Corruption and re-election: how much can politicians steal before getting punished?☆

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A B S T R A C T

Can corruption be used to improve re-election chances of politicians in office? What is the optimal level of corruption for doing so? In this paper I use suspicious patterns of public procurement allocations in local government as a proxy measurement of corruption, based on combining quantitative and qualitative evidence on corrupt practices in local government. I then tie suspicious procurements to re-election probabilities of mayors in Croatian cities and municipalities from 2009 to 2017, and find that due to a rent-extracting relationship formed between firms and political elites, local politicians can engage in potential corruption and still win elections. There is an optimal level of suspicious procurements for which politicians maximize their re-election chances. When a mayor surpasses the cut-off level of around 20% of suspiciously allocated funds from public procurement his or her probability of re-election starts to decline, while he or she loses office for at least one half of all procurements allocated suspiciously. In order to address potential endogeneity issues I apply a fuzzy regression discontinuity design based on population thresholds that determine the size of the local council, where the intensity of the treatment (potential corruption) increases with increasing council size. The results overall confirm the hypothesized nonlinear relationship between corruption and re-election.

1. Introduction

Political economy theory posits that corrupt politicians holding power have every incentive to design a system that maximizes their probability of re-election as well as their rent-seeking behaviour (Brennan and Buchanan, 1980; Ferejohn, 1986; Persson and Tabellini, 2000; Besley, 2006). This is usually carried out through informal networks of interests where distributional benefits (jobs, exclusive contracts, favourable legislation, protectionism) are shared to actors within the network who in return promise political loyalty. The key to political survival lies in the effectiveness of such networks to preserve the systemic corruption that enables all the connected actors to keep extracting rents (Bueno de Mesquita et al., 2005; North et al., 2009). In practice this means that politicians

holding power will engage into numerous deals with various special interests from which they can expect to receive electoral support (Coate and Morris, 1995; Mc Chesney, 1997; Grossman and Helpman, 2002; Gilens, 2012; Gilens and Page, 2014; Coviello and Gagliarducci, 2017). In a co-dependent system based on close personal ties where concessions are traded in return for votes, bribes, or other kind of support, all members of a network have every incentive to preserve their status quo and keep corrupt politicians in power for as long as possible.

In this paper I examine whether corruption formed through such informal networks has any effect on re-election chances of local politicians. I present a hypothesis that the mechanism through which corruption affects electoral chances is non-linear. Whether voters punish corruption is contingent on two factors: size of a city's budget which presents different rent-extracting opportunities, and whether they play a repeated game with politicians and are able to update their beliefs given new information. The empirical section only tests the first factor.

Corruption is defined by observing suspicious public procurement contracts administered by local mayors to politically-connected private firms (as done by Fazekas et al., 2016; Ferwerda et al., 2017 or Fazekas and Kocsis, 2017). I use a combination of qualitative and quantitative evidence to capture the elements of potential fraud in the procurement process. The quantitative part of the definition rests upon detailed data on local public procurements in 556 Croatian cities and municipalities, conducted in the period of two consecutive local government mandates, the first one from 2009 to 2013, and the second one from 2013 to 2017. From the database on almost 140,000 public procurement contracts I single out various cases which present a reasonable doubt in the regularity of the procurement procedure, defining them as *suspicious procurements*. Examples include cases in which firms with no employees and as a single bidder on the tender receive multiple contracts worth millions, cases in which firms sign contracts that vastly exceed their capabilities, and cases when firms with substantial losses receive indirect subsidies through lucrative deals that cover their losses entirely.

However, many of the aforementioned procurement irregularities may simply point out to specific patterns within the allocation process that need not imply corruption. The observed allocation outcomes may be a product of limited competition, government inefficiency or negligence, or are a direct consequence of the procurement process and the institutions that enforce it. Decarolis (2014), for example, finds that the trade-off between low prices of the awarded contract and poor ex-post performance is a direct consequence of bad institutional design of the procurement process and not necessarily corruption.

In order to strengthen the implication that corruption does indeed arise from such suspicious allocations I conducted interviews with key stakeholders in the procurement process, including special police criminal investigators, local government procurement officers, and anti-corruption watchdogs to validate my definitions on how to recognize potential corruption in the existing procurement data. The summaries of these interviews are presented in Online Appendix B, where each definition of a potentially fraudulent procurement is justified. The qualitative evidence confirms that the identified incidences of suspicions procurements are indeed good proxies for actual corruption in the procurement process. Whenever a criminal investigation uncovered fraud and corruption in public procurements it involved either a firm with a high share of revenues from procurement contracts, a firm with zero employees and the only bidder at an auction, or a firm which had losses and made profits the year after signing the contract. These are the usual red flags that encourage a criminal investigator to open a fraud investigation.

This valuable insight aligns my definition of suspicious procurements with the institutionalized corruption index presented in Fazekas et al. (2016); an index based on observing instances of restricted competition and recurring contracts to the same company. The definitions of corruption proxies in this paper therefore expand the literature definition of suspicious procurements to account for evidence of how procurement frauds are committed in practice. A methodological contribution of the paper is not the classification of specific procurement contracts as corruption, but the usage of qualitative evidence to confirm suspiciously identified patterns within the procurement process and thus provide a direct link that captures potential collusion between mayors and local bidders (as in Coviello and Gagliarducci (2017)), and whether a potentially fraudulent contract delivers any kind of electoral benefit to the mayor. The hypothesis is that due to personal connections and mutual dependence between local rent-extracting firms and the local political establishment, mayors can engage in corruption without having to sacrifice their chances of winning elections. Moreover mayors have a greater probability of staying in power if they create an informal network of interests that enables and encourages corruption.

The biggest contribution is presented in the empirical section. I find evidence of a statistically significant effect of corruption on re-election, confirming the hypothesized non-linear relationship. Corrupt practices entail a concave effect on re-election chances, meaning that corruption can increase the probability of re-election, however only until a certain cut-off after which corruption is too high and politicians get punished. I successfully bridge the gap between two competing hypotheses of whether voters punish corruption — they do, but not until it becomes too large and too noticeable. I calculate an optimal level of corruption to keep a politician in power. Probability of re-election is maximized for about 20% of all suspiciously allocated funds from public procurement. If more than 50% of all procurement is allocated suspiciously, a politician very likely loses power.

Because this relationship could potentially be subject to selection bias I apply a fuzzy regression discontinuity (RD) design based on population thresholds that determine the size of the local council. The fuzzy design is used since the intensity of the treatment — proxy level of corruption — increases with increasing council size, while the as good as random assignment of local units into treatment and control groups is generated at each population threshold. The results of the RD estimation confirm the conclusion of a non-linear relationship between corruption and re-election. However, the fuzzy RD empirical strategy still cannot provide true randomization given that the data at hand does not come as a result of experimental conditions. The empirical section discusses at great length a number of budgetary, socio-economic, and political factors that are controlled for, however there could still be unobserved factors that change discontinuously at the thresholds even when observing them within very narrow bandwidths. It is therefore difficult to impose a direct causal implication, but the given empirical strategy is the most viable alternative to estimating the correct treatment effect and confirming the existence of a non-linear relationship between corruption and re-election.

The following sections present the contributions in greater detail. Section 2 presents the underlying theory and describes the hypothesized non-linear mechanism. It also briefly discusses why Croatia offers a good empirical test of this theory. After describing the data and the measurement procedure behind six different proxy variables of corruption in Sections 3 and 4, the empirical section presents the full set of results on the relationship between corruption and re-election. The final section concludes and presents implications for further research.

2. The non-linear mechanism between corruption and electability of incumbent politicians

The central hypothesis of the paper revolves around the idea that political survival is contingent on informal exchanges between firms and incumbent politicians. Through these informal social networks personal ties and long-term interactions solve the collective action problem and build trust between actors. Politicians receive rents in the form of bribes or campaign funding that helps them get re-elected, while rent-extracting firms receive their rents either in the form of favourable legislation (e.g. monopoly rights or lax regulation) or exclusive procurement contracts. This logic partially follows the findings in Coviello and Gagliarducci (2017) who confirm that political longevity in power is associated with collusion between incumbents and a few favored local bidders over the allocation of procurement contracts.

What is the mechanism that translates procurement irregularities arising from political networking into re-election? In other words, why would more potentially fraudulent procurement contracts make it easier (or harder) for a politician to win election and what is the role of voters in this exchange? Should we assume that this mechanism is necessarily linear? Finally, how does this fit into the existing literature with competing conclusions about whether voters punish politicians?

This section will provide an answer to these questions and hence define the set-up for the empirical analysis. There are two possible mechanisms that suggest a non-linear effect, both of which are rooted in the informational asymmetry assumption[1] The first is driven through a repeated interaction between voters and politicians where Bayesian voters keep updating their beliefs on political types with respect to receiving new information. The second is contingent on the size of local budgets where larger budgets present different rent-extracting opportunities.

The first underlying hypothesis is based primarily on the findings of political agency models, most notably from Besley (2006) and Besley and Smart (2007) combined model of moral hazard and adverse selection. Politicians can be of two types, good or bad, with varying preferences over rent-seeking (in this case corruption). Voters observe the creation of public goods and reward the politician without knowing whether he delivered the public goods with some corruption. Political types (good or bad) are hidden, so voters must infer type based on the observed action — whether or not the politician provides enough public goods and under what cost. Public goods can be provided under a high cost by a bad politician who engages in corruption (and still gets re-elected) if the voters believe he faced a high cost shock. If the voters observe a low cost they are certain that the politician is good. If they observe a high cost of public goods then there is some positive probability that this is a bad politician with a low cost shock who is extracting the difference for himself, or that this is a good politician who was unlucky and faced a high cost shock. Imagine a scenario of a repeated game between the voters and politicians where in each period the voters observe a high cost shock. Initially they might believe that the politician was unlucky, but over time, persistently high cost shocks might send a different signal to the voters, particularly if they also observe the rise of favoring special interests in their city.

For example, the more people involved within an informal network of a politician's key supporters, the more likely that corruption will be noticed by outsiders. How? Following the information hypothesis from Kurer (2001) and Winters and Weitz-Shapiro (2013) voters are unaware of actual corruption and are only aware of rumours and media reports. These rumours and media reports increase in intensity as the mayor gets involved in more corrupt practices (e.g. allocates more fraudulent procurement contracts). In other words, the more corrupt activities there are, the more difficult it is to hide them from the public's eye. The voters and the reporters do not see the full extent of corruption. They only see signals if other people talk more about them. A mayor who is corrupt manages to deliver a substantial amount of public goods through his cronies, and this is perceived to be beneficial by the voters (and rewarded with re-election), as they do not notice any direct corruption. However as more and more jobs are distributed to a narrow group of core supporters, voters (and reporters) do start to notice and the information spreads.

