the dynamics of variables whose current levels strongly depend on their past values. In defining the lag of our ADL model, we refer to the literature on the determinants of corruption-related crimes in Italian regions (Capasso and Santoro 2018; Del Monte and Papagni 2007, 2001), and specify an ADL (1,1). One-year lags seem to be appropriate, given that also anecdotal evidence suggests that corruption-related crimes are on average reported to the Italian Judicial Authority after a time-lapse of one year from their occurrence.

We do not expect any large systematic differences, through regions, on the relationship between corruption offences reported and those actually committed, given that previous studies have found a significant spatial homogeneity in the Italian judicial data and no different effect of the efficiency of regional law enforcement on the number of reported corruption crimes (e.g. Del Monte and Papagni 2007; Capasso and Santoro 2018). Although we have added in Eq. (4) a vector of region-specific unobserved effects, as a further robustness check, we compare the distribution of grand and petty

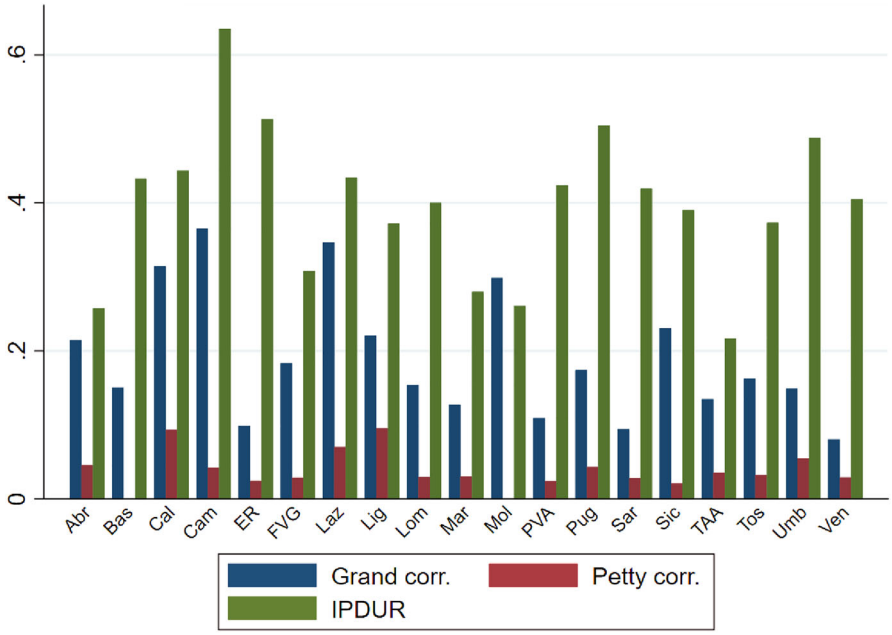

Fig. 4 Normalized (0–1) reported corruption offences and efficiency index of the regional judicial system (IPDUR) in Italy. Source: authors' calculations based on ISTAT data related to corruption crimes reported per 100,000 inhabitants (Annals of Judicial Statistics) and IPDUR – variables rescaled between 0 and 1

corruption with an efficiency index of the regional judicial system (IPDUR), widely adopted in the literature (Del Monte and Papagni 2007; Capasso et al. 2021), that measures the average length of the criminal proceedings in the Courts of Appeal. As shown in Fig. 4, there is no correlation, nor a clear trend between the regional averages of grand corruption, petty corruption and the IPDUR index. This is further confirmed by a correlation analysis, that shows a correlation of 0.09 with grand corruption and of 0.06 with petty corruption, which is quite negligible.

In addition, to control for the reliability of our corruption judicial measures, we compare the judicial data of reported crimes about grand and petty corruption with the Corruption Perception Index (CPI) at the national level, to look if there is a temporal trend in place. As shown in Fig. 5, in the time span we consider, our judicial measures display a similar trend to the CPI, suggesting that the operationalization is appropriate.

$\boldsymbol{X}$ is a vector of explanatory variables which includes two proxies for political competition and electoral rules, as well as other control variables. The nature of the political system is determined by two dimensions: the level of competition between parties (INHHI) and the proportionality of the electoral outcome detected by the Gallagher or Rae index, alternatively. As already stressed, the latter measure the disproportionality in the election in assigning seats to winning parties. The indexes run continuously from 0, extreme disproportionality, to 1, extreme proportionality.

