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LEGISLATORS' BEHAVIOUR AND ELECTORAL RULES: EVIDENCE FROM AN ITALIAN REFORM

by Giuseppe Albanese*, Marika Cioffi** and Pietro Tommasino**

Abstract

We explore how electoral rules and cultural traits (namely, the degree of civicness) interact in shaping elected officials' behaviour. We use a dataset that includes the expenditure proposals sponsored by members of the Italian Senate from 1993 to 2012 (as well as other individual and district characteristics) and exploit the 2005 electoral reform that transformed a mainly majoritarian system into a proportional one. As a first step, we can confirm previous empirical findings: legislators elected in first-past-the-post districts show a higher propensity to sponsor locally-oriented bills and to put effort into legislative activity than those elected with a closed-list proportional system. More importantly, however, we find that the effects of the change in the electoral rules are muted in areas with a high degree of civicness. We also propose a simple theoretical probabilistic voting model with altruistic preferences that is able to rationalize this finding.

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1 Introduction[1]

Few political phenomena are more widespread across countries and through time than the tendency of elected politicians to indulge in pork barrel expenditure, i.e. to use public money for narrowly-targeted projects, as a means of favouring local constituencies. However, while pork barrel is a feature of all democracies, several studies suggest that its importance varies systematically as a function of social and political characteristics of each country.

The fraction of narrowly-targeted as opposed to broad expenditure programmes depends on the electoral rule. A positive relationship between majoritarian representation and targeted expenditures is found by Persson and Tabellini (2005) and by Milesi-Ferretti et al. (2002) in a panel of countries, and by Gagliarducci et al. (2011), using Italian legislators' individual data.

Electoral rules also influence also elected representatives' incentives to engage in self-serving or dishonest behaviour: there is evidence that proportional representation increases corruption (Persson et al. 2003; Persson and Tabellini 2005; Kunicova and Rose-Ackerman 2005),[2] as well as other less serious forms of misbehaviour, such as absenteeism (Gagliarducci et al., 2011).

Of course, the main concern for any empirical analysis of the causal impact of electoral rules is to account for the potential non-random selection of the rules themselves. Persson and Tabellini (2005) address this endogeneity issue by means of an instrumental variable approach.[3] Gagliarducci et al. (2011) exploit a peculiarity of the Italian electoral system: during the period 1994-2005 some members were elected in single-member districts under the plurality rule and the remaining were elected through a closed-list proportional system. They address the issue of self-selection in one of the two tiers through regression discontinuity techniques.

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[2]Chang and Golden (2007) offer a more nuanced view, and point out that the details of the electoral regime matter for the results.

[3]They assume that the date of the adoption of constitutions (proxy for common historical determinants) and latitude determine the relevant features of constitutions but are uncorrelated with other unobserved determinants of fiscal policy, such as expenditure composition. See Acemoglu (2005) for further details.

In this paper, we use microdata on the Italian legislators as in Gagliarducci et al. (2011), but we follow a different empirical approach, exploiting a (novel) theoretical insight to inform our identification strategy.

We will describe our theoretical model below, but start with a quick preview of our argument. According to Persson and Tabellini (1999), electoral competition in majoritarian systems tends to concentrate in districts with a relatively high fraction of swing voters, i.e. voters whose vote can be easily swayed even by a small change in policy platforms. One of the most efficient ways to convince a swing voters to switch sides is to increase the amount of transfers specifically targeted to their district; general interest expenditures would also benefit voters in non-swing districts, and would therefore be partially wasted from an electoral point of view. Furthermore, as competition tends to be stiffer in swing districts, the authors also show that the marginal cost of a more self-serving electoral platform is higher. Therefore, in majoritarian systems there is a stronger incentive for candidates to commit to a high level of both productivity[4] and pork-barrel once elected.

While in Persson and Tabellini (1999) voters are self-interested when choosing among competing platforms, in our model voters not only care about their own self-interest, but also about others' welfare. This, in turn, affects their voting behaviour. We show that this implies that an *increase* in the degree of voters' civicness *reduces* the impact of a change in the electoral rule on pork barrel and on politicians' effort. The intuition is relatively straightforward: the fact that in majoritarian elections competition is concentrated in the swing districts is less consequential with civic voters who partly internalize the preferences of citizens living in other districts, thus altering the incentives for candidates underlying the two electoral systems. This is the major prediction we test in the empirical part of this paper.

For this purpose, we exploit (i) the well-documented (at least since the seminal work by Putnam, 1994 [5]) heterogeneity in civicness across Italian regions and (ii) the electoral reform of 2005, which changed the system for electing the Italian Parliament from one based on single-member first-past-the-post districts to one based on larger multiple-member districts, where the competition is between closed party lists. Our empirical exercise is structured as follows. First, for each electoral district of the Italian Upper House (Senate), we collect measures of citizens' civicness. Second, we gather data on the sponsorship of legislative bills by members of the Senate before and after the reform,

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[4]Concerning politicians, we use productivity and effort interchangeably. Similarly, concerning citizens, we employ civicness and civic capital as synonymous.

[5]See also Guiso et al. (2004) and Guiso et al. (2011).

distinguishing between general interest and pork barrel bills. Finally, we check whether (i) the propensity to sponsor pork barrel bills and (ii) politicians' productivity, as measured by the overall number of sponsored bills, decrease after the reform and whether reduction is smoller in districts with a high degree of civicness, which is our theoretical *a priori*; this is the main innovation with respect to the existing literature. Our approach helps to pin down causality, as it singles out a specific channel through which electoral rules affect outcomes.[6] Indeed, as we have a prediction concerning the *interaction* between civicness and electoral rules (that varies across both time and space), we are able to control both for time and for district fixed effects, thus addressing various concerns arising in standard comparative politics analyses (e.g. reverse causation and omitted variables).

The rest of the paper is organized as follows. After a review of previous contributions (Section 2), in Section 3 we outline a simple theoretical model in which electoral rules and civicness jointly determine the equilibrium level of pork barrel, general interest spending, and political rents. In Sections 4 and 5 we describe the evolution of the Italian institutional set-up and our dataset. In Section 6, we present our econometric analysis. Section 7 concludes and describes some possible implications of our finding for institutional design.

2   Literature review

Theory. - The literature has highlighted two main reasons why electoral rules have an impact on pork barrel politics. First, in proportional systems the incentive to favour small but pivotal or more mobile groups through targeted expenditure is weaker than in majoritarian systems (Persson and Tabellini, 1999; Lizzeri and Persico, 2001). Second, in closed-list proportional systems the approval of voters in the district is less important in determining re-election, as voters cannot reward/punish the individual politician but only the party (Carey and Shugart, 1995; Persson and Tabellini, 2002);[7] therefore, the is

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[6]This is analogous in spirit to Rajan and Zingales (1998). They focus on an altogether different problem, namely the relationship between financial development and growth. Their empirical strategy hinges on the argument, based on economic theory, that financial development influences economic growth not only directly, but also via its interaction with sector specific financial dependence. Therefore, they look at the effect of the interaction while controlling for time and industry fixed effects. This strategy has been adopted in several other contexts. In our case, we argue that there is reason to believe that the influence of electoral rules on politicians' behaviour is not only straightforward, but also mediated by civicness.