This is why I assume a non-linear relationship between corruption and re-election probabilities — I measure procurement-based corruption, which is not observed by the majority of the public at lower levels. A mayor easily gets away with some small(er) level of corruption without antagonizing too many constituents. As more jobs are distributed within the informal elitist network, more and more local constituents tend to notice that the distribution of procurement contracts is unfairly skewed towards the same people, the people with closer ties to the mayor. This triggers media reports and spreads the information to a wider number of voters, who, upon receiving this new information, update their beliefs over the mayor's competence and behaviour, and decide whether the level of corruption is indeed too high and that it should be punished. When too much corruption becomes visible, mayors are faced with a lower probability of survival.

Extending the moral hazard and adverse selection logic to this paper's particular context, a bad politician can fool the voters only so many times before such practices get uncovered. In other words, the informational asymmetry helps the politician initially persuade the voters that he indeed faced a high cost shock, however as this game is repeated enough times voters get access to new information, they update their beliefs and react accordingly. Hence the possibility of a concave effect of corruption on electoral

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[1] Corruption and political types (whether a politician is good or bad) are both hidden from the voters. Each can be uncovered only sporadically, which sets the stage for politicians to engage in corruption whilst successfully hiding their true type from the voters.

chances. Initially corruption is beneficial (or at least ambivalent) to electoral chances, but as the game is repeated enough times, enough voters begin to realize the extent of corruption and punish the incumbent.

Brollo et al. (2013) find another potential mechanism. They too develop a political agency model with moral hazard and adverse selection and draw a direct line of causality between the demand for rent-extraction and greater chances of re-election. Their model predicts that larger budget revenues signal greater rent-extracting opportunities without having to disappoint voters (the high public good shock that keeps a corrupt politician in power). In addition, a potentially lucrative rent-extracting opportunity will affect political selection and invite candidates of lower ability to compete for office. This selection effect reinforces the moral hazard effect, given that an incumbent with less able opposition can freely extract more rents without jeopardizing his chances of re-election. Therefore in an environment of high corruption driven by excess public revenues incumbents have a higher chance of being re-elected. Although the findings in the paper are linear, the implications are that this effect should differ with respect to city size. Is the corruption effect larger in big cities or in smaller municipalities? Big cities have much greater oversight and the media is more able to uncover corrupt practices which would hurt the mayors' chances. Perhaps there is an upper limit where corruption is higher in smaller cities and lower in big ones (due to media oversight) and lowest in the smallest municipalities (due to small budgets). The theoretical implication is that we should observe a different effect of corruption on re-election contingent on city (and budget) size. The empirical estimation directly confirms this theoretical proposition.

Intuitively, there is no justification of why corruption should entail a linear effect on the probability of winning (so that it is either a strictly increasing or decreasing function of corruption). It is much more likely that the relationship depends on the specific situation the incumbent is in. For example, is the incumbent electorally safe, or does he have to fight for his or her seat? Nyblade and Reed (2008) use the argument that the effect of corruption on re-election depends on the uncertainty surrounding the electoral race. If a politician expects a close race he is less likely to engage in corruption (to "loot") but more likely to try and disturb the election process to win (to "cheat"). In other words, the behaviour of a politician and by extension his election chances depend on how good he performs in previous elections and to which extent does this allow him to cheat. We would therefore observe a positive correlation between corruption and re-election in safe seats and a negative correlation between corruption and re-election in heavily contested seats, again suggesting a non-linear effect.

The underlying non-linear mechanism can help us understand why the literature delivers contradictory findings of whether corruption is beneficial to electoral chances. For example, a famous study by Peters and Welch (1980) found that US Congressmen from 1968 to 1978 were more likely than not to get re-elected following a corruption charge against them.[2] However in a repeated study on US Congressmen from 1982 to 1990 done by Welch and Hibbing (1997) the conclusion was of a negative impact of corruption on re-election chances. Also for the US, Rundquist et al. (1977) conducted a survey experiment and found that voters would trade-off corruption for other things they value in a candidate. On the other hand Dimock and Jacobson (1995) looked at the effect of the House banking scandal on US voters in 1992 and found that voters did in fact punish corruption. Varying outcomes are confirmed in Brazil as well where Brollo et al. (2013) find a positive relationship between greater corruption opportunities and re-election while Ferraz and Finan (2011) using the same dataset of randomized procurement audits find that voters do in fact punish uncovered corruption. For developing and emerging countries there is also evidence both in favor of the hypothesis that corruption does not get punished at the polls (Manzetti and Wilson, 2007; Chang and Kerr, 2016), and against it (Klasnja, 2015; Klasnja et al., 2016).

The same voters can therefore both punish and not punish corruption. The observed outcome depends primarily on the specific context. Voters' preferences and beliefs about politicians may change over time. Furthermore, in small or medium-sized cities where there is not enough media scrutiny or accountability higher corruption can indeed be translated into greater electoral chances. In larger cities greater accountability towards the media and the voters may act as a constraint so we would notice an opposite effect.

Finally, the given relationship between corruption and re-election carries important economic implications. If corrupt politicians deliver successful policies (infrastructure, growth, etc.), i.e. if they are perceived to be of high competence, corruption is irrelevant to the voters and politicians can avoid punishment for years. This is one mechanism by which corruption can become entrenched in democracies. Podobnik et al. (2015) show that democracies do not cause corruption but can serve as a mechanism that preserves it. If voters rationally decide to be ignorant about political corruption, or if they rationally support a known corrupt candidate, then the mechanisms of political competition do not work, and democratic institutions are inefficient in combating corruption (Kurer, 2001; Helland and Sorensen, 2012). As a consequence countries can stay trapped in low equilibria, or as North et al. (2009) call them *limited access orders*, in which well-organized ruling elites manipulate the economy by generating privileges based on the personalization of governing institutions. The finding that corrupt activities reinforce electoral chances is depressing for the future of highly corrupt countries.

2.1. Why Croatia?

Croatia is particularly suitable to be analysed under the given theoretical framework. First, the country is riven with endemic corruption. According to Transparency International (TI) it ranks 60th out of 180 countries (Transparency International, 2018), but with an average score of 48 out of 100, defining it as a mostly corrupt country. It also ranks at the bottom of the EU Member States, with only Greece, Italy, Bulgaria, and Romania having higher corruption levels. The Commission (2014) anti-corruption report states

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[2] Similar findings were confirmed other developed countries such as Italy (Chang and Golden, 2004; Golden, 2004), Greece (Dobratz and Whitfield, 1992; Patrikios and Karyotis, 2008), and Japan (Reed, 1999; Nyblade and Reed, 2008).

a similar conclusion, reporting that Croatia is particularly vulnerable to corruption in its public procurement procedure and its legal framework. According to the report 64% of domestic entrepreneurs claim that corruption is extremely high in the public procurement process, while 89% say it is impossible to win a tender without "pulling strings".

Furthermore, a few recent cases of political corruption trials testify of a worrying relationship between politics and rent-seeking firms. Croatia's former Prime Minister (served six years in office, winning two elections) was accused and sentenced to nine years in prison on corruption charges for forcing state-owned enterprises to hand a private sector firm exclusive procurement contracts.[3] His party, the conservative HDZ, was also found guilty on corruption charges in 2014, and was ordered to return the money they've acquired illegally for campaign financing (30 mil kunas; about 4 mil euros). However the Supreme Court brought down the entire sentence in 2016 due to a technicality, returning the process back to the city court in Zagreb, raising public outcry. Other political parties were not immune to the same type of behaviour. In the past several years five mayors from large Croatian cities (Dubrovnik, Vukovar, Varazdin, Sisak, and the capital Zagreb), originating from parties in the centre-left coalition (SDP and HNS; social-democrats and liberal-democrats), were all arrested on corruption charges for abusing power by favouring private sector companies and extracting bribes for themselves. One of these mayors was sentenced, served his one year probation sentence, and came back to win a local by-election in 2015 (Tomicic (2015)). Two other mayors were in jail for six months on corruption charges, and their ongoing court trials did not prevent them from winning regular local elections in 2017.

The country's electoral and political institutions support such outcomes. There are no term limits for local office, meaning that local mayors may stay in power indefinitely (some of them have been holding local office for more than 20 years, and a great deal have held office for at least 12 years). Furthermore, mayors enjoy an incredible amount of unchecked decision-making power in their local environments (from urban planning to allocating procurement contracts), granted to them by the new law of local and regional government (Parliament, 2009). However even within such a system that fails to limit incentives for corruption there is great variability in corruption outcomes. Another useful artefact of the local government environment is the definition of population thresholds which are associated to a single policy — the one determining council size. This is a very useful set-up for the identification strategy used in the paper. Croatia is thus an ideal case-study to examine the impact of political corruption on long-lasting re-election chances.

The Croatian case is comparable with two groups of countries: Post-Communist transitional economies, given the similar historical and institutional background, and Mediterranean countries of the European South such as Greece, Italy, Spain, or Portugal, which share similarly high levels of corruption persistence. Any extension to the empirical contributions of this paper seeking its external validity should first attempt to test the given contributions on these two groups of countries.

3. Data

The complete database on public procurements contains over 400,000 contracts administered between 2009 and 2017, worth in total around 160bn kuna (about 21bn euros).[4] From this large dataset I managed to single out 139,870 contracts signed by the local public administration for the duration of two mayoral mandates, the first one from June 2009 to May 2013, and the second one from June 2013 to May 2017. This includes all public companies under direct ownership of the local government such as communal services, but excluding local health and education procurements, since these are not under direct control of the local mayor. The benefit of focusing only on local government procurements is that their administration is under full discretion of the local mayor. The total value of these contracts was 94.181 billion kunas (about 12.5 billion euros), out of which I managed to merge 77% of all contracts to each of the 6399 firm's financial statements, meaning that the total value of all contracts in my sample was 73.259 billion kunas (about 10 billion euros). Online Appendix C presents a detailed summary statistics of this sample.

The source of the procurement database was the Official Gazette of the Republic of Croatia Official (2019) and its online registry of public procurement. The procurement database contained information on who proscribed the legal tender (which unit of government), location (which municipality), date, total value of the contract, the firm that won the tender, its financial identification number, and a brief description of what the tender was for. The quality of the data depends solely on the precision of entry in the Official Gazette.