To test the overall effect of the political system on corruption, as is standard practice in institutional modelling, the INHHI, Gallagher and Rae indexes enter the

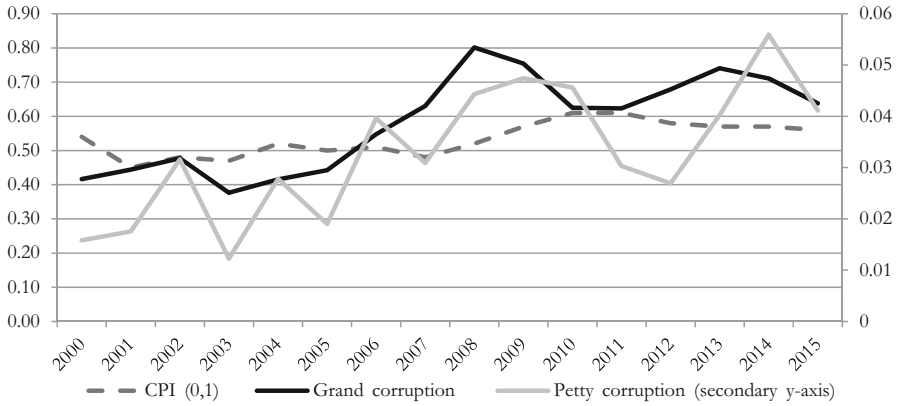

Fig. 5 Normalized (0–1) reported corruption offences and Corruption Perception Index (CPI) in Italy. Source: authors' calculations based on ISTAT data related to corruption crimes reported per 100,000 inhabitants (Annals of Judicial Statistics) and Transparency International data—CPI rescaled between 0 (absence of corruption) and 1 (highest level of corruption)

model in two ways: as isolated regressors and in the interaction terms between the (dis)proportionality index (Gallagher or Rae, alternatively) and the political competition index (INHHI). The objective is to allow for both the effects of the electoral formula and political competition on their own and the combined effects of the two.

Other control variables include a measure of economic development, public investments, the gender gap, the regional population and social capital. To measure economic development, we introduce among the regressors the share of agriculture to GDP (*Economic backwardness*), the idea being that corruption is negatively influenced by the level of development (Del Monte and Papagni 2007; Capasso and Santoro 2018). Public investment can positively influence the amount of resources that can be extracted through bribery and we therefore introduce among the control variables *Public investment* (Acconcia et al. 2014; Alfano et al. 2013).

In recent years, the literature has discussed the role that the gender gap in politics can have on corruption, but the results are often conflicting. Some evidence suggests that the presence of women in public life has been found to reduce the level of corruption (Alfano et al. 2013; Dollar et al. 2001; Sung 2003), although the rationale behind this result is not so clear. However, other studies (Frank et al. 2011; Hazarika 2018; Vijaylakshmi 2007) find no significant relationship between corruption and women's participation in politics. To control for the representation of women in regional government, we introduce among the control variables the ratio between females and males in the regional executive council (the variable *Women*). This variable in our analysis is particularly important since some of the elections we include in our dataset carry an anti-gender gap in electoral law. Under the law, the voter can express two votes instead of one, provided they are given to politicians of different genders. This may lead to a bias in the number of women in the legislative branch since many of them were running on tickets with male politicians.

Following the literature on corruption (see for example Alfano et al. 2013; Fiorino et al. 2015; Goel and Nelson 2011), we control for size heterogeneity among the twenty Italian regions by employing a measure of the regional population (*natural logarithm of the population*). The regional endowment of social capital can reduce the level of corruption. To capture the effect of civic virtues on corruption, we also control for a measure of the share of cooperative business firms on the total (the variable *cooperativism*). We also introduce in all specifications a geographical dummy (*Special regions*) to take into account possible bias due to the higher degree of legislative and fiscal autonomy characterising the five Special Constitution regions.

Finally, we employ the variable *Mafia infiltration* in all specifications, to control for possible biases caused by the presence of organized crime and its infiltration in public apparatus.

Indeed, the presence of Mafia in regional institutions could influence the efficacy of law enforcement in fighting corruption, because, for instance, local police and judicial authority would be full-time engaged in the fight against the mafia, downplaying the importance of anti-corruption campaigns. As a result, the frequency of complaints about corruption crimes in the area would be underreported and the estimation results biased.