[7]Things are less clear-cut in open-list proportional systems, where an element of intra-party competition is at play, as discussed by Carey and Shugart (1995) and by Chang and Golden (2007).

limited incentive to indulge in pork barrel as a means to cultivate a personal vote.[8]

The same channels are at play in the case of politicians' effort. Electoral competition is in generally less stiff in proportional regimes, so parties have less incentive to commit to honest behaviour (Persson and Tabellini, 1999). On top of this, closed-list proportional systems reduce the incentive to engage in constituency service (see again Persson and Tabellini, 2002; Carey and Shugart, 1995). A further effect has been highlighted by Myerson (1993): small districts - a typical feature of majoritarian systems - may select less honest politicians if voters have different ideological preferences and vote strategically.

In the following section we propose a model in which electoral rules and civicness interact in determining policy choices. While to our knowledge we are the first to do this, there are previous theoretical contributions investigating the link between civicness and policy outcomes. For example, Giordano and Tommasino (2013) and Nannicini et al. (2013) show that civicness (modelled, respectively, as an increased propensity to become informed and as altruism) curbs political rents because it makes easier for citizens to keep the incumbent politicians accountable.[9]

Evidence. **-** From an empirical viewpoint, besides the contributions discussed in the introduction, our paper is closely related to Nannicini et al. (2013) in terms both of data - our dataset represents an updated version of theirs, as it includes also the two legislatures elected after the 2005 reform - and of the empirical specification that we bring to the data. However, their focus is more on civicness than on electoral rules and two additional key differences exist. First, they exploit the discontinuity represented by the existence of two tiers (with differences in electoral rules) within each House during the pre-reform period. This is questionable, both in the case of the House of Representatives (due to the above-mentioned self-selection issue discussed in Gagliarducci et al., 2011) and for the Senate (see our discussion in the next section). Instead, we use the 2005 electoral reform, focusing on a specific channel (the degree of civicness) to pinpoint differences in the intensity of its impact. Second, Nannicini et al. (2013) pool together the data from the Upper and Lower House. This choice ignore some major differences between the systems in place in the two houses, which will be discussed later in this paper. Instead, in the present paper we consider only the Senate. These two different approaches turn into different results. Indeed, Nannicini et al. (2013) do not find strong evidence that

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[8]Electoral rules may also have an impact on outcomes through their influence on the equilibrium number of parties represented in the parliament and in the government coalition (see e.g. the discussion in Persson et al., 2007). As we discuss below, our empirical strategy controls for this channel because we include legislature fixed effects.

[9]We do not know of any paper discussing the effects of civicness on pork barrel.

the interaction between electoral rules and civicness influences pork barrel expenditures, while we find a statistically and economically significant effect.

Also related is Funk and Gathmann (2013), who considers the effect of the change in the rules for the election of sub-national governments on their expenditure composition. As these entities changes from a majoritarian system to a proportional representation in different periods, they are able, as we do, to control for geographical and time fixed effects. Finally, an early work by Stratmann and Baur (2002) shows that legislators elected in the plurality tier of the German mixed system tend to become members of parliamentary committees that are involved in pork-barrel more frequently than do their colleagues elected in the proportional tier.

3   A simple model

In this section, we propose an extension of the model by Persson and Tabellini (1999). We introduce an element that accounts for civicness in the preferences of the voters. We will show that the main predictions of Persson and Tabellini (1999) also hold in this more general setting, namely rents are lower and pork-barrel higher with a majoritarian electoral rule than with a proportional one. Second, and more importantly, we will show that the differences in politicians' behaviour between the two regimes (proportional versus majoritarian) diminish if civicness is high. This result motivates our empirical strategy.

The model has three building blocks: (1) a very simple endowment economy, (2) a government with the ability to raise taxes in order to provide a general interest public good, district specific transfers or to pocket political rents; and (3) a political system in which two parties (or individual candidates) compete for election in order to earn rents from office.[10]

The economy. - We consider a country with three regions, each populated by a measure-one continuum of individuals. Agents care not only about their own consumption but also about the consumption of the others. Specifically, an agent k living in district i maximizes:

$$W_k^i = c_k^i + \alpha^i \sum_{j \neq i} c^j \tag{1}$$

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[10]The two-party assumption captures reasonably well the structure of political competition in Italy during the period we study (see e.g. Hopkin, 2015).

Where c^i indicates consumption and α^i is the district specific degree of civicness.[11] We assume that all the individuals have the same endowment, and therefore from now on we drop subscript k except where it is strictly needed. Equation (1) is a very standard way of capturing altruistic preferences (Rabin, 1998; Bergstrom, 2006), and it has also been used previously in political economy models (Lind, 2007; Messer et al., 2010).[12]

Consumption is in turn derived from a private good (the numeraire) and from a non-excludable, non-rival public good (g). Each agent has an endowment equal to 1 of the gross-of-tax numeraire good.[13] Therefore:

$$c^i = 1 - \tau + b^i + h \ln(g) \tag{2}$$

From equations (1) and (2), W^i can be rewritten as:

$$W^i = (1 + 2\alpha^i)(1 - \tau + h \ln(g)) + b^i + \alpha^i \sum_{j \neq i} b^j \tag{3}$$

Where $1 - \tau + b^i$ is disposable after tax income (τ) and district specific transfers (b^i) and $h\ln(g)$ is the consumption derived from the public good. The strictly positive parameter h captures the usefulness of the public good relative to the private good.

Public finance. - The Government rises from each citizen the same amount of non-distortionary taxes $0 \leq \tau \leq 1$, and uses the revenues to finance the general public good $g \geq 0$, district-specific transfers $(b^1, b^2, b^3) \geq \mathbf{0}$, and rents for politicians in office $r \geq 0$.[14] Its budget constraint is therefore given by:

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[11]In principle, the degree of civicness could be district-dependent, in which case equation (1) should be generalized as follows:

$$W_k^i = c_k^i + \sum_{j \neq i} \alpha^{ij} c^j$$

where α^{ij} is the weight given to the consumption of fellow citizens living in district j. One could relax the assumption that $\alpha^{12} = \alpha^{13}$, $\alpha^{21} = \alpha^{23}$, $\alpha^{31} = \alpha^{32}$ and instead require only that $\alpha^{12} \geqslant \alpha^{13}$ and $\alpha^{32} \geqslant \alpha^{31}$. Indeed, assuming that district 2 lies geographically between the others, it can be considered as more plausible as it means that citizens care more about people in districts that are geographically or ideologically closer. This would complicate the algebra, but it turns out that our theoretical conclusions would not be affected.

[12]For a model of distributive politics that uses a different kind of other-regarding preferences (in which people have a concern for fairness) see Dhami and al Nowaihi (2010).

[13]The choice of quasi-linear preferences (meaning that the optimal consumption of a public good does not depend on individual wealth and therefore the cross-derivative with respect to the public and private good is not relevant) is standard in the literature. It simplifies the algebra without influencing the theoretical mechanisms we are interested in.