The second step was to combine the official data on each procurement contract with the financial statements for companies that were engaged in the procurement procedure. Each contract was linked to a firm via its financial identification number (OIB), and clustered across local units (city or municipality) where it was completed. The source of data on firm financial statements was extracted from the government's Financial agency (FINA), the official public database on business entities, for all eight years during which the tenders have been assigned. The financial statements data includes size of revenues and expenditures, total profits and losses after taxes, tax liabilities, total assets and liabilities, total capital, and number of employees for all firms that won tenders in the observed period. This way it was possible to define suspicious procurement contracts by observing which firms were potentially favored in the procurement procedure. For example, the data shows how many tenders a firm has won over the years, and what the competition for the tender was, which made it possible to single out firms that were the only bidder, and that won multiple contracts in a single year. The next section describes the various corruption proxies that were made using some of these indicators from the

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[3] He used the money flowing to this company to take rents for himself and to finance his party's campaigns. This is only one of the six major cases against the former PM (Petrusic, 2014).

[4] 2009 is the first year the government started to publish all procurement contracts in a single online database in an effort to increase transparency.

database. It should be noted that 23% of all procurements could not be assigned to any company due to errors in reporting the unique financial numbers of a firm, or other missing data. This raises a slight concern with regards to potential measurement error, however as the next section explains, the ways in which corruption indices were defined reduces this concern.

The data on electoral results was extracted from the State Electoral Commission of the Republic of Croatia (2018) for local elections in 2009, 2013, and 2017 on a municipal level for 556 cities and municipalities. The sources of the many economic and demographic controls were the Croatian Bureau of Statistics (DZS, 2018) and its 2011 Census, the Croatian Employment Bureau (2018), and the Ministry of Finance. The Electoral Commission was the source of data on various political, but also mayoral and municipal specific characteristics, such as turnout, vote shares in various elections, data on political experience, size of governing coalition, size of local council, and mayor gender.

4. Measuring potential corruption in public procurements

Measuring corruption precisely is immensely difficult. The primary reason is obvious: participants of corrupt activities successfully hide their transactions from any methodological coverage. Unless there is a criminal investigation followed by a court hearing, these transactions will remain hidden from the public eye. However, grand-scale political corruption manifested through close relationships between politicians and firms can be approximated by carefully overseeing the flow of public resources. In particular the price, quantity, and the end quality of the public good, provided as a result of a dubious procurement process. The European Commission (Commission, 2014), in their corruption report on 28 EU member states, reported that the lack of transparency in public procurement is the main source of political corruption in all of its member states.

This section describes the main methodological contribution of this paper. It describes the logic behind classifying certain contracts as suspicious and lists all of the six proxy variables used to measure potential corruption. The way corruption is defined in the paper is by no means subjective; it follows the literature and uses established indicators of fraudulent procurement practices (e.g. Fazekas et al. (2016) use large procurement datasets to uncover "red flags" such as cases of restricted competition and multiple contracts repeatedly awarded to the same firm; while Ferwerda et al. 2017 use data from criminal investigations to develop risk indicators of corruption based on lack of transparency, the size of the tender, and collusion of bidders),[5] and it validates the given measures by calling upon qualitative evidence — interviews conducted with key stakeholders in the procurement process: special police investigators, civil sector anti-corruption watchdogs, local government officials, public sector bureaucrats, and entrepreneurs[6]. The interviews served the purpose of external validation but also in recognizing and including other sources of suspicion. After establishing how suspicious procurements were quantified I perform an additional validity check using independent evidence from state audit reports on procurement irregularities and a local government transparency indicator.

Despite best efforts and despite rigorous cross-referencing of contracts and validation of the created proxies, there is always room for doubt in whether the given definitions truly capture corruption. Because corruption can never entirely be uncovered by the data alone (i.e. without criminal investigations), I cautiously define such practices as *suspicious procurements*. The paper does offer readers the benefit of doubt in the empirical sections and in its general phrasing by using the word *corruption*, however the way corruption is classified in the paper follows the theoretical logic of measuring some form of collusion between rent-extracting firms and local politicians. Most importantly the definitions were formed based on qualitative evidence from stakeholders recognizing patterns of potential fraud in the data. This gives the paper much credibility in classifying suspicions patterns of procurement allocation as corruption. Nevertheless, in order to maintain objectivity the indices used in the paper should only be considered as *proxies for corruption* defined through a rent-extracting relationship between firms and politicians.

4.1. Defining the proxies

What do suspicious procurements look like? Any contract that raises reasonable doubt that factors other than the official tender requirements were used to determine who gets the contract, or that the tender requirements were designed to favour a particular firm over all others is classified as suspicious. These include cases in which firms with zero employees receive multiple contracts as the only bidder in the procurement, firms that win tenders in which the value of the procurement contract is larger than their average annual revenues, and firms with large losses which are indirectly subsidized by the local government. From these categories six proxy variables for measuring corruption are assembled, with two additional variables that measure corruption in public infrastructure investments (according to Tanzi and Davoodi, 1997 and Mauro, 1998). The reason I focus only on local procurements is because the local government does not use procurements to buy highly-specialized technical equipment (hospital or military) which usually only a handful of companies in the whole country can do. The vast majority of local government contracts include random construction work, maintenance jobs, or a number of services from driving to printing. These are jobs that are highly unlikely to have only one suitable firm to perform them. An additional benefit is that according to the Law of local government (Parliament, 2009) the allocation decisions are at the mayor's full discretion. This makes it useful to operationalize and test the theoretical model of how

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[5] Many research efforts use specific indicators to quantify corrupt behavior of politicians. Reinikka and Svensson (2004) study the misappropriation of education spending in Uganda, Olken (2007) the quality of roads in Indonesia, Ferraz and Finan (2011) the misappropriation of local government budgets via public procurements in Brazil, Bandiera et al. (2009) public procurement of civil service in Italy, and Di Tella and i Schargrodsky (2003) public procurement of hospitals in Argentina.

[6] Full summaries of interviews available in the Online Appendix.

mayors' discretionary decisions in procurement allocations affect their relationship with connected firms and how this in turn affects their electoral prospects.

For each category of suspicion a corruption proxy is calculated as the ratio of total resources (the monetary amount) allocated to suspicious procurements to the total value of all procurements in the observed period in a single municipality (methodologically similar to Ferraz and Finan, 2011):

$$k_i = \frac{\sum_i^n s_i}{\sum_i^n u_i}, \forall\ s_i \subseteq u_i$$

(1)

The proxy variable in all cases is the share of the total monetary sum of suspicious procurement contracts (s_i) in total contracts (u_i), determined for the entire observed period for a given municipality i.

A procurement contract is labelled as suspicious (s_i) in the following three cases:

- (1) If the total value of a single contract given to a particular firm exceeds 70% of its total average annual revenues for the four years observed (large tenders)[7]
- (2) Cases in which multiple contracts were allocated to firms with zero employees and which were the only bidder at the tender (fake firms)
- (3) Cases in which multiple contracts were given to companies which were operating at a net loss prior to the tender, but made a profit in the following year after signing the contract (as a measure of indirect subsidies gained through political connections).

The detailed explanations behind each indicator are presented in Online Appendix B, under the summary of interviews with key stakeholders in the procurement process, and in Online Appendix C, which presents the summary statistics of corruption proxies in addition to a few examples for each indicator. This section briefly clarifies the logic behind each indicator, summarizing the information from the appendices.

The first proxy, (1) *total value of contracts exceeding 70% of average annual four-year revenues*, focuses on firms which had little or no sources of revenues other than contracts received from the local government. The puzzling thing about the majority of such firms is that they received contracts worth several millions, but their revenues remained minuscule in the following years (about 73% of the over-70 subsample includes such firms; and they represent about 17% of the entire local procurement sample). This suggests a clear example of accounting fraud as there was no sign of the allocated funds in their annual reports. According to the information from the interviews (Appendix B) such cases do happen occasionally. They represent clear examples of money laundering schemes usually performed by fake firms, where a firm with almost no revenues would win a tender at a dumping price, and then sell it to another (often sister) firm at a higher price.

In addition to firms whose contract value exceeded their revenues, there were others that did exist on the market, but who were over-reliant on government support (about 27% of the subsample). The 70% cut-off for the entire group was chosen as the first marginal point above having two thirds of one's revenues received from public procurement, and it was the estimate that correlated highest with other used measures of corruption. A sensitivity analysis was performed for other values of the cut-off. Anything above the 100% cut-off exhibits the same effects as the 70% cut-off, while anything below the 50% cut-off exhibits no significant effect. Values between 50% and 70% could have also been used, however the 70% cut-off was chosen to have a conservative estimate of potential corruption. In other words this definition underestimates rather than overestimates the approximation for corruption, making sure it only captures firms that have the highest probability of being politically connected. This is further reinforced by the information from special police investigators who state that every corrupt firm they were investigating had an over-reliance on government procurement contracts (see Online Appendix B), and furthermore that most large tenders given to firms with otherwise low revenues always raise red flags of suspicion. In addition, having income come only (or mostly) from public procurement contracts suggests a high level of dependence on politics and the allocation of public budgets, which raises the probability that a firm would have to maintain good political connections in order to be awarded a contract. Particularly since the local contracts almost never included highly-specialized jobs that only a single firm can do.

The second proxy (2) looks at *multiple contracts given to firms with zero employees where the firm was the only bidder in the auction —* the so-called 'fake firms' (see Online Appendix B). Similar to the first proxy indicator this was coded as suspicious because firms with zero employees that won the tender almost never performed the tender by themselves, and have always served as a proxy company for another bidder who was unable to compete at the tender due to a conflict of interest (personal connection to the decision-maker). This indicator captures corruption with a high degree of confidence and has been labelled as almost certainly a case of corruption. However, such firms did not grab a large portion of the procurement allocation, only around 3% in total, but this still amounted to almost 800 million kunas received from the local budgets.

The third proxy (3) looks at *how much the local government indirectly subsidized firms with large losses*, which after signing the procurement contract several times higher than their annual revenues, realized a profit in their next business year. Giving money to firms operating with losses is not a corrupt activity per se, but it constitutes bad practice according to the procurement administrators, and is highly indicative of a political connection (see Online Appendix B). It also raises outrage among non-connected

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[7] Following the formula in 1, k_i will be the sum of all contracts allocated by the municipality in which a particular firm wins a tender with a value at or in excess of 70% of its average revenues, divided by the total value of contracts from all public procurement contracts in the municipality. The same reasoning is applied to variables (2) and (3).

entreprenuers as firms with large losses acquire political connections which ensure that they are 'bailed out' during times of economic hardship.