Moreover, organized crime may infiltrate the political system and influence public decisions and, in turn, the level of corruption. There is substantial judicial and anecdotal evidence showing that the interaction between Mafia organizations and local politicians often influences the decisions of bureaucrats. For this reason, we expect *Mafia infiltration* to exert a greater influence on *Grand corruption*, a proxy of political corruption, than on *Petty corruption*.

Equation (4) is dynamic in the sense that it includes lagged values of the independent variable and hence could entail some degree of endogeneity bias. To control for endogeneity, we estimate our model by means of the generalised method of moments (GMM), not a new approach in the recent empirical literature on corruption (Aidt et al. 2008; d'Agostino et al. 2016; Dollar and Kraay 2004). The system-GMM estimators, introduced by Arellano and Bover (1995), and fully developed by Blundell and Bond (1998), solve for possible endogeneity by treating the model as a system of equations in the first differences and in the levels. The endogenous variables in the first-differences equation are instrumented with the lagged values of their levels, whereas the endogenous variables in the levels are instrumented with lags of their first differences. The limitations of this estimator are well known. Roodman (2009) warns that since the set of potential instruments includes all sufficiently lagged variables, which exponentially increase with the number of times, an excessive number of instruments may lead to an over-fitting of the instrumented endogenous variables and thus lower the consistency of the GMM estimators. To reduce the number of instruments to the minimum, we employ the first suitable lag of the explanatory variables and collapse the instrumental variable set.

To control for a possible two-way causality between corruption and political variables, we add the lagged values of variables to address this issue and employ corruption and political variables as instruments in order to correct some possible bias in the estimations.

As a robustness check, we also apply the two-step variant to the GMM estimators which are supposed to be more efficient than the one-step estimator, especially for the system-GMM. Although the two-step is asymptotically more efficient, the two-step standard errors tend to be downward-biased (Arellano and Bond 1991; Blundell and Bond 1998). To overcome this bias, we apply a finite-sample correction to the two-step covariance matrix (Windmeijer 2005).

These estimation methods have the advantage of avoiding heteroscedasticity and serial correlation of the errors. We run all standard tests that normally complement this estimation, namely the (Hansen 1982) J-test of over-identifying restrictions to control for the exogeneity of the instruments in the presence of robust standard errors and the Arellano and Bond (1991) test to control for serial correlation of residuals up to the second/third order, which can cause a bias to both the coefficients and the estimated standard errors.

Rome (the main city in Lazio) hosts national government head offices, as well as local authorities. Given that data on corruption offences refer to the number of complaints by regional jurisdiction of the judicial system where the crime takes place, Lazio is a possible outlier since it is a stage for political corruption at local as well as national level. In other words, in the Lazio region the number of charges for corruption offences could well exceed those in other Italian regions. For this reason, as a further robustness check, we estimate Eq. (4) by excluding Lazio. The results (available on request) still hold.

Finally, we estimate Eq. (4) by employing the fixed effects only to avoid an excessive number of instruments which would have occurred if the time dummies had been used. Moreover, although time-varying shocks are unlikely in the short time span we consider (2000–2015), we checked for a possible time-varying shock common to all the regions. Specifically, we re-estimated Eq. (4) by adding a calendar year dummy to take into account some possible bias in the estimation due to the Anti-corruption Law in 2012 but the results (available on request) do not change.

5 Estimation Results

Following the literature, we first test the impact of the political system on corruption as a whole and do not find any statistically significant effect on the variables, apart from the lagged ones (see Table 2). The same results hold when we employ, as a robustness check, a more general measure of corruption (see Table 4 in the Appendix). This outcome reflects the mixed evidence that has emerged in the numerous empirical works aiming to highlight the interconnections between the political context and the level of corruption. Evidently, by focusing on a broad definition of corruption these works are unable to capture the in-depth linkages between political and bureaucratic power and the power to extract rent through a bribe. In our opinion, grand corruption is indeed the final expression of such linkages.

We pursue a different strategy and regress, alternatively, grand corruption and petty corruption on a set of control variables. The latter include the two measurements of the nature of the political system, competition between parties and disproportionality in the electoral outcome, along with an interaction term between these two dimensions.