[14]It is straightforward to translate the results concerning rent extraction into results concerning effort (which is the variable that we study in the empirical part).

$$3\tau \geq r + \sum b^i + g \tag{4}$$

Political competition. - We consider a political system in which two parties (A and B) compete for government. They simultaneously propose binding policy platforms (q^A, q^B) to the voters:

$$q^A = \left\langle \tau^A, b^{1A}, b^{2A}, b^{3A}, r^A \right\rangle, \; q^B = \left\langle \tau^B, b^{1B}, b^{2B}, b^{3B}, r^B \right\rangle$$

After observing the two platforms (q^A, q^B), voters cast their ballots. As is standard in probabilistic voting models, they not only consider the impact of the proposed policy platforms on their disposable income, but are also influenced by an aggregate (δ) and an individual (σ_k^i) 'popularity shock'. The latter are drawn from a region specific distribution. Therefore, individual k from group i votes for party A if and only if

$$W^i(q^A) > W^i(q^B) + \delta + \sigma_k^i$$

where:

$$\delta \sim U[-\frac{1}{2d}; \frac{1}{2d}]; \sigma_k^i \sim U[\bar{\sigma}^i - \frac{1}{2s^i}; \bar{\sigma}^i + \frac{1}{2s^i}] \text{ for } i = 1, 2, 3. \tag{5}$$

The vote share of party A in district i is the following:

$$\pi^{A,i} = s^i \left[W^i(q^A) - W^i(q^B) - \delta - \bar{\sigma}^i \right] + \frac{1}{2} \tag{6}$$

where the expression in brackets indicates the swing voters in district i.

Without loss of generality, let $\bar{\sigma}_1 > \bar{\sigma}_2 = 0 > \bar{\sigma}_3$.[15] Moreover, let us follow Persson and Tabellini (1999) and assume that region 2 (the one with the more moderate distribution of 'ideologic tastes') is also the region with the more homogeneous ideological distribution. In particular, we assume:

Assumption 1

$$s^2 > \max \left[\left(\frac{1 - \alpha^1}{1 - \alpha^2} \right) s^1; \left(\frac{1 - \alpha^3}{1 - \alpha^2} \right) s^3 \right].$$

Moreover, we require (again following Persson and Tabellini,1999) the following condition to hold:

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[15] As in Persson and Tabellini (1999), we simplify the algebra by assuming that $\bar{\sigma}_1 s^1 + \bar{\sigma}_3 s^3 = 0$.

Assumption 2: $\bar{\sigma}_1$ and $\bar{\sigma}_3$ are sufficiently far apart. Under the assumption that ideological bias is large enough, party A expects to win with quite a safe margin in district 1 and to lose by an equivalent margin in district 3, so that the competition only takes place in the marginal district 2.

The objective function of party A and B is:

$$(R+r)E\left[p^A(q^A, q^B)\right] \tag{7}$$

$$(R+r)E\left[1 - p^A(q^A, q^B)\right], \tag{8}$$

where R are exogenous rents from office and p^A is the probability that party A is elected as a function of the two electoral platforms.[16]

Specifically, p^A depends on how votes are aggregated into an overall policy outcome. We first consider the case of a single nation-wide electoral district, which is meant to capture the mechanics of a typical proportional system. In this case winning the elections requires winning at least 50% of the national votes. As an alternative case, we consider a majoritarian system, in which each region elects a single representative in a first-past-the-post race, and the party that gets at least two regional representatives takes the government. This set-up implies that a party can win the election even earning less than 50% of the overall votes, provided it gets at least 50% of the votes in two out of three districts (therefore, in principle, to win it may be enough to convince just 33% of the electorate).

In the first case, one has:

$$p^A = P\left[\frac{1}{3}\sum_i \pi^{A,i} \geq \frac{1}{2}\right] \tag{9}$$

In the alternative case, by Assumptions 1 and 2, only the marginal district matters because it has the highest number of swing voters whose ballot is prone to be swayed by redistributive policies:

$$p^A = P\left[\pi^{A,2} \geq \frac{1}{2}\right] \tag{10}$$

Let us define q^{prop} and q^{maj} as the equilibrium policy outcomes under the two electoral

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[16]The uncertainty underlying the expectation derives from the aggregate shock δ. The uncertainty linked to the individual shocks cancels out at the population level.

systems:

$$q^{prop} = \left\langle \tau^{prop}, b^{1prop}, b^{2prop}, b^{3prop}, r^{prop} \right\rangle; \; q^{maj} = \left\langle \tau^{maj}, b^{1maj}, b^{2maj}, b^{3maj}, r^{maj} \right\rangle.$$

One can prove the following two results:

Proposition 1 $b^{i,prop} \leq b^{i,maj}$ for $i = 1, 2, 3$, with the inequality strict for $i = 2$; $r^{prop} > r^{maj}$; $g^{prop} > g^{maj}$.

Proposition 2. - Provided α^2 is sufficiently high, $\frac{\partial\left(g^{prop}/g^{maj}\right)}{\partial\alpha^i} < 0$ for i=1,2,3; $\frac{\partial\left(r^{prop}/r^{maj}\right)}{\partial\alpha^i} \leq 0$ for i=1,2 (with strict inequality for i=1,3); provided $\alpha^1, \alpha^2, \alpha^3$ are sufficiently high, $\frac{\partial\left(b^{maj}/b^{prop}\right)}{\partial\alpha^i} < 0$ for i=1,2,3.

In words, Proposition 1 says that in majoritarian regimes there is less provision of general interest public goods and less rent extraction but geographically targeted transfers are higher, with than in proportional regimes. This statement basically extends the main result of Persson and Tabellini (1999) to our setting with altruistic voters. Proposition 2, instead, captures the essence of our argument. It states that the *difference* in policy outcomes between the two electoral regimes is *smaller* the *higher* the degree of civicness. Intuitively, introducing altruistic preferences is equivalent to making the majoritarian race close to the proportional competition because voters internalize the preference of a broader group of citizens and therefore it is less efficient for candidates to focus on the swing district; rather, the electoral competition is widespread across the three districts. This result concerning the interaction between civicness and electoral rules is key to our empirical strategy.

Discussion. - Before moving to the next section, we would like to stress that our very stylized model is not meant to capture all the details of the Italian electoral set-up. In our model the difference between a majoritarian and a proportional system boils down to an increase in district magnitude, whereas it is well known that the two systems differ in other respects as well (see e.g. the discussion in Sartori, 1997).[17] However, certainly the average district magnitude certinaly increased significantly after the 2005 reform in Italy, and therefore the mechanism described by the model arguably affected the behaviour of political players.

A second caveat concerns our assumption that national parties are the major players in the election game, with no role for individual candidates. While this is obviously a sim-

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[17]In Section 4, we will discuss at length the changes introduced by the Italy's 2005 reform.

plification, the assumption is fairly realistic in the Italian setting. Indeed, the available literature suggests that in parliamentary (as opposed to presidential) democracies, and in contexts in which parties have an important role in selecting candidates, individual politicians have very little autonomy. Not surprisingly, in those countries legislators tend to vote along party lines (Carey and Shugart, 1995). For Italy, the average RICE index, that measures the fraction of legislators of a given party that vote in the same way in a given vote, is over 95 per cent, indicating a very high degree of party loyalty (Depauw and Martin, 2009).