The overall conclusion that can be drawn from the use of the aforementioned proxies is that even though not every single case can be labelled as outright corruption, all of them raise red flags of suspicion with the authorities, and most of them implicate some form of political connections. Despite this evidence, there is obviously still room for caution in interpretation and a possibility of unintentionally labelling some regular procurements as corrupt or a result of political connections. The margin of error therefore certainly exists, however given the volume of contracts and the fact that each proxy only looks at the relative level of suspicious contracts within a city or municipality, the error most likely does not undermine the validity of the definition.

Using the given definitions of suspicion I am able to design three separate indices of corruption proxies, in order to capture all possible suspicious procurements in a given municipality. These indices are intended to be an even better indication of a rent-extracting relationship because they capture all cases where political connections could have played a role in the allocation process within a single local unit. Each index is a weighted average of the aforementioned variables along with several others taken out from the database and described below[8]:

- (4) *Index 1*: measures all incidences in which firms had a high share of suspicious procurement revenues in their total revenues. The index is a weighted average of firms whose value of suspicious contracts exceeds 70% of total revenues, 100% of total revenues, and contracts in excess of 100% of the firm's profits or losses;
- (5) *Index 2*: cases where firms received multiple contracts as the only bidder (but not only those with zero employees), and all firms that overturned losses into profits for the full value of the tender;
- (6) *Total Index*: weights all of the aforementioned indicators of suspicious procurement equally, capturing all the potential frauds into a single, common corruption indicator. None of the individual cases overlap, meaning that, for example, a firm that had both zero employees and contracts in excess to 70% of revenues was included only once. Because the Total Index takes into account all incidences of suspicious procurements within a single city or municipality it is the central corruption proxy used throughout the empirical part of the paper.

The summary statistics of all 6 corruption proxies are presented in Table 1. It shows the mean values for each corruption proxy by city, municipality and overall. As expected, instances of corruption tend to be higher in cities than in municipalities.

4.2. Independent validation of the proxies

An ideal example of external validation of the assembled corruption proxies would be to use actual arrests and indictments of mayors, however since such cases are rare and happen infrequently (and are often correlated with electoral cycles), I seek other independent evidence about potential corruption. I perform a validity check using audit reports on either the violation of the procurement procedure or any other kind of budgetary irregularities, in addition to a local government transparency indicator. I use two sources for this validation exercise: the official state audit that each year audits local budgets and expresses positive or negative opinions regarding the budget process and the allocation of procurements (Office, 2011), and a local budget transparency index, created by the Croatian Institute for Public Finance (IJF) (2018).

The State audit issues a passing grade to cities and municipalities which show no irregularities in its budgetary allocation, its accounting processes, its procurement allocation, or in managing its assets. It also publishes a list of local units which have had irregularities and violations of the law in either one of the aforementioned procedures. Such irregularities are not defined lightly. The irregularities and violations recognized by the State audit are often used in cases of criminal indictment against corrupt politicians, in the rare cases when such arrests are actually made. Irregularities in the budget allocation process usually imply fraudulent bookkeeping and financial statements, deliberate misrepresentation of the value of the unit's assets like land and property, missing important documents and contracts, favouritism in funding selected budgetary recipients (e.g. for schools, cultural institutions, health facilities, sports, etc.), allocating funds without underwriting procurement tenders, irregular compensation of city or municipal assembly-members, and various other errors and omissions. In public procurements irregularities are mostly related to allocating contracts without tenders, but even when such tenders were underwritten in many cases the negotiation process was highlighted as troublesome (by favoring a single bidder) and not abiding to the law. I separate the cases of procurement irregularities with cases of any irregularity in order to design two indicator variables that are supposed to measure the extent of potential corruption in local government. The indicator is coded as 1 if the state audit issued a negative grade in any of the four years during the mayor's tenure, and 0 otherwise.

In addition to these official indicators of irregularities and violations, the budget transparency index published by the Institute for Public Finance is another useful robustness indicator. It ranks cities and municipalities based on whether or not they made the entire decision-making process behind its budget accessible online (including planning for the next fiscal year, previous year execution, revision, details of the current budget and guides for the general public). Each of these is required by law to be published online and easily accessible to the public. Although the transparency indicator in itself does not measure corruption or any illicit activity, it creates a decent measure of transparency that should, according to the literature (e.g. Lindstedt and Naurin, 2010), be highly correlated to corruption.

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[8] All three indices are assembled in the same way as the first three proxies, described by Eq. (1).

Table 1

Summary statistics of the six corruption proxies .

Corruption proxy	(1)	(2)	(3)	Index 1	Index 2	Total Index
City	0.289	0.173	0.033	0.147	0.127	0.157
Municipality	0.102	0.098	0.017	0.061	0.054	0.069
Overall	0.145	0.115	0.021	0.081	0.071	0.089

Note: The standard deviation of each proxy is given in the summary statistics Table A1 in the Online Appendix.

Table 2

Corruption correlation matrix .

	Total index	Audit irregularities	Audit procurement irregularities	Budget transparency
Total index	1.00			
Audit irregularities	0.213	1.00		
	(0)			
Audit procurement irregularities	0.179	0.484	1.00	
	(0)	(0)		
Budget transparency	0.094	0.099	0.097	1.00
	(0.001)	(0.001)	(0)	
Corruption index by all irregularities			Corruption index by procurement irregularities	
0.055***			0.053***	
(0.0)			(0.0)	

Note: p-values reported in parentheses. The final two rows report t-tests for the differences in corruption indices by all irregularities (left) and by procurement irregularities (right).

All three indicators based on independent evidence of suspicious behaviour should therefore offer a good validation of the corruption proxies. Table 2 below uses the Total Index of suspicious procurements and compares it to the three designed indicators: State audit irregularities, State audit procurement irregularities (both coded as an indicator variable), and Budget transparency index (coded on a scale from 0 to 5). The corresponding t-tests are reported below. The table shows only cross-correlations with the Total Index, however in the case of all other proxies the results point to the same conclusion: there is a statistically significant correlation between independent evidence on irregularities and transparency and the indices defining suspicious procurements.

5. Does corruption affect re-election?

The main question of interest is whether corruption approximated via suspicious procurements affects re-election chances. The theoretical implications suggest that it should, and that the relationship between the two should be non-linear. Before examining the causal effect with an RD estimation I first establish the conditionality for the right functional form, and examine the relationship with respect to all corruption indices available.

The first step is to test directly how suspicious procurement contracts are turned into votes. The following binary model is evaluated, anticipating the effect of the independent variable which represents a specific measure of corruption on the probability of electoral success of the incumbent mayor:

$$P(R_i=1|k_i, \epsilon_i) = G(\beta_0 + \beta_1 k_i + \beta_2 k_i^2 + V_{t-1} + \xi \mathbf{I_i} + \varphi \mathbf{E_i} + \mu \mathbf{M_i} + \vartheta \mathbf{D_i} + \epsilon_i) \quad (2)$$

Where G is the standard cumulative distribution function (c.d.f.) defined between 0 and 1, $0 < G(z) < 1$, for all real numbers z. A standard linear probability model (LPM) is used for estimation (a probit estimation has also been tried and it yields identical results).

The dependent variable, R_i is a binary variable which takes the value of 1 if a mayor is re-elected in the 2013 or 2017 elections and 0 if not.[9] The independent variable k_i represents the Total index of corruption, or one of the remaining proxy measures. The β_1 and β_2 parameters jointly measure the total effect of corruption on re-election. The square value of k_i^2 should indicate either the concavity or the convexity of voter preferences towards corruption (depending on whether β_2 is positive or negative).

I draw a series of political (I), economic (E), mayoral or municipal (M), and socio-demographic (D) covariates from the economic voting literature empirically proven to have an effect on the probability of re-election (Lewis-Beck and Paldam, 2000; Duch and i Stevenson, 2008) and for Croatian national elections (Glaurdic and Vukovic, 2016). The political variables (I) include the following:

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[9] The variable primarily looks at electoral fortunes of mayors but it also takes into account the value of a party staying in power for a long time. However the electoral fortune of the major is of primary concern. For example, if the mayor got re-elected but changed parties (usually by becoming independent), the value assigned is 1. If a mayor lost, but his party remained in power (e.g. as a minority partner or if it found a new candidate), the value is 0. If, however, a mayor left for higher office or retired and his party stayed in power by appointing his deputy as mayor in the new election and the deputy won, the value assigned is 1. This happened in less than 5% of the overall cases but it is nonetheless important to keep track of it as party politics carries a strong cue for voters in many local government units.

Table 3

Corruption and re-election, simple and full models .

Dependent variable: Re-election (R_i)	(1)	(2)	(3)	(4)
Corruption (k_i)	−0.127	0.568	0.663	0.708
	(0.11)	(0.26)**	(0.30)**	(0.31)**
Corruption squared (k_i^2)		−1.547	−1.681	−1.67
		(0.65)**	(0.76)**	(0.75)**
Vote share ($t - 1$)		0.541	0.543	0.570
		(0.07)***	(0.08)***	(0.08)***
Years in power			−0.004	−0.004
			(0.003)	(0.003)
Mayor Gov			0.042	0.037
			(0.03)	(0.02)
Turnout			−0.341	−0.342
			(0.14)**	(0.15)**
Size of governing coalition			−0.033	−0.029
			(0.01)***	(0.01)***
Local tax rate			−0.642	−0.606
			(0.34)*	(0.34)*
Council size			0.006	0.006
			(0.006)	(0.005)
Unemployment				0.331
				(0.20)*
Income p/c				$2.0x10^{-6}$
				$(2.7x10^{-5})$
Grants p/c				$- 1.8x10^{-5}$
				$(6.7x10^{-6})$***
Education				0.013
				(0.02)
War disabled				−0.002
				(0.002)
Settlement size				−0.057
				(0.04)
Istria				0.077
				(0.05)
Male mayor				0.581
				(0.23)**
Observations	1112	1105	1105	1105
R squared	0.0015	0.0473	0.0663	0.0790

Notes: All estimates are calculated using OLS regressions. Standard errors are shown in parentheses, are robust to heteroskedasticity, and are clustered by city status. *** denotes significance at 1%, ** at 5% and * at 10%.

V_{t-1}, vote share the incumbent received in the previous election (in 2009 for the first part and in 2013 for the second part of the dataset) as a measure of the incumbency effect. I further included size of the governing party coalition in the local council for the entire mandate (2009–2013 and 2013–2017) in order to evaluate the effect of voter anticipation of post-electoral coalitions on the probability of electoral success (Armstrong and Duch, 2010). The next was turnout which usually carries a negative effect on re-election probability, followed by the alignment indicator variable of whether or not the mayor was from the same party that was in power on a national level at the beginning of the term (denoted as Mayor Gov), which usually boosts the local candidate's electoral changes (Glaurdic and Vukovic, 2017). Finally I also include political experience which is simply total number of years in power for the current incumbent.