Table 2 General corruption in political systems

	Gallagher index		Rae indexx	
	General corruption		General corruption	
	S-GMM	2STEP	S-GMM	2STEP
Dependent variables	(2.1)	(2.2)	(2.3)	(2.4)
General corruption (t-1)	0.358*** (0.0695)	0.295*** (0.0697)	0.360*** (0.0731)	0.303*** (0.0851)
Gallagher (t-1)	47.78 (57.32)	1.096 (46.18)		
Rae (t-1)			1.684 (2.181)	− 0.442 (1.857)
INHHI (t-1)	5.127 (6.006)	1.158 (5.496)	5.034 (5.799)	0.243 (5.434)
Gallagher*INHHI (t-1)	− 57.37 (67.79)	− 0.523 (54.17)		
Rae*INHHI (t-1)			− 1.899 (2.507)	0.555 (2.053)
Econ. Backwardness (t-1)	− 0.0227 (0.0592)	− 0.0796 (0.0795)	− 0.0483 (0.0513)	− 0.0814 (0.0721)
Publ. Investment (t-1)	− 0.115 (0.337)	0.0725 (0.380)	− 0.105 (0.346)	0.0723 (0.407)
Women (t-1)	− 0.178 (0.251)	− 0.121 (0.177)	− 0.211 (0.266)	− 0.145 (0.330)
Ln Population (t-1)	− 0.224 (0.176)	− 0.140 (0.231)	− 0.225 (0.179)	− 0.136 (0.267)
Cooperativism (t-1)	0.258 (0.173)	0.159 (0.188)	0.258 (0.175)	0.174 (0.303)
Special regions (Dummy)	− 0.673 (0.489)	− 0.320 (0.587)	− 0.715 (0.492)	− 0.346 (0.744)
Mafia infiltration	1.045*** (0.402)	1.050** (0.482)	1.032** (0.522)	1.058** (0.502)
Observations	300	300	300	300
N° of groups	20	20	20	20
N°of instruments	16	16	16	16
Hansen J-test (*p*-value)	0.449	0.449	0.440	0.440
AR(1) test (*p*-value)	0.163	0.187	0.165	0.184
AR(2) test (*p*-value)	0.459	0.464	0.466	0.464
N° of lags	2_3	2_3	2_3	2_3

The time span is 2000–2015. The regressions are based on one-step (S-GMM) and on two-step (2STEP) Blundell and Bond System-GMM estimators. In all regressions the constant terms are not reported; significant coefficients are indicated by *** (< 1% level), ** (< 5% level) and * (< 10% level); robust standard errors in parentheses

We also run a robustness check by substituting for the index of disproportionality (Rae index) and applying two variants of the system GMM estimator.

Table 3 presents the results which confirm our hypothesis: the nature of the political system influences grand corruption (columns 1–2 and 5–6) while it is insignificant in determining petty corruption (columns 3–4 and 7–8).

It is also interesting to mention that only the lagged values of grand corruption affect the respective current ones, whereas this does not occur for petty corruption. This is no coincidence since grand corruption is a proxy for political corruption which is usually systemic and persistent, unlike petty corruption, that by its nature often ends up in isolated incidents and a non-organized phenomenon. This evidence further confirms the reliability of our proxies for grand and petty corruption.

The effects of the political system on grand corruption need to be carefully examined since the political competition and the electoral formula interact in influencing corruption. Hence, to draw some reasonable lessons from the results one needs to examine each of the above factors both in isolation and in a combined context.

Let us start by examining the effect of the electoral formula. In the absence of political competition (i.e. while INHHI tends to 0), more disproportionality in the electoral outcome, i.e. an increase in the level of GDI (columns 1–2) or Rae (columns 5–6), reduces grand corruption. This result, in a qualitative descriptive context, would be equivalent to saying that after a more disproportional election (such as the ones resulted by a stricter majoritarian electoral systems) the level of corruption is lower, or equivalently that a more proportional system would involve more corruption. This evidence is in line with other studies (for example Alfano et al. 2013), and may have different interpretations. First, in a more proportional system "one vote more" is always better since all votes can proportionally increase the number of seats, while in a more majoritarian system with a number of seats granted for the winner, in terms of seats a winning margin of 1% or 10% may well make no difference to the party awarded the seat. Hence, in the former system the incentive to "buy" votes is higher since such votes can influence the electoral outcome. Second, if we consider that each party has a fixed set of stakeholders as a separate electorate of reference, in a proportional system more parties will sit around decisional tables, and hence more stakeholders will put forward "demands" and "needs" to elected politicians. These demands may require misuse of public power and result in illegal payoffs to the elected officials. Finally, under a less proportional system, it is easier for incumbent parties to defend electoral advantages and it is harder for the opposition party to win elections, especially at a regional level, where the link with their own voters is closer. This "electoral advantage" translates into longer horizons for politicians to be in power and lower incentives to engage in bribery and expand their electoral constituency (corrupt voters).