4 Electoral rules for the Italian Parliament

The Italian Parliament is composed of two houses, with substantially equal prerogatives, which jointly exercise the legislative power (to become law, a text must be voted by both houses). The Lower House (Chamber of Deputies) is composed of 630 members; the Upper House (Senate of the Republic) has 315 members, plus a small number of life members appointed by the President of the Republic.

Starting from the legislature XII (1994-1996) and until legislature XIV (2001-2006), Members of the Parliament were elected according to a two-tier system: 75% of them in single-member districts under the plurality rule, the remaining 25% in larger multiple-member districts with a closed-list proportional rule (for a detailed description, see Katz, 2001).

The electoral system was somewhat different in the two branches of Parliament. For the Chamber of Deputies, voters received two ballots: one to cast a vote for the preferred candidate in the majoritarian first-past-the-post district, and one to cast a vote for a party list in a single national level proportional district. Candidates could choose in which tier to run. They could even run in both tiers, but if successful in both, the election in the majoritarian tier dominated on the one in the proportional tier. For the Senate, voters received a single ballot for the plurality race; however, the number of districts (232) was lower than the number of seats. The remaining seats (83 out of 315) were assigned to the best losers according to a party-based proportional formula at the regional level.

It is important to note that, while in the competition for the Lower House voters effectively perceived a difference between the majoritarian and the proportional electoral competition, this was not true for the Senate, essentially because of the single ballot. This is why we believe that - as far as legislature XIV and the previous ones are con-

cerned - it is not possible to interpret the differences in behaviour of the Senators elected in different tiers as reflecting differences in incentives. For the same reason, for these legislatures, pooling data from the Senate with those from the Chamber of Deputies is problematic.

Following a reform passed in 2005 and applied in the legislature XV (2006-2008) and legislature XVI (2008-2013), MPs are elected with a closed-list proportional system with a majority bonus.[18] Voters receive only one ballot, and they can choose between party lists, but not the individual candidate. In the new system, the main difference between the two branches of Parliament lies in the size of the electoral districts, with the Senate districts corresponding to the regional area, while for the Chamber od Deputies the major regions include more than one district.[19] The reform was approved in December 2005 and applied six months later, and therefore any anticipation effect is very unlikely (on this, see also the discussion by Pasquino, 2007). Of course, the reform had been discussed in the months before, but as negotiations were mostly held among the party leaders in 'smoke-filled rooms', and given the muddled decision-making process, uncertainty about the outcome of the reform remained very high.It is plausible therefore to assume that until the end of legislature XIV elected officials behaved according to the incentives prevailing under the proportional system.

5   The dataset

Our dataset covers all members of the Senate, from legislature XII to legislature XVI (spanning the period 1994-2013), for a total of 1020 individuals. Senators display a high dispersion in their survival rate: 670 (corresponding to 42% of observations) were in charge for only one term during the period under observation; only 6 (2% of the sample) were veteran politicians, in office continuously during the spanned five legislature span ; 137 Senators(33% of the sample) survived the electoral reform, i.e. they succeeded in being elected at least once under both electoral systems. About one quarter of senators are members of a party steering committee at the national level or are experienced local government officials.

The reason why we restricted the sample to members of the Senate essentially boils down

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[18]The bonus is awarded to the most voted party, and consists in a number of seats sufficient to obtain a 55% majority of seats.

[19]As in most proportional systems, seats are assigned only to those parties that pass a minimum threshold of votes. Another difference between the Chamber of Deputies and the Senate is that thresholds are applied at the national level in the former and at the regional level in the latter.

to the differences in the electoral system between the two houses. For the Senate only, as we argued in the previous section, candidates could not choose in which tier to run (they only competed for the plurality race, while the proportional tier involved closed-list preferences and therefore party loyalty, rather than individual electoral campaign, was pivotal in determining election) and so did not diversify their electoral strategy. Both during the electoral campaign and once in office, they all faced identical incentives, irrespective of the tier of election. Similarly, the two tiers were not perceived as distinct playing fields by voters, as they were confronted with straightforward winner-takes-all races between individual candidates. Furthermore, unlike the Lower House, candidates could not choose in which tier to run and they did not diversify their electoral strategy accordingly. For the Senate only, therefore, the reform mimics a shift from a majoritarian to a closed-list proportional system.

Our dataset contains information concerning the institutional activity and the personal characteristics of the Senators. Data for Senators in office from 1994 to 2006 are from the dataset assembled by Nannicini et al. (2013), which we extended with data for legislature XV and legislature XVI .

As in Gagliarducci et al. (2011), we measure pork-barrel expenditure with the share of bills targeted to the district of election during each legislature (which is the relevant time dimension). Two elements are crucial for the definition of this measure: first, as for the source, we relied on the official classification (TESEO) of the legislative acts to identify the 'targeted' nature of the proposed bill. In TESEO (which includes a list of 9602 geographical entities), each bill is classified according to the administrative level/geographical entities that it affects (if any). For our purposes, a bill constitutes pork barrel if at least one geographical entity affected by the bill is included in or overlaps with the district of election. Second, as for the geographical targeting, we choose the regional dimension, both to minimize measurement errors and to ensure comparability across electoral systems, as under the proportional system (and the proportional tier in the mixed system) electoral districts overlap with the Italian regions.[20] Pork barrel is the empirical counterpart of the particularistic transfer b^i of the theoretical model and it captures the behaviours of the senators confronted with the tradeoff between broad spending programmes (e.g. social security) and narrowly targeted transfers responding to opportunistic targets. Operationally, we constructed our measure as the fraction of

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[20]Using a finer geographical partition for targeted bills would be subject to non-negligible measurement errors. Prior to the reform, the geographical span of plurality districts was highly heterogeneous. In some cases, two or more provinces were included in one district; at the other extreme, some large municipalities were split into several districts.

targeted bills over the total proposed by each Senator as main sponsor during the whole legislature. The yearly number of bills proposed by each Senator as main sponsor, averaged by legislature, is the second outcome we use to test the findings of the model: it is a proxy of the individual effort put into the electoral mandate and it represents the opposite of rent r.[21] Indeed, proposing bills as main sponsor is not costless in terms of effort. It requires negotiations between different political groups in the Senate and in particular, among the Senators sitting on the relevant Committee (which depends on the topic of the bill). This view is supported by data: the number of bills proposed by each Senator ranges from 0 to over 100 by legislature. This high variability would be difficult to rationalize if proposing bills did not require effort. One could think of using the number of bills approved as as alternative outcome; however, this is very low (on average less than half) and it depends on exogenous factors that are not under the control of the individual legislator, such as the Parliament's agenda and the Government's legislative activity.

The individual characteristics of Senators (see Table 1) are drawn from *La Navicella* (the Annals of Parliament) and include demographic characteristics (e.g. age, gender, number of children), education, professional activity, and information on the Senator's political/parliamentary experience: nation-wide relevance (whether the Senator is a member of the steering committee of a political party at the national level), previous experience at the local level (as regional governor), or in the national Parliament. In addition, we define as 'mover' any Senators whose district of election differs from the district of residence (i.e. they were elected in a region where they are not officially resident). This variable will be pivotal in our analysis in Section 6.5.