Economic covariates (E) also follow the standard literature on economic voting (Lewis-Beck and Paldam, 2000; Duch and Stevenson, 2008): the local tax rate, average four-year unemployment rates, average income per capita, and average intergovernmental grants received all act as measures of economic strength of a local unit. Mayoral and municipal (M) controls include an indicator of male gender and local council size, while socio-demographic (D) controls include average years of education for the population over 15 years of age, share of war disabled per 1000 inhabitants, the settlement size of a municipality, and a regional indicator variable for Istria. Size of municipality represents a proxy variable for the urban-rural cleavage and is measured as the logarithm of the weighted average of settlement size. The variable war disabled per 1000 inhabitants quantifies to which extent a municipality was exposed to the Croatian war for independence. It represents the number of people (civilians and military) that were made disabled from 1991 to 1995 due to the war devastation. This variable represents the most important determinant of voter preferences in the last four national elections in Croatia (according to Glaurdic and Vukovic, 2016). Finally, the regional dummy for Istria is necessary due to a specific electoral situation in this region where a local political party dominates the majority of local elections for the past 25 years.

Table 4

Corruption and re-election, OLS estimates for all proxies .

Dependent variable: Re-election (R_i)	(1) Value of contract to revenues > 0.7	(2) Only bidder & zero employees	(3) From loss to profit	(4) Index 1	(5) Index 2
Corruption (k_i)	0.275	0.178	0.347	0.498	0.210
	(0.04)***	(0.08)**	(0.21)*	(0.09)***	(0.16)
Corruption squared	−0.263	−0.149	−0.720	−1.18	−0.672
(k_i^2)	(0.13)**	(0.11)	(0.39)*	(0.02)***	(0.09)***
Controls	YES	YES	YES	YES	YES
Observations	1105	1105	1105	1105	1105
R squared	0.0723	0.0721	0.0791	0.0765	0.0729

Notes: All regressions are OLS estimates as specified in Eq (2). Controls include all the variables used in the full model version of Table 3. Standard errors are shown in parentheses, are robust to heteroskedasticity, and are clustered by city status. *** denotes significance at 1%, ** at 5% and * at 10%.

5.1. OLS estimation of the non-linear relationship

Table 3 presents initial results of Eq (2) using the linear probability model (LPM) for estimation and building the relationship from a simple to a full model. It starts with a basic linear regression between corruption and re-election (column 1) and then it builds it to include the squared term for corruption and previous period vote share for the incumbent (column 2), after which is starts including first the political covariates (column 3) and finally the political, economic, and socio-demographic covariates all together (column 4). In this Table only the *Total Index* of corruption is used to examine the relationship of interest, given that *Total Index* equally weights all the proxy variables used (defined in the previous section). All other corruption proxies are shown in Table 4 below.

The results presented in Table 3 are in line with the theoretical predictions. The initial linear estimate is negative albeit not statistically significant (it also fails to achieve statistical significance as other covariates are added; this is not shown). The non-linear estimates, on the other hand, yield a result consistent with the hypothesis: by increasing the proxy level of corruption (i.e. increasing the share of suspicious public procurements in total procurement) the probability of re-election of the local politician increases. The negative value of estimated parameter $\hat{\beta}_2$ across all regressions in all three tables implies the concavity of voter preferences with respect to corruption. This suggests that too high levels of suspicious procurements decrease voter utility and imply a punishment. There is a maximum (marginal level) of the probability function for which the voters find corruption acceptable. Adding covariates in Table 3 does not affect statistical significance but it does increase the magnitude of the effect.

Before unpacking this further, there are a few control variables in Table 3 that deserve some attention. Higher vote share in the previous election increases a mayor's probability of winning in the next election. This is hardly surprising given that high previous period vote share signals durability and strength. Higher turnout and a higher governing coalition in the local council (both proxies for greater political competition) generate a negative effect on re-election, which is also expected. Higher local tax rates also generate an expected negative effect, however more grants received from the national government reduce electoral chances, which is a somewhat counter-intuitive finding (usually more intergovernmental grants help mayors increase their chances of political survival). Finally, having a male mayor increases chances of re-election, which is not surprising in the Croatian context given that over 80% of all mayors are men.

Table 4 presents the same findings across all the three main proxies (value of the contract greater than 70% of revenues; single bidder firms with zero employees, and firms who used the tender to overturn a loss into a profit) and the two remaining indices of corruption (Index 1 taking into account only firms where suspicious contracts had a varying high share of firm revenues, and Index 2 which pools together the last two proxies). All these proxies and indices imply the same conclusion as in Table 3, albeit with varying levels of statistical significance and effect size.

It order to quantify the total effect of corruption on re-election and calculate the cut-off point (maximum of the re-election probability function) after which higher corruption adversely affects electoral chances, I use the following formula:

$$\hat{k}_i^* = \left| \frac{\hat{\beta}_1}{2\hat{\beta}_2} \right|$$

(3)

Where k_i^* is the marginal cut-off value of the proxy for corruption while $\hat{\beta}_1$ and $\hat{\beta}_2$ are estimated regression coefficients from Eq 2.

Take for example the values from the final column of Table 3 examining the joint *Total Index*. If we take $\beta_1 = 0.708$, $\beta_2 = -1.67$, then the marginal value of k_i^* according to Eq (3) is $k_i^* = 0.708/2(1.67) = 0.2119$, or 21.2%. This implies that a mayor will maximize the probability of re-election when the share of all suspicious in total procurements is 21.2%. If the mayor increases the share of suspicious procurements above 21.2% this does not necessarily imply he or she will lose the election, but that his or her probability of re-election decreases. The mayor can, without any constraint, allocate almost half of total public procurement tenders in a suspicious way without jeopardizing his or her position in power. Other proxies and indices vary in effect size. For example the first two proxies find the maximum at between 50 and 60% of procurements allocated in a particularly suspicious way. It makes sense that individual proxies yield higher effects than joint indices given that the joint indices assign a weight to each individual proxy.

Overall the results confirm that a mayor maximizes his or her time in office if the weighted average of all suspicious procurement
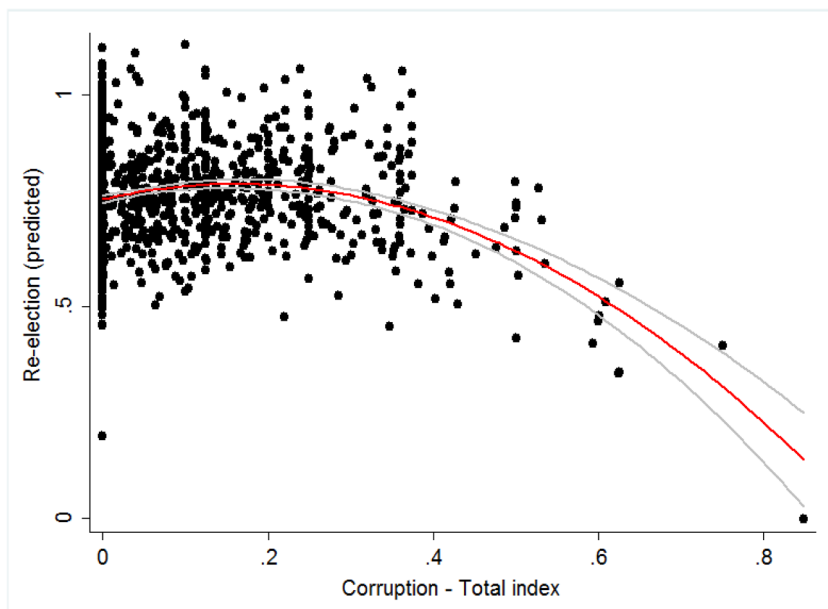
Fig. 1. Corruption and re-election. The Total Index was used as the corruption proxy, while the y-axis shows predicted values of the re-election indicator variable. The probability of re-election function is fitted using the LPM regression estimates with 95% confidence intervals.

contracts within his municipality or city is roughly a fifth of total procurements. This does not imply that the politician cannot allocate even more resources to suspicious procurements, however after about 20% of procurements allocated this way his or her probability of re-election decreases. Fig. 1 shows the estimated probability of winning function against the Total Index of corruption.

According to the estimated values of the dependent variable 're-election' from Fig. 1, it can be inferred that the probability of re-election increases to 75% with optimal levels of corruption ($k_i^* = 21.2\%$), other things held equal. However if the level of corruption increases by two standard deviations (e.g. if we jump from a municipality where the total index is 20% to a municipality where this index is around 50%) the probability of re-election drops below 50%, other things held equal. These initial results suggest that the probability of re-election increases with the level of corruption, i.e. when politicians are entrenched within their networks. However, voters will punish excessive corrupt behaviour when politicians have redistributed too much to their cronies.

5.2. Identifying the treatment effect of corruption on re-election using fuzzy regression discontinuity

The effect of corruption on local re-election as defined in Eq (2) and presented in the previous sections can potentially be biased due to many unobservable confounders. Even though I control for quite a few municipal-specific political, economic and demographic factors, the estimated effects could still be driven by things that cannot be measured. For example, a politician's intrinsic competence or ability may increase re-election probability and at the same time enable him to be more corrupt. It is thus necessary to find a way to control for such unobserved factors by exploiting some kind of randomization on the impact of corruption.

In order to address potential endogeneity issues and estimate the treatment effect of corruption on re-election I use a 'fuzzy' regression discontinuity (RD) design. Unlike the regular or 'sharp' RD design where treatment is a deterministic and discontinuous function of a given covariate after some cutoff level, the fuzzy design exploits a discontinuity in the *probability* or *intensity* of treatment around an arbitrary threshold. In such cases the discontinuity can be treated as an instrumental variable for treatment status.

In this paper I use population thresholds determining the size of local councils as defined by law (Parliament, 2009) as the main source of discontinuity (similar to Pettersson-Lidbom (2012) for Sweden and Finland, and Egger and Koethenbuerger (2010) for Germany). The design exploits the fact that council size increases in increments of 2 (or 4 for larger cities) following an arbitrary rule on population size for each local unit. The as good as random assignment of local units into treatment and control groups is generated at each population threshold. Because we are comparing units just below and just above the threshold, we are operating under the standard regression discontinuity assumption that such units are very similar in all unobservable covariates except for the change in council size, making it possible to infer a treatment effect by comparing their outcomes.