The level of competition between parties (INHHI) is a feature of the political system that influences corruption only when the latter takes the form of grand corruption (columns 1–2 and 5–6), while it is completely ineffective on petty corruption (columns 3–4 and 7–8). In detail, we find that a higher level of competition among parties reduces the amount of grand corruption across regions. Such evidence, in line with the results of other studies (Persson et al. 1997; Mulligan and Tsui 2006), has a straightforward interpretation. The higher the political competition among parties (a higher value of

Table 3 Grand and petty corruption in political systems

	Gallagher index (GDI)				Rae index			
	Grand corruption		Petty corruption		Grand corruption		Petty corruption	
	S-GMM	2STEP	S-GMM	2STEP	S-GMM	2STEP	S-GMM	2STEP
Dependent variables	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)	(3.7)	(3.8)
Grand corruption (t-1)	0.348*** (0.0817)	0.338*** (0.0987)			0.354*** (0.0814)	0.346*** (0.100)		
Petty corruption (t-1)			− 0.0374 (0.0299)	− 0.0482 (0.0370)			− 0.0377 (0.0294)	− 0.0448 (0.0367)
GDI (t-1)	− 28.39* (14.74)	− 38.91** (16.50)	− 1.214 (2.303)	− 0.217 (3.135)				
Rae (t-1)					− 1.199* (0.617)	− 1.640** (0.657)	0.0139 (0.125)	0.105 (0.138)
INHHI (t-1)	− 2.501* (1.379)	− 3.373* (1.647)	0.0376 (0.192)	0.0916 (0.272)	− 2.488** (1.243)	− 3.530** (1.414)	0.135 (0.267)	0.270 (0.321)
GDI* INHHI (t-1)	32.29* (18.01)	45.66** (20.49)	1.525 (2.895)	0.286 (3.906)				
Rae* INHHI (t-1)		− 0.169** (0.0700)			1.396** (0.676)	1.896** (0.723)	− 0.0121 (0.149)	− 0.117 (0.167)
Econ. Backwardness (t-1)	− 0.134*** (0.0475)		− 0.0132* (0.00685)	− 0.0148 (0.00890)	− 0.144*** (0.0451)	− 0.166** (0.0680)	− 0.0127* (0.00672)	− 0.0156* (0.00886)
Publ. Investment (t-1)	0.294** (0.118)	0.326** (0.141)	0.0110 (0.0120)	0.0220 (0.0188)	0.304** (0.122)	0.337** (0.141)	0.0109 (0.0118)	0.0232 (0.0194)

Table 3 (continued)

	Gallagher index (GDI)				Rae index			
	Grand corruption		Petty corruption		Grand corruption		Petty corruption	
	S-GMM	2STEP	S-GMM	2STEP	S-GMM	2STEP	S-GMM	2STEP
Women (t-1)	0.0962 (0.129)	0.0296 (0.132)	0.0133 (0.0130)	0.0102 (0.0140)	0.0995 (0.141)	0.0590 (0.138)	0.0138 (0.0127)	0.0111 (0.0148)
Ln Population (t-1)	0.0235 (0.0207)	0.0190 (0.0252)	− 0.000536 (0.00300)	0.000332 (0.00417)	0.0207 (0.0214)	0.0165 (0.0274)	− 6.57e-05 (0.00319)	3.16e-05 (0.00462)
Cooperativism (t-1)	0.0398 (0.0505)	0.0534 (0.0686)	0.00174 (0.00541)	− 0.00248 (0.00536)	0.0355 (0.0527)	0.0461 (0.0715)	0.00172 (0.00569)	− 0.00249 (0.00578)
Special regions (Dummy)	0.124 (0.0968)	0.111 (0.112)	0.00455 (0.00928)	0.0119 (0.0118)	0.101 (0.110)	0.112 (0.123)	0.00550 (0.00923)	0.0120 (0.0112)
Mafia infiltration	0.786** (0.370)	0.790* (0.448)	0.0801** (0.0380)	0.0431 (0.0426)	0.640* (0.331)	0.649 (0.410)	0.0750* (0.0386)	0.0425 (0.0521)
Observations	300	300	300	300	300	300	300	300
N° of groups	20	20	20	20	20	20	20	20
N° of instruments	16	16	16	16	16	16	16	16
Hansen J-test (*p*-value)	0.076	0.076	0.409	0.409	0.076	0.076	0.335	0.335
AR(1) test (*p*-value)	0.012	0.022	0.064	0.071	0.012	0.02	0.065	0.069
AR(2) test (*p*-value)	0.662	0.795	0.53	0.275	0.726	0.831	0.503	0.269
N° of lags	2_3	2_3	2_3	2_3	2_3	2_3	2_3	2_3