Civicness is measured at the regional level, so as to guarantee comparability with institutional data and with the geographical dimension of pork barrel, and is time-invariant. This is justified by the high degree of inertia in the way cultural traits evolve across time, which is widely documented in the literature (see e.g. Guiso et al., 2004 and Guiso et al., 2011). Civicness is the empirical analogue of the altruistic preference α of the model. In our econometric strategy, we use two alternative measures of civicness: the average referendum turnout in the period 1946-1995 (drawn from the Ministry of the Interior), and the number of blood donators per 100 inhabitants in 2002 (provided by ISTAT). Both the indicators are well-established in the literature on civicness (Guiso et al., 2011). Concerning referendum turnout, it should be noted that voters are willing to bear the

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[21]We take the number of bills normalized by year, rather than the overall number by legislature, because of the heterogeneity in the length of legislatures.

cost of voting even if no personal economic payoff is at stake. Most referenda during the period concerned non-economic issues, such as the form of government (republic or monarchy), the regulation of divorce, and abortion. In any case, no referendum was on local public finance issues. Following the literature, we do not consider referenda held after 1995, because since then it has become customary, among voters wo were against the aim of the referendum, to abstain in order to make the referendum fail (in Italy, a turnout of at least 50% is needed for a referendum to be effective). Blood donation is also often used as aproxy for civicness: since there is neither a legal obligation nor a financial incentive to blood donation, it can be regarded as a purely altruistic gesture, driven by internalized social norms. However, some recent works (Lacetera and Macis, 2012) have pointed out that blood donation does not just rely on altruism, as employees are entitled to a one/two-day leave from the work when they donate. As this may represent a confounding factor, referenda turnout is our preferred indicator of civic capital. Figure 1 depicts the regional distribution of such indicators (highlighting a remarkable correlation between the two). In particular, referenda turnout ranges from a minimum of 64 per cent of voters in a southern region (Calabria) to a maximum of almost 90 per cent in a region with an entrenched leftist political tradition (Emilia Romagna). On average, almost 80 per cent of eligible voters cast their ballot in referenda during the period 1946-1995.

Finally, the dataset also includes, as regional controls, per capita income (from ISTAT) and non-sport newspaper diffusion (from Cartocci 2007), as a proxy of the share of informed voters in the district. This might be relevant, as better informed voters should exercise a higher degree of monitoring of representatives' behaviour, and via this channel could affect their behaviour.

6 Econometric analysis

6.1 Empirical strategy

Figure 2 shows the difference in the variables of interest (pork barrel and productivity) between the proportional and the plurality system, as a (linear) function of the degree of civicness. According to the graph, proportional rule leads to less pork barrel (by 10 percentage points in the least civic district), but this comes at the expense of lower productivity. This difference diminishes as civicness increases (then reverts at the highest level of civicness), exactly as predicted in Proposition 2.

Figure 1: Civic capital, by region
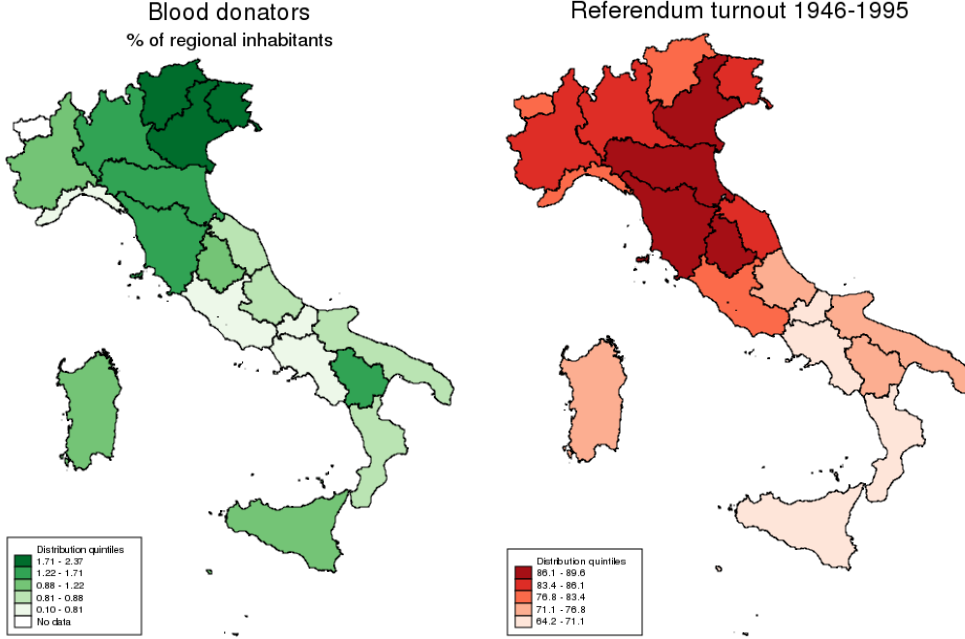
In the rest of the section we assess whether this evidence withstands a more formal econometric analysis, and whether it can be causally interpreted.

As a first step, we exploit the time variation provided by the electoral reform and the cross-section variation in civicness to estimate the following specifications.

$$Y_{ijt} = \beta_0 + \beta_1 post_t * civic_j + \beta_2 post_t + \beta_3 civic_j + \boldsymbol{X}_{it}'\boldsymbol{\alpha} + \boldsymbol{Z}_{jt}'\boldsymbol{\theta} + \epsilon_{ijt} \qquad (11)$$

where the dependent variable (y_{ijt}) is alternatively the share of locally targeted bills or the average number of bills sponsored during legislature t by Senator i elected in district j. $civic_j$ is a proxy for district specific civicness; $post_t$ is a dummy for the reform and β_2 indicates the effect of shifting from a mainly majoritarian to a closed list proportional electoral system. β_1 is our coefficient of interest, as it indicates how the incentives provided by different electoral rules to incumbents differ according to the level of civicness of the electorate (it captures how the impact of the electoral rule is heterogeneous across different levels of civicness), thus accounting for possible complementarity/substitutability between institutions and culture.We allow for selection on observables by controlling for a vector of individual-specific ($\mathbf{X}_{it}$) and district-specific ($\mathbf{Z}_{jt}$) characteristics.

What matters for the unbiasedness of the β_1 coefficient is that the change in politi-

Figure 2: Difference in outcomes between electoral systems, as a function of civicness
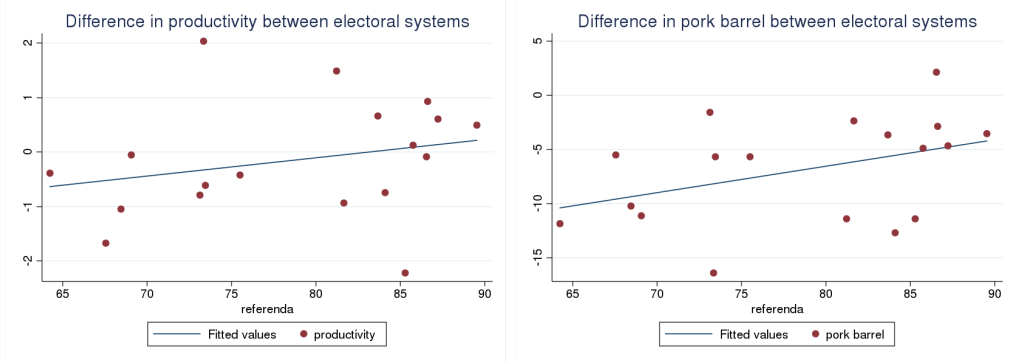
cal outcomes with respect to the pre-reform period, after controlling for all the above observable characteristics, is not influenced by differences in civicness. Although this identifying assumption cannot be formally tested, Figure 3 provides informal evidence in favour of its plausibility: in the legislatures before the reform, the the fraction of pork barrel bills in high civicness(above the median) and low civicness (below the median) districts moved in a roughly parallel fashion (panel A); the same is true for legislative productivity (panel B).