More importantly the existence of different thresholds that determine council size will enable the estimation of heterogeneous treatment effects for each threshold. This is important as it will enable a direct test of the theoretical mechanism on whether city size is a determining factor of the relationship between corruption on re-election.

5.2.1. Council size, corruption, and the exclusion restriction

Council size is indeed positively correlated with corruption. This could be explained as a proxy impact of local coalition formation. The more sitting members in the council, the more likely for a mayor to engage in corruption (the greater the intensity of

Table 5
Council size with respect to population threshold .

Population threshold	Council size below	Council size above	No of units 5% below threshold	No of units 5% above threshold
500	7	9	5	3
1,000	9	11	13	21
2,500	11	13	60	54
5,000	13	15	36	41
10,000	15	17	13	15
20,000	17	21	4	5
35,000	21	25	1	3
60,000	25	31	5	2
100,000	31	35	0	2
200,000	35	45	0	0
300,000	45	51	0	0
Total			137	146

Notes: The final two columns represent the total number of cities and/or municipalities within the 10% bandwidth from the threshold.

corruption) to satisfy key individual members (the swing representatives) and thus maintain his or her political support. This section summarizes the logic behind this first stage relationship and discusses the validity of this instrument's exclusion restriction.

The number of council representatives for each local unit is determined on a national level by law (i.e. exogenously imposed) and is contingent on the total population of a given city or municipality. The lowest requirement determined by the Law of local and regional government (Parliament, 2009) is to have at least 7 representatives, which is allocated to municipalities under 500 inhabitants. The law then defines the population values for each next number of representatives, increasing in increments of 2 or 4 (in order to always have an odd number). For example, between 501 and 1000 inhabitants, the total number of council members is 9, between 1001 and 2500 it is 11, between 2501 and 5000 it is 13, and so on (see Table 5). As the population of a city or municipality changes, these numbers automatically adjust, going up or down by 2 (or 4) council members. The population size is determined nationally based on census data. The rule is therefore exogenously imposed and cannot be manipulated by any local actor, making it as good as randomly assigned.

How does council size exert its indirect influence on corruption? Or in other words why should the intensity of corruption increase with increasing council size? One hypothesis is that more council members can induce a mayor to be more corrupt, as in order to keep his council majority he needs to divert more resources towards corrupt activities and from this bribe the council members for support. Bribe is only one method, this can also include patronage where mayors have the power to employ representatives' family members in city or municipal companies, or in politically-connected private firms. The evidence for both of these practices is ample. The mayor of Zagreb is infamous for employing whole families of city council members in public firms (N1 News, 2016). The most famous example of bribery of council members was the case of the convicted mayor of Vukovar who was audio-taped offering 50,000 km to an opposition council member to switch to his side (Vecernji list, 2013). He was sentenced to one year and four months in prison (Patkovic, 2014). Anecdotal evidence suggests that the mayor of Vukovar was the "only one sentenced for something that everybody does in local politics" in Croatia (Litvan, 2014). Because of this it makes a big difference if a mayor is trying to get a majority in the local council of 25 members or in a local council of 9 or 11 members. Less people to corrupt implies lower demand for corruption.

Additional evidence to support the link between corruption and council size is based on the reports of the independent Committee for Determining Conflict of Interest, which has jurisdiction to investigate and conclude whether a public official is in any form of conflict of interest. According to numerous reports from 2012 to 2016 on local mayors and their council members the Committee has found that the most usual cases of conflict of interest arise when a mayor allocates a procurement contract to the firm run by one of his or her council members (from the mayor's coalition, and even more often to a member of the local opposition party). According to the Committee this practice is a regular occurrence in local politics in Croatia (Committee for Determining Conflict of Interest, 2017, 2016, 2015, 2014). A mayor therefore builds a coalition of supporters within the local council by allocating procurement contracts to them. This practice will increase the instances of suspiciously allocated procurement contracts within a city or municipality and is the key factor that can explain the high correlation between council size and corruption measured through suspicious procurements.

The corruption indicator at hand is only a proxy for actual corruption, approximated through suspicious procurement. It therefore assumes that cities and municipalities where the mayor engages in more suspicious procurements also carry a higher probability of other corrupt activities like bribes and nepotism. In other words higher levels of suspicious procurements administered by the local government are likely to be correlated with incidences of bribes and patronage. According to the report from the State Attorney Office, in cases of arrests of either mayors or former ministers they contained incidences of all three — bribery, patronage, and fraudulent procurement (Attorney General of the Republic of Croatia, 2015).

If mayors bribe members to keep their council majority, will this affect their re-election chances as well? Not directly. Since 2009 elections for local mayors and local council have been separated. Voters vote for parties on one ballot and for the mayor on the other ballot. A mayor has an incentive to have a majority in the council, but his or her primary concern is to be voted in directly by the voters. Therefore the realization of council majority comes ex post and independently of the mayor's electoral victory. If a mayor bribes council members to achieve this majority the act itself has no effect on voters directly (unless uncovered by a criminal investigation, obviously).

An additional feature of Croatian laws is that the only policy change that occurs at the population thresholds as specified in

Table 5 is the size of the local council (Parliament, 2009). The status of the mayor does not change, nor does any category of budgetary revenues or spending. The allocation of intergovernmental grants is based on development indicators and has nothing to do with population or council size (Glaurdic and Vukovic, 2017). Electoral rules also remain the same regardless of population size, while rules on public officials' salaries and the maximum local tax rate follow a different pattern than council size rules.[10] Other rules that determine some of the aforementioned categories are in no case contingent on population size or local council size. This makes the argument that an increase in council size does not carry any policy or spending effect other than corruption more persuasive. It reduces the possibility of compound treatment — when different policies change in the same population threshold (Eggers et al., 2018) — and increases confidence in satisfying the exclusion restriction in that the size of local council after a particular population threshold has no other way of affecting the outcome (re-election) other than through the treatment.

Is there any other factor that can move alongside council size and therefore potentially bias the estimates of the identification strategy? There is no direct budgetary effect and no policy change occurring at these thresholds. However, cities and larger municipalities with greater council size could face greater electoral competition making it more difficult for a mayor to get re-elected. Larger council size could therefore be correlated with greater electoral competition, which represents a potential threat to the identification strategy. To control for this I performed a separate analysis by controlling for the number of candidates in the elections and I included the variable in the balance tests described in the next section (with results presented in Table A3 in the Online Appendix). Electoral competition is indeed greater in cities and more populous municipalities (on average there are 2.6 candidates in cities and 2.2 candidates in municipalities, a statistically significant difference), however there is no change in the overall effect when controlling for this variable. This is not the only variable measuring electoral competition however. Other control variables that are already included in the main estimations, all of which good proxies for electoral competition, are the size of the governing coalition, turnout, and previous period vote share of the incumbent (e.g. turnout is higher in more contested units, as is the size of the governing coalition, while higher previous incumbent vote share suggests lower electoral competition). The results remain robust with respect to all of these controls.

There is also the possibility for greater minority representation in larger councils which could carry an impact on electoral chances. In Croatian politics some local units do have minority representatives however they are elected on a separate ballot and do not account towards the number of seats in the local council as measured in the paper. If a local unit has a minority representative this is only one person and this person is added to the council separately. Furthermore large cities do not have minority representatives as part of the city council, only smaller municipalities do. While this person could theoretically be the tie breaker, the variable size of the local coalition — which is the control variable used in the estimation — takes this into account. It shows that a minority representative was never crucial in determining a council majority nor that he or she had any effect on a mayor's electoral chances.

There is still room for caution given that places with higher council sizes and larger populations obviously have larger budgets meaning that any spending category is bigger and can entail its own specific effect on re-election. In other words what I see as a corruption effect might simply be disguised as a spending effect. It is for this specific reason that I only compare cities and municipalities with similar size, i.e. within a narrow bandwidth around each population threshold (see Fig. 2). Places with 5% higher and 5% lower population size from the threshold, or even within 2.5% higher or lower population size from the threshold (which can be anything between 25 people, 250 people, or for a few big cities a 1000 people) are indeed not too different from each other in terms of budgetary spending or fiscal capacity, particularly when controlling for geographical areas, war-affected areas, and electoral competition. The downside is that I can only estimate the local average treatment effect which applies for a limited sample size of cities and municipalities. However, given that the effects are estimated across each individual threshold, a significant effect across each threshold increases the confidence in the validity of the identification strategy as well as the resulting estimates.

However even when we control for all possible factors and examine a number of budgetary, socio-economic or political variables, one still cannot be too certain that an instrument provides (as-if) random variation. In other words there could still be other unobserved factors that change discontinuously at the thresholds that we cannot control for even within narrow bandwidths from the threshold. True randomness can only be achieved with random lotteries or experimental events which is impossible to define in this particular context when we are not dealing with experimental conditions. Therefore one must stop short of implicating causality between corruption and re-election, however keeping in mind that the set-up of this paper is the next best alternative of estimating the treatment effect given the available data and empirical strategy.

5.2.2. Validity tests of the fuzzy RD design: sorting and balance tests

The validity of the identification strategy is also sensitive to potential manipulative sorting around the population thresholds. The local government entity may manipulate its population size in order to artificially place itself in one category and thus achieve certain benefits. Intuitively it makes little sense to observe this in the data given that there are no policy changes at these particular thresholds. Furthermore the mayors themselves would have no incentive for sorting around higher or lower council sizes given that this does not affect any of their budgetary responsibilities,[11] their fiscal capacity, their funds received from the central government, or their re-election chances.

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[10] In cases of the local tax law, all municipalities regardless of size have the same maximum allowed rate, while cities are divided based on a different population threshold — at 30,000 inhabitants (Parliament, 2016). The same is true with public officials' and council members' salaries, they are defined based on the 3000 inhabitant threshold, and therefore should not affect any change at the council size threshold (Parliament, 2010)

[11] The costs of having two additional council members is minuscule, given that council members do not receive salaries but symbolic compensations for their work in the council.
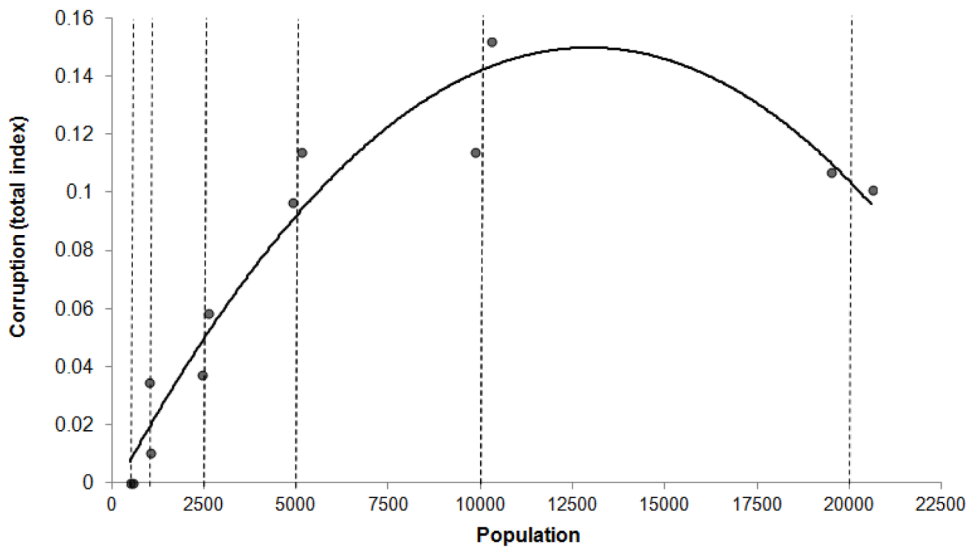
Fig. 2. First stage relationship between corruption and population thresholds.