Notes: see Table 2

INHHI), the higher the importance of candidates' reputation and, in turn, the opportunity cost of corruption: competition increases incumbents' accountability toward the electorate, since the probability of being re-appointed is weakened by wider political alternatives for voters.

The result is stronger in a very proportional outcome (i.e. when GDI is equal to 0) when the higher number of political parties and candidates tend to share the votes market more equally. Interestingly, the combined effect of political competition (INHHI) and the degree of disproportionality in the electoral law (GDI or Rae) on grand corruption is significant and positive. Following the arguments suggested by previous studies (Heywood 1996), the positive sign on the interaction term on grand corruption may be related to the different features of the electoral campaign under the two electoral formulas. Indeed, given that the final effect on corruption of GDI is $\beta_{GDI}GDI + \beta_{GDI*INHHI}INHHI$, it could be argued that under disproportional electoral outcome (higher levels of GDI or Rae), a higher level of political competitiveness undermines the likelihood of the incumbent being re-appointed and increases the incentive to engage in corruption to "satisfy" electoral demands. Let us argue another possible explanation. Under a more proportional electoral outcome (lower levels of GDI or Rae), there is less need of funds. Thus, a decrease in political competition would not encourage the incumbent to engage in corruption to ensure his/her re-appointment.

The estimation results also show a different effect of the control variables on grand and petty corruption. According to previous studies (Del Monte and Papagni 2007; Capasso and Santoro 2018), the coefficients on the variable measuring the degree of economic development, *economic backwardness*, are negative. As the regional economy improves (economic backwardness decreases), the opportunity to extract rent increases and so does corruption. Yet the effect is greater (nearly ten times) and more significant for grand corruption (columns 1–2, 5–6) compared to that one for petty corruption (columns 3–4, 7–8).

Table 3 shows similar results for *public investments*, our proxy for the degree of government intervention in the economy, which has been found to cause corruption (e.g. Haque and Kneller 2015; Mauro 1998). An increase in the amount of *public investment* has a positive and significant effect only on grand corruption, while it is negligible on petty corruption. A straightforward explanation is that funds for public investments are managed only by high-level bureaucrats. Despite being insignificant, also the coefficients on *cooperativism*, our proxy for social capital, and *population*, our proxy for the size of the regions, are larger on grand corruption. Instead, we do not find that the presence of *women* in regional government has any significantly different effect on the two kinds of corruption. The dummy *special regions* is insignificant both on grand and petty corruption, confirming that our estimates on the twenty Italian regions are not affected by any bias introduced by a different degree of autonomy underlying the five Special Constitution regions in Italy.

The coefficients of *mafia infiltration* on grand corruption are around ten times greater comparing to those on petty corruption. This result is in line with many anecdotal evidences that highlight a close relationship between mafia organizations and some high rank bureaucrats. These results confirms further that our proxy of grand corruption is a good proxy for corruption activities at high levels of government bodies.

Finally, the Hansen (1982) J-test of over-identifying restrictions confirms the exogeneity of our instruments, while the Arellano and Bond (1991) test confirms the absence of serial correlation of the disturbances up to the second order.

6 Conclusions

This paper studied the effects of the political system on corruption. The main idea motivating the work is that the electoral formula and the party system may affect grand corruption, but not petty corruption. This is the reason why, despite considerable anecdotal evidence, the literature has hitherto found no conclusive evidence on the impact of the political system on overall corruption.

Using Italian regional data, we found that an increase in the disproportionality in the outcome of elections reduces grand corruption in the absence of political competition, and it is uninfluential on petty corruption. This result holds with two different disproportionality measures. The same deterrent effect on grand corruption is also found for the proxy of political competitiveness (e.g. more parties with similar electoral power). However, the combined effect of the two variables may lead to different results. More disproportional electoral outcomes appear to increase corruption when the level of competition increases.