As a further step, we add to the baseline specification a full vector of regional district dummies, which allows us to control for all the unobserved time-invariant characteristics of the districts (including the level of civicness).

$$Y_{ijt} = \beta_0 + \beta_1 post_t * civic_j + \beta_2 post_t + \mathbf{X'_{it}}\boldsymbol{\alpha} + \mathbf{Z'_{jt}}\boldsymbol{\theta} + \mu_j + \epsilon_{ijt} \qquad (12)$$

Finally, we add, together with the district fixed effects, a full set of legislature dummies to capture possible common macroeconomic shocks:

$$Y_{ijt} = \beta_0 + \beta_1 post_t * civic_j + \mathbf{X'_{it}}\boldsymbol{\alpha} + \mathbf{Z'_{jt}}\boldsymbol{\theta} + \mu_j + \delta_t + \epsilon_{ijt} \qquad (13)$$

Owing to the inclusion of the set of legislature dummies, the coefficient on $post_t$ turns to be meaningless, owing to multicollinearity. Legislature dummies, in fact, capture the marginal effect of each legislature on the outcome of interest rather than the overall aggregate impact of the shift in the electoral system. It also reduces substantially the risk of omitted variables and reverse causation that would bias our estimates.

Figure 3: Assessing the common trend assumption
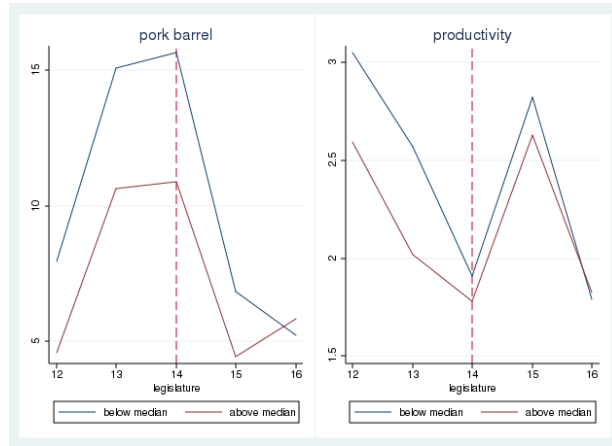
In all our specifications $\mathbf{X}_{it}$ includes: age, gender, number of children, years of education, nation-wide relevance (whether the Senator is member of the steering committee of a political party at the national level), two dummies summarizing previous experience at the local level (as regional governor or as member of the regional executive, and as provincial governor or as member of the provincial executive), the length of the parliamentary experience (which is allowed to enter both linearly and squared, to account for possible non linearity in seniority effects), and a dummy switched on if the representative belongs to a localistic party (the most prominent of which is the *Lega Nord*). In the political science literature, these individual-level controls are supposed to have an impact on the propensity of legislators to act on the basis of personal motivations/ambitions, instead of following party directives (see e.g. Carey and Shugart 1995).

The $\mathbf{Z}_{jt}$ vector includes per capita income (from ISTAT) and non-sport newspaper diffusion[22]), and a dummy equal to 1 if the region is a Special Statute Region (the Italian Constitution awards this special status to five regions; traditionally, those regions benefit from more generous transfers from the central government and are granted a significant degree of autonomy).

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[22]Newspaper readership is a commonly used indicator of the attention that the local population pays to political issues and of the degree of monitoring of elected officials. We take the figures from Cartocci (2007).

6.2 Estimation results

The results of our baseline estimation are summarized in Tables 3 and 4.[23] In the first three columns of Table 3 we investigate the effect on pork barrel of taking referendum turnout as a proxy for civicness. As predicted by our model, the switch to proportional representation tends to reduce pork barrel by more than three times its mean (and about twice the standard deviation, column 1). Similarly, there is some evidence that the higher the level of civicness, the lower the tendency to divert public resources to meet particular territorial needs, although the magnitude of the effect is quite small. More importantly, we want to analyse how the impact of the electoral system differs according to the civicness endowment of the electoral districts: the coefficient on the interaction terms is positive and significant, thus counteracting the impact of the electoral reform itself. This is in line with our model, which predicts that the effects of a change in the electoral rules on pork barrel are mitigated where civicness is high.[24] The result remains true even when we add district as well as legislature dummies (Columns 2 and 3).[25] Moreover, the size of the coefficients is quite stable as we go from the most parsimonious to the richest specification.

Similar evidence is found (taking into account the different scale) when using blood donators as an alternative proxy for civic capital (Columns 4 to 6)

In Table 4 the effect on the effort of Senators is analyzed. The impact of the electoral reform is found to be a decrease by less than twice the average senator's effort over the legislature (Columns 1 and 2). Also in this case, the results are in line with our theoretical predictions, as the effect of the change in the rules is smaller in high-civicness districts (the sign of the estimated coefficient of the interaction term is again positive). This is true across all specifications and irrespective of the proxy for civicness

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[23]Standard errors (in parentheses) are clustered at the regional level (which perfectly overlaps with the electoral district), to account in a flexible manner for within-region dependence of errors. We do not use a two-way clustering by region and legislature because we cannot rule out that a serial correlation exists in the dependent variable even after controlling for legislature fixed effectd in the Senators in charge for more than one mandate. In this case, inference with cluster-robust standard errors would require the number of cluster goes to infinity (otherwise standard asymptotic tests would over-reject the null hypothesis). In order to overcome this issue, with a relatively small number of clusters, we use a bootstrap-t procedure described in Cameron et al. (2008). Bootstrapped p-values in brackets show no evidence of a downward bias of the standard errors, thus confirming the validity of the inference.

[24]In order to confirm that the change in electoral system is the driving factor shaping our outcomes, we perform an F-test on the combined effect of civicness and of the interaction term; the test fails to reject the null hypothesis that their joint effect is zero.

[25]Clearly, in column 2 the civicness variable is not identified because it is time invariant; in column 3,too, the reform dummy is not identified because of multi-collinearity with the legislature dummies used.

Figure 4: Difference in outcomes between electoral systems, as a function of civicness: Estimation results
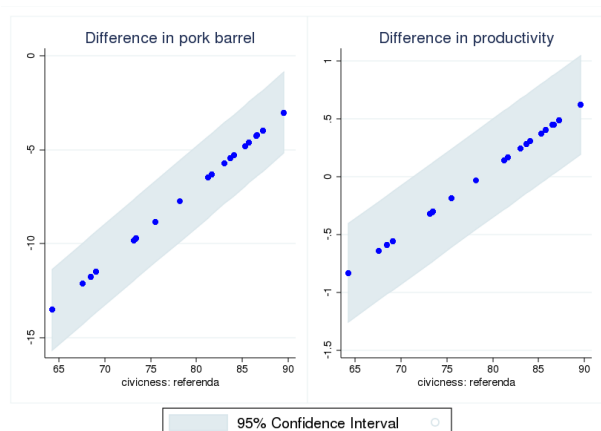
we use.