Nevertheless it is still necessary to test for this as even accidental sorting may bias the estimates. There are two ways to check for sorting: the first is a McCrary (2008) density test of frequency discontinuity in the running variable — the difference in population from the zero threshold. The McCrary test is first performed for all the thresholds pooled together and then for each threshold separately (where the data allowed it). According to the Figures A1 to A4 in the Online Appendix there seems to be no statistically significant evidence of sorting around the threshold in any of these cases that could have biased the results of the estimation.

The second way to check for sorting is to perform a series of balance tests on each covariate in order to examine whether the treatment and control groups were similar in all pre-observed characteristics. Any nonrandom sorting would imply statistically significant differences between treated and untreated municipalities across several covariates, meaning that these differences could be biasing the estimates. The balance tests were performed first for the narrow 5% level above and below each threshold pooled together (they have also been performed for lower bandwidths and the results are similar), and then across each threshold just as the McCrary density tests. Tables A2 and A3 in the Online Appendix report the t-tests across all covariates.

The results for the 5% bandwidth presented in Table A2 imply statistically significant differences for the size of the governing coalition, and a weak significance (under 10%) for the number of candidates and the local tax rate. This suggests caution in interpreting the results as the balance between the municipalities is not perfect across the categories measuring electoral competition. However, when observing the individual threshold balance tests the two electoral competition variables are no longer statistically different one from another. The local tax rate still is however and it remains a source of concern, at least for the upper two and bottom two thresholds. The local tax rate is not determined by population size nor does it change at any of the given thresholds. It is therefore safe to say that it does not carry an effect on re-election through council size, but it could be biasing the corruption effect on re-election. To amend this a separate estimation has been done by excluding the local tax rate and the results are unchanged, although the effect is slightly smaller. This is taken into account in the results section below.

5.2.3. Estimation and results

The setup is a two stage least squares (2SLS) procedure in estimating the treatment effect of corruption, k_i and corruption squared, k_i^2 (the compound treatment), instrumented by council size, on the outcome — re-election. The running variable (p_i) is the difference in population of each unit from its population threshold (so that the middle value is 0). This type of non-linear 2SLS estimation, according to Angrist and Pischke (2009, pp. 192) and Wooldridge (2002, pp. 235-236), requires the usage of two first-stage equations where both first stages contain both instruments. It treats k_i and k_i^2 as endogenous while instrumenting them with the regular instruments — council size (cs_i) and its squared value (cs_i^2). In addition, a simple linear version without the quadratic parameter and with a single first stage has also been performed and its results are reported.

The non-linear first stages are therefore:

$$E[k_i|cs_i] = \alpha_1 + \beta_{11} cs_i + \beta_{12} cs_i^2 + f_1(p_i) + X_i \gamma + \epsilon_{i1} \tag{4}$$

$$E[k_i^2|cs_i] = \alpha_2 + \beta_{21} cs_i + \beta_{22} cs_i^2 + f_2(p_i) + X_i \gamma + \epsilon_{i2} \tag{5}$$

where $f(p_i)$ represents the function of the running variable, while X_i is the vector of all covariates used in Eq (2). The second stage estimates the following equation:

$$E[R_i|k_i] = \alpha + \tau_1 \hat{k}_i + \tau_2 \hat{k}_i^2 + f(p_i) + X_i \gamma + \eta_i \tag{6}$$

Table 6
Fuzzy regression discontinuity results: linear and quadratic estimates .

	Total Index		Index 1		Index 2	
	(1) Linear	(2) Quadratic	(3) Linear	(4) Quadratic Linear	(5) Linear Quadratic	(6)
Corruption	2.68	2.78	2.55	3.77	2.84	1.82
	(1.78)	(0.81)***	(2.17)	(0.68)***	(1.84)	(1.75)
Corruption^2		−14.12		−12.94		−17.75
		(5.89)**	(3.5)***	(6.94)**		
First stage k_i	0.005	0.018	0.006	0.022	0.005	0.014
	(0.004)	(0.002)***	(0.006)	(0.002)***	(0.004)	(0.002)***
First stage k_i^2		−0.0003		−0.0004		−0.0002
		(0.0001)***	(0.0001)***	(0.0001)**		
Controls	YES	YES	YES	YES	YES	YES
Observations	1101	1101	1101	1101	1101	1101
R-squared	0.6417	0.4620	0.6211	0.5374	0.6009	0.2640

Notes: The dependent variable in each case is the indicator value of re-election. Estimated coefficients represent the $\hat{\tau}$ coefficients from the 2SLS estimation of Eqs. (4) to (8). The covariates used are the same as used in Table 3. Standard errors are reported in parentheses, are robust to heteroskedasticity, and clustered by city status. *** denotes significance at 1%, ** at 5% and * at 10%.

Where $\hat{k}_i$ and $\hat{k}_i^2$ are first-stage estimates of corruption and corruption squared from Eqs. (4) and (5). The estimated coefficients τ_1 and τ_2 represent the compound treatment effects of corruption on re-election. The results are presented in Table 6.

However this specification rests upon strong parametric assumptions, so in addition to performing the non-linear estimations I also run a linear RDD for each threshold separately to get the heterogeneous effects (similar to Brollo et al., 2013). The crucial part here is to perform the 2SLS estimation within a narrow bandwidth around each threshold (I use the standard rule-of-thumb ± 5% bandwidth in addition to performing the Calonico, Cattaneo and Titiunik (henceforth CCT), 2014 optimal bandwidth selection estimator which was around ± 2.5% for each threshold). This allows me to test the non-linearity assumption on a step-by-step basis; i.e. I will be able to see for which threshold the relationship between corruption and re-election turns from positive into negative. The reduced form equation is:

$$E[R_i|p_0 \leq p_i < p_0 + \Delta] - E[R_i|p_0 - \Delta < p_i < p_0] = \rho\pi \qquad (7)$$

while the first stage for k_i is:

$$E[k_i|p_0 \leq p_i < p_0 + \Delta] - E[k_i|p_0 - \Delta < p_i < p_0] = \pi \qquad (8)$$

The resulting estimate ($\rho\pi/\pi = \rho$) is the local average treatment effect (LATE) of corruption on re-election that is estimated for each threshold.

According to Tables 5 there are 6 possible thresholds to use: 500, 1000, 2500, 5000, 10,000, and 20,000. The first and the final threshold do not have enough data to perform the full estimation (8 and 9 observations respectively), so I only use the middle four, but I also pool them two by two as an additional robustness check for the non-linear trend. Results are presented in Table 7. The heterogeneous effects from each threshold enable me to directly draw out the non-linearity between corruption and re-election. Fig. 2 presents the first stage relationship between corruption and population where for each threshold I draw the average values of corruption for municipalities just above and just below each threshold (for the 5% bandwidths, with the graph for the Calonico et al. (2014) bandwidths in similar shape). The dots represent the averages for all observations just above or just below each threshold. This first stage relationship clearly confirms the non-linear implication: corruption on average is low in smaller munici-palities (around the 500 and 1000 threshold) but it then steadily increases for the 2500 and 5000 thresholds, only to reach its

Table 7
Fuzzy regression discontinuity heterogeneous effects: individual thresholds within the 5% bandwidth.

	(1) Total index	(2) Index 1	(3) Index 2	Obs
Threshold 1000	9.87($3x10^{-12}$)***	6.48 ($2x10^{-12}$)***	4.65 ($2x10^{-13}$)***	33
Threshold 2500	−9.89 (0.43)***	−2.43 (0.03)***	−4.21 (0.19)***	114
Threshold 5000	−2.26 (0.03)***	−1.95 (0.62)***	−1.56 (0.26)***	77
Threshold 10,000	−2.06 (0.75)***	−2.96 (1.62)*	−2.02 (0.44)***	28
Thresholds 500 & 1000	28.9 ($5x10^{-9}$)***	4.14 ($2x10^{-11}$)***	0.68($1x10^{-12}$)***	41
Thresholds 2500 & 5000	−0.17 (1.27)	−0.16 (1.24)	−0.17(1.24)	191
Thresholds 10,000 & 20,000	−0.98(0.13)***	−0.83(0.02)***	−1.61 (0.06)***	37