These results have interesting implications on the incentive that the horizons of politicians (i.e. how long they expect to remain in office) create in extracting value from rent-seeking activities. An increase in political competitiveness reduces the political lifetime of candidates, and increases their incentives to engage in corruption. For the opposite reason, majoritarian systems ensure a lower level of grand corruption.

Our estimates also show that, unlike petty corruption, grand corruption turns out to be persistent and systemic, and that it is essentially an endemic phenomenon. This, in turn, implies that grand corruption not only might be more damaging for the economy and the smooth working of institutions but it is also more difficult to eradicate.

This paper contributes to the literature on the relationship between political systems and corruption, adopting a new approach and using data on regional elections rather than regional data of national elections. This allowed corruption crimes to be linked more clearly to the related (regional) political system. In addition, the use of reliable proxies of grand and petty corruption for the Italian regions represents a novelty both for the specific strand of literature on corruption and political systems and for the general literature on corruption. Indeed, the discrimination between grand and petty corruption may be useful for future research on corruption.

Despite being based on Italian data, we believe that this study delivers important general policy implications. After all, a better understanding of how a country's political system affects different types of corruption may help to better shape the political system and to create a context which is less conducive to corruption. It is far from straightforward to establish the right contours of a political system which does not foster corruption; the final effects on corruption depend not only on the socio-economic condition of the country or region, but also on the structure of the political system itself. As was explained above, particularly high levels of competitiveness between candidates or parties can reduce the predicted positive deterrent effect of a majoritarian system on corruption.

Appendix

See appendix Table 4

Table 4 General corruption (alternative measure) and political systems

	Gallagher index		Rae index	
	S-GMM	2STEP S-GMM	S-GMM	2STEP S-GMM
Dependent variables	(2.1)	(2.2)	(2.3)	(2.4)
General corruption (t-1)	0.339*** (0.0727)	0.267** (0.0951)	0.336*** (0.0749)	0.268** (0.100)
Gallagher (t-1)	6.630 (64.54)	− 54.74 (66.85)		
Rae (t-1)			− 0.0646 (2.296)	− 2.847 (2.306)
INHHI (t-1)	1.568 (6.686)	− 3.878 (7.234)	1.380 (6.141)	− 5.085 (6.472)
Gallagher*INHHI (t-1)	− 9.852 (76.57)	65.21 (80.12)		
Rae*INHHI (t-1)			0.139 (2.674)	3.320 (2.671)
Econ. Backwardness (t-1)	− 0.194* (0.107)	− 0.307* (0.158)	− 0.229** (0.0978)	− 0.301** (0.143)
Publ. Investment (t-1)	0.309 (0.435)	0.646 (0.563)	0.335 (0.452)	0.664 (0.590)
Women (t-1)	0.0310 (0.321)	0.0936 (0.349)	0.00788 (0.341)	0.113 (0.384)
Ln Population (t-1)	− 0.192 (0.190)	− 0.0907 (0.227)	− 0.196 (0.191)	− 0.0863 (0.225)
Cooperativism (t-1)	0.281 (0.204)	0.131 (0.247)	0.277 (0.209)	0.130 (0.254)
Special regions (Dummy)	− 0.483 (0.564)	− 0.00573 (0.671)	− 0.549 (0.578)	0.00236 (0.698)
Mafia infiltration	2.082*** (0.549)	2.035*** (0.487)	1.916*** (0.616)	1.865*** (0.578)
Constant	1.474 (3.371)	4.882 (3.698)	1.607 (3.191)	5.875* (3.361)
Observations	300	300	300	300
Number of id	20	20	20	20
No. of instruments	16	16	16	16

Table 4 (continued)

	Gallagher index		Rae index	
	S-GMM	2STEP S-GMM	S-GMM	2STEP S-GMM
Hansen J-test (*p*-value)	0.288	0.288	0.282	0.282
AR(1) test (*p*-value)	0.059	0.065	0.058	0.065
AR(2) test (*p*-value)	0.448	0.791	0.490	0.835
No. of lags	2_3	2_3	2_3	2_3

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: The time span is 2000–2015. The regressions are based on one-step (S-GMM) and on two-step (2STEP) Blundell and Bond System-GMM estimators. In all regressions the constant terms are not reported; significant coefficients are indicated by *** (< 1% level), ** (< 5% level) and * (< 10% level); robust standard errors in parentheses

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