The estimated marginal effect of the electoral reform, $\beta_1 * civic_j + \beta_2$ is shown in Figure 4. The Figure confirms the intuition of Figure 2: shifting from a single-member plurality system to a closed-list proportional system decreases both pork barrel and effort. Concerning pork barrel (left graph), the difference gradually diminishes in magnitude as civicness increases, from a 10 percentage point decrease (roughly equal to the mean) in the lowest-civicness district to a decrease of just 1 point in the highest-civicness district. Concerning effort (right graph), we observe a decrease equal to about one bill per year (around one-third of the mean) in the lowest civicness districts, which turns into a slight increase in the district with the highest civicness. Briefly, civicness tends to reduce differences in incentives across electoral systems, so that the effects of the reform are more evident at low levels of civic capital, where pork barrel is high and the level of officials' effort low.

6.3 Endogenous selection

The effect found in our estimates can be interpreted along the lines proposed by our model (i.e. the existence of different incentives for legislators under the two electoral regimes), but it may be also driven by systematic differences in the characteristics of elected politicians under the two systems. That is, politicians who are more likely to succeed in a proportional race may have a different propensity to indulge in pork barrel politics and/or to exert effort compared with politicians who are more fit for

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the majoritarian system. Unobservable characteristics (along with the observed ones) may drive not only the self-selection of candidates (or selection within the party) into a specific electoral system, but also the selection into being elected, that is the chances of being successful in an electoral race under a specific electoral system.

In this case, the estimated effect would capture the joint impact of the change in post-electoral behaviour for given individual characteristics and of the change in the (unobservable) quality, which influences both behaviours once in office and the probability of electoral success. From a reform evaluation perspective, one could argue that what matters is the overall impact (including the selection effect), but it is interesting to try to disentangle the two channels.

As a matter of fact, as shown in Table 2, Senators elected under the pre-reform system and Senators elected under the post-reform rule display different observed characteristics. Under the latter, Senators tend to be older and slightly more educated; the share of women is higher, as well as that of Senators with previous parliamentary experience, while the share of Senators with previous local experience as regional governor is almost halved. Moreover, the share of movers, i.e. those elected in a district other than that of residence, is more than double under the proportional rule. The differences in observables shown in Table 2 may indicate the existence of systematic heterogeneity in *unobservable* factors that might be driving in turn both the probability of being elected and behaviour once elected.

For example, some candidates might be intrinsically more dedicated to their geographical constituency, and for this reason more inclined to run under the plurality system; similarly, these individuals may have a greater chance of being voted and of succeeding, *ceteris paribus*, under the plurality rule. On the contrary, people naturally less inclined to particularistic policies may be more prone to self-select and to be chosen under the proportional rule.

In order to test for this possibility, we perform several variable addition tests.
First, following Wooldridge (1995) and Vella (1998), we augment our baseline specifications with a dummy for selectivity s_i, equal to 1 if the individual Senator survived the electoral reform (i.e. if she was in office during at least one legislative term before and one after the reform). We then use a standard t-test to test the coefficient on s_i, supposed not to enter the model significantly under the hypothesis of no selectivity bias.

$$Y_{ijt} = \beta_0 + \beta_1 post_t * civic_j + \beta_2 post_t + \beta_3 civic_j + \mathbf{X}'_{it}\boldsymbol{\alpha} + \mathbf{Z}'_{jt}\boldsymbol{\theta} + \gamma s_i + \epsilon_{ijt} \quad (14)$$

As shown in Table 5, we fail to reject the null hypothesis of no selectivity bias for all our specifications.

While being computationally simple, this test does not allow for a flexible selection model. To overcome this inconvenience, we explicitly model the selection mechanism as follows:

$$s_i = 1[\boldsymbol{\Psi_{ijt}\delta} + u_{ijt} > 0] \tag{15}$$

In this model a selection effect arises if there is a correlation between unobservable factors driving the selection process u_{ijt} and those shaping the outcome ϵ_{ijt}, i.e. if $E[\epsilon_{ijt}|u_{ijt}]$ is non null (see the seminal papers by Heckman (1979) and Hausman and Wise (1979)). To take into account sample selection we use a Heckit estimator and we proceed as follows: first, we estimate equation (15) by a probit model. Then we augment our baseline specifications with the estimated inverse Mills ratio $\lambda(\Psi_{ijt}\hat{\delta})$ as follows.

$$Y_{ijt} = \beta_0 + \beta_1 post_t * civic_j + \beta_2 post_t + \beta_3 civic_j + \boldsymbol{X'_{it}\alpha} + \boldsymbol{Z'_{jt}\theta} + \rho\lambda(\Psi_{ijt}\hat{\delta}) + \epsilon_{ijt} \tag{16}$$

We then test whether the coefficient that accounts for correlation between errors of the selection model and of the structural equation is different from zero.

$$H_0 : \rho = \sigma_{\epsilon,u} = 0$$

Importantly, the Heckman model may be close to unidentified if identification only relies on the non-linearity of the selection mechanism. We therefore include among the regressors of the selection equation a variable assumed to affect the probability of winning a seat but not the behaviour of successful candidates (thus satisfying the exclusion restriction), as follows:

$$\Psi_{ijt} = \{X_{it}, Z_{jt}, w_{it}\}$$

where w_{it} is the added regressor. It is the product of the inverse of the ranking position in the party list, weighted by the percentage of votes obtained by the list and the number of seats attributed in the district. This is meant to be a proxy of the likelihood of being elected under the proportional rule. In fact, it is increasing in the electoral strength of

the party (depending on the assignment of seat to the party within each district) and in the relative strength of the candidate within the party (which is reflected in their individual positioning in the party list, e.g the second candidate in the list has clearly more chances of being elected than the ones that follow, given that under the plurality rules voters can cast their preference for a party only.).[26]

This test again fails to reject the null of no selectivity bias, as shown in Table 6.

6.4   Other robustness checks

Alternative measures of civic capital. - As a robustness check, we estimate equations (11), (12) and (13) with alternative measures of civic capital.

One could argue that our preferred proxy, referendum turnout, may be sensitive to the choice of referenda (we use referenda held during the period 1948-1995 for the reasons explained in Section 5). The referendum on constitutional reform held in 2016 shares in part the non-economic topic of the sampled referenda and did not require a minimum turnout threshold for validity (actually, the average turnout was 72 per cent). While we do not include it in our measure of referendum turnout because it took place after the period we investigate, it is interesting to note that even in this recent referendum the 'ranking' among regions in term of turnout has been substantially preserved (Figure 5). More formally, Table 7 show the estimation results obtained used the 2016 referendum turnout as a measure of civicness. Reassuringly, results are substantially unchanged with respect to those displayed in the first three columns of Tables 3 and 4.

As a second excercise, it is useful to avoid the scale difference between the two main indicators of civic capitals (referendum turnout has a mean of 80, while the average number of blood donators is around 1; for details of the two distributions, see Table 1. For this purpose, we standardize the two variables by subtracting the respective mean and dividing by their standard deviation. As shown in Tables 8 and 9, results are similar in magnitude irrespective of the civicness indicator.[27]

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[26]As for the exclusion restriction that the added regressor is required to satisfy, we could not think of any direct (i.e. not mediated by the electoral rules) link between it and post-election behaviour. We also checked that the instrument is not weak.

[27]When considering effort as outcome, the effect of the shift in electoral system appears to be non statistically significant. However our coefficient of interest (on the interaction term, third row) remain statistically significant at the 1% level.

Figure 5: 2016 referendum turnout, by region

Referendum turnout 2006

Distribution quintiles
73.8 - 76.7
72.1 - 73.8
68.9 - 72.1
62.1 - 68.9
54.4 - 62.1
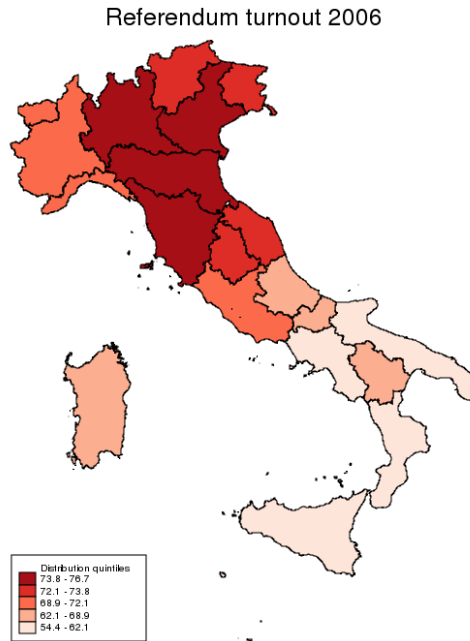
Alternative measures of Senators' effort. - Our measure of effort includes all the
bills sponsored by each Senator, both targeted and non-targeted. As an alternative, we
employ as outcome the yearly number of proposed bills net of those identified as pork
barrel. Results are shown in Table 10. As expected, the magnitude of single estimates is
reduced, owing to the shrinking of the outcome variable. The estimated marginal effect
of the change in electoral system ($\beta_1 * civic_j + \beta_2$) is virtually unchanged.

A placebo test. - Finally, in order to rule out any anticipation effect and to test the
common trend assumption, we perform a placebo test: we artificially set as a placebo
treatment the legislatures starting from legislature XII instead of those starting from the
legislature XV (the first one under the new electoral system); then we estimate equation
(12) on pre-reform data (i.e. all legislatures prior to XV). Since no change applies in
electoral rules, we expect that the effect of the placebo treatment will not be statistically
significant. Table 11 confirms the validity of our empirical strategy as the coefficient on
the legislature dummy is not statistically different from zero.

6.5 Extensions

Inherited and environmental civicness. - Our estimates so far do not disentangle
the two components of civicness, singled out by Guiso et al. (2004) as *inherited* and *en-*

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vironmental civic capital, which in our set-up are given by, respectively, the endowment of civic capital of each individual Senator and of her electorate respectively.

Indeed, our model assumes that politicians are only motivated by self-interest, but it may be possible that their preferences also reflect an element of civicness.

Table 12 shows the results of some further analyses we conducted on this issue. Column (1) reports the results of specification 12, augmented with a dummy for being a mover (i.e. a Senator whose district of election does not coincide with that of residence, as defined in Section 5). Estimates are in the same range as Table 3. Plausibly, being a mover decreases the likelihood of engaging in particularistic transfers regardless of the electoral system. We also perform a split sample exercise: we estimate equation 12 on the subsample respectively of movers (column 2) and non-movers (column 3). It turns out that the effect of the change of electoral system on pork barrel is driven by non-movers (column 2), while the shift in electoral rules has no effect on movers' behaviour (column 3). In this latter subsample it is possible to disentangle the civicness endowment of the district of election and of the district of residence; we find that neither has a significant effect (whether considered alone nor if interacted with the reform dummy). Finally, in columns (4) and (5) we find no evidence of a tendency of movers to use public resources for particularistic transfers towards their region of residence.[28]

All in all, this evidence reinforces the prediction of the theoretical model that the civicness of the district of election (in other terms, the environmental civicness) is the driver of the effect of the reform.

Electoral cycle. - We also investigate whether our results are mainly or partly influenced by the electoral cycle. To do this, we compute our outcome variables separately for the first year, for the last year, and for the rest of the legislature. One could conjecture that politicians behave differently in the years around the elections (for example, because voters pay more attention to promises). This, however, is not confirmed by the evidence. We find no significant difference in β_1 and β_2 estimated for the first year (Table 13) or for the last year (Table 14) compared with the rest of legislature. This suggests that Senators tend to behave in a fairly uniform manner throughout the whole duration of their mandate.

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[28]In Table 3we show replications of equation 12; similar results are obtained by replicating equations 11 and 13. These results are the opposite of those of Carozzi and Repetto (2016). They find - somewhat unintuitively - that movers benefit their residence district but not their electoral district. However, the analysis by Carozzi and Repetto only spans majoritarian legislatures. Furthermore, they do not look at the role of civic capital. Finally, they don't look at legislative proposals but at actual transfer from central government to municipalities, irrespective of those who proposed them.

Swing districts. - Finally, we investigate the possible heterogeneity of the effect of the reform between swing and non-swing electoral districts. We define swing district as a district where, in at least half of the elections held during the period under consideration, the margin of victory is lower than 5 per cent between the two individual candidates (under the plurality system) or party lists (under the proportional race) who ranked in the first positions in terms of ballots.

One implication of our model (shared with Persson and Tabellini, 1999) is that races in single-member districts induce politicians to favour swing districts in terms of pork barrel. As we have already mentioned, the massive presence of swing voters is indeed a powerful levy because their ballot is more likely to be influenced by narrowly targeted public transfers.

In line with the intuition of the model, Table 15 shows that the drop in pork barrel when the electoral system shifts from majoritarian to proportional is more pronounced in swing districts. This is true both simply looking at the impact of the electoral system (first row) and at the combined effect of the institutional change and the geographical heterogeneity in terms of civicness (first and third rows).

7   Concluding remarks

We provided evidence on the link between electoral rules and politicians' behaviour using a new dataset on the legislative choices of the members of the Italian Senate. We find that Senators elected before 2006 under a system based on single-member districts have a higher propensity to sponsor pork barrel bills and to exert effort (as measured by the overall number of proposed bills) than those elected since 2006, under a closed-list proportional system. We adopt a new empirical strategy, based on the assumption that the relationship between rules and outcomes depends on the degree of civicness. To motivate this identifying assumption, we spell out a theoretical model.

Of course, our analysis is purely positive, and any normative attempt to assess the desirability of the two systems is outside of the scope of this paper.

However, before concluding, we would like to point to some institutional-design implications of our analysis. Suppose, indeed, that we want to choose an electoral rule that minimizes a social loss function which depends positively on the amount of pork barrel and negatively on