Notes: The dependent variable in each case is the indicator value of re-election. Estimations are done across each threshold for the three different definitions of the corruption index. In each case I only focus on observations within the 5% bandwidth above and below each threshold as specified in Table 5. Standard errors are reported in parentheses, are robust to heteroskedasticity, and clustered by city status. *** denotes significance at 0.1%, ** at 1% and * at 5%.
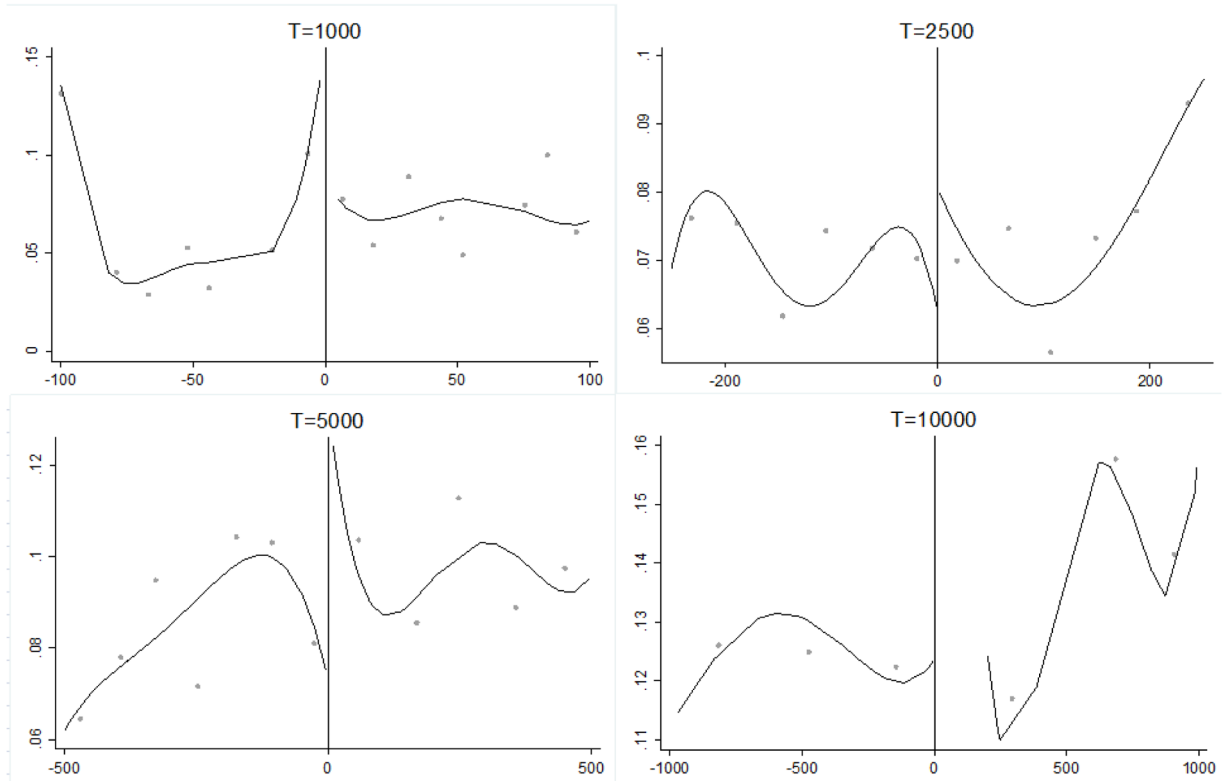
Fig. 3. Discontinuous jumps in corruption around each population threshold.

maximum in municipalities/cities around the 10,000 threshold, and then gradually decrease for cities at the 20,000 threshold. Notice that for the three middle thresholds in each case corruption was higher in municipalities just above compared to similar ones just below the threshold. The reverse was true for the 1000 threshold and for the final 20,000 threshold. This is also visible for the four thresholds graphically represented in Fig. 3. Both of these figures represent merely the first stage relationship and should not be confused with the heterogeneous effects presented in Table 7.

Table 6 shows the results of the initial linear and non-linear estimations for the full sample across all three main indices of corruption. I use all three indices to see which definition of procurement irregularities drives the effect the most. Index 1 measures incidences of irregularities in cases when suspicious procurements constitute a high share of revenues for the receiving firm. Index 2 measures incidences of irregularities in cases when firms with zero employees receive multiple contracts as the only bidder, or when they are indirectly subsidized by the local government. The Total index pools all of the proxy measures together.

The non-linear estimations confirm the hypothesized concave effect of corruption on re-election. In each case the corruption parameter has a positive effect (it lack statistical significance only for Index 2) while its squared value has a negative effect on re-election. The first stage estimates also support this finding: there is a strong positive relationship between council size and corruption, and a strong negative relationship between council size squared and corruption squared. The estimated coefficients are larger than the original quadratic estimates from Table 3, however the magnitude of the effect is slightly smaller across both estimates. The upper cut-off after which the probability of re-election starts to decline is now between 9.8% and 14.5% for the full sample (when excluding the local tax rate the effect is slightly smaller and stands at between 8.5% and 13.5%). Interestingly the effect is stronger for Index 1, when procurement irregularities are only focused on firms with high shares of suspicious procurements in their average annual revenues. The relationship loses statistical significance for the first corruption parameter for Index 2 — cases where procurement irregularities are measured through single bidder firms with zero employees.

However in the linear estimations across all three indices, neither the reduced form nor the first stage estimates are statistically significant even though they are both positive. This result reinforces the necessity to perform the linear RD estimations separately for each threshold to confirm a potential non-linear effect. This is done in Tables 7 and 8.

The heterogeneous effects estimates across individual thresholds suggest a very interesting relationship. The estimated coefficients of the impact of corruption on re-election for the first threshold ($T = 1000$) in Table 7 and the first two thresholds ($T = 1000$ and $T = 2500$) in Table 8 are very high and positive. However, for every subsequent threshold in Table 6 the estimated coefficient is negative, while in Table 8 the coefficient is negative for the $T = 5000$ threshold (there was not enough data to calculate optimal CCT thresholds for $T = 10000$ and beyond). This means that higher corruption has a positive effect on re-election in the smallest municipalities, but a negative effect in larger municipalities and cities. Given that these coefficients are estimated within narrow bandwidths just above and just below each threshold they are closest to achieving quasi-randomization as assumed by the fuzzy RD design.

Table 8

Fuzzy regression discontinuity heterogeneous effects: individual thresholds within CCT optimal bandwidths .

	(1) Total index	(2) Index 1	(3) Index 2	Obs
Threshold 1000	3.81 ($5x10^{-13}$)***	3.46 ($3x10^{-13}$)***	3.2 ($9x10^{-15}$)***	18
Threshold 2500	1.79 ($4x10^{-13}$)***	3.69 ($1x10^{-12}$)***	11.78 ($3x10^{-12}$)***	26
Threshold 5000	−4.09 (1.73)*	−4.73 (2.53)	−2.64 (0.97)**	21
Thresholds 500 & 1000	6.14 ($8x10^{-13}$)***	12.44 ($1x10^{-12}$)***	5.09 ($3x10^{-13}$)***	24
Thresholds 2500 & 5000	−3.64 (0.126)***	−5.43 (0.992)***	−3.13 (0.621)***	63

Notes: The dependent variable in each case is the indicator value of re-election. Estimations are done across each threshold for the three different definitions of the corruption index. In each case I only focus on observations within the 2.5% bandwidth above and below each threshold, estimated using the Calonico et al. (2014) optimal bandwidth estimator separately for each threshold. Standard errors are reported in parentheses, are robust to heteroskedasticity, and clustered by city status. *** denotes significance at 0.1%, ** at 1% and * at 5%.

In other words these estimates are most likely to produce a (local) treatment effect of corruption on re-election. Furthermore they confirm the hypothesis presented in the theoretical section according to which the effect of corruption on re-election varies with respect to city/municipal size.

The pooled thresholds suggest the same implication: corruption entails a positive effect on re-election in the smallest municipalities (which have around 500 or around 1000 inhabitants), and a negative effect for all larger municipalities and cities (although the effect is not statistically significant for the middle pool in Table 6, for municipalities with around 2500 and 5000 inhabitants; however it is significant in Table 8). The findings are consistent across all three indices of corruption (and are robust to excluding the local tax rate), but the effect is strongest for the Total index pooling all the proxies together.

Note that the number of observations in Table 8 is much smaller than in Table 6, however this is the standard trade-off in RD design and bandwidth selection: a smaller bandwidth around the threshold increases causal implications at the expense of loss of data. It is thus useful, as a robustness check, to report estimates across both bandwidth selections.

Overall these findings suggest two things: (1) the relationship between corruption and re-election on the case of Croatian cities and municipalities is indeed non-linear and is driven by varying city/municipal size. And (2), both the OLS and the fuzzy RD estimates suggest a quite substantial level of suspicious procurement allocations Croatian mayors are allowed to get away with. However this effect is the strongest in the smallest and mid-sized municipalities, arguably because there is very little oversight and accountability in such areas. In larger cities on average more corruption will entail a punishment from the voters.

To sum up, it is safe to conclude that the effect of corruption on the probabilities of re-election is not being driven by any omitted variable, and that corruption can influence the chances of re-election in a non-linear fashion: re-election chances increase with corruption until around one fifth of all procurements are allocated suspiciously. Politicians have the motivation to allocate public funds in a suspicious way, as this not only gives them access to rents, it also helps them increase their chances of staying in power. The overall findings confirm that politicians can use public funds to generate political support.

6. Conclusion

The central implication of the paper is that long-term political survival depends on how successful politicians are in creating mutually dependent networks of interests with rent-extracting firms where electoral support is exchanged for favorable procurement contracts. The empirical section confirms a non-linear relationship between corruption and re-election, where the probability of re-election is maximized for around one fifth of all procurements allocated in a potentially fraudulent way. When about half of all procurements are allocated this way, a mayor, on average, loses elections. The voters therefore do punish corrupt behavior, but only when corruption becomes too rampant and too obvious. Furthermore the positive effect of corruption on re-election works mostly in smaller and mid-sized municipalities with little oversight and low accountability. For larger cities the estimated effect of corruption on re-election is negative, hence confirming the overall non-linear effect.

The methodological contribution attempts to provide a blueprint for researchers to move away from perception indices and try and find a more robust and more precise measure of corrupt behaviour. It builds upon the recent literature that attempts to do the same thing by gaining access to much better datasets on public procurements (Fazekas et al., 2016; Ferwerda et al., 2017; Fazekas and Kocsis, 2017). Even with such efforts there is always a concern of committing a type I error (falsely coding a regular procurement as suspicious). In addition, using only procurement contracts might also be underestimating the overall level of corruption. There are various other corrupt activities the local government is prone to, such as converting agricultural land to residential land, or changing local legislation to favor partial interests. All these practices also suggest a close relationship between local political elites and local rent-extracting firms, however they are much harder to measure and quantify than is the case with procurement contracts. Future research efforts should be going in this direction as well, in addition to generating even better efforts at recognizing corruption in public procurements.

Finally, a normative implication can be drawn from the paper's main results, specific to the Croatian electoral framework analysed in the paper. The suggestion is to introduce a term limit electoral rule for the maximum of two terms. Two terms in power (a total of eight years) can often be enough for a politician to create a powerful network from which he or she could extract rents. Research on the effects of term limits on political behavior (e.g. Besley, 2006; Ferraz and Finan, 2011) have found that politicians steal more in their last and final term, knowing they will lose office with certainty. However, having no term limit is arguably worse

than having a two term limit, as there is virtually no constraint imposed on the politician either on the amount of theft he can do, or for how long he can do it. Resting upon the assumption that political corruption and the manipulation of public finances prevent the progress of local communities making them dependent on interpersonal relationships between powerful interests and political elites, it is crucial to first reduce political power. In the case of local government the introduction of term limits is the first step towards achieving that goal.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.jce.2019.09.002.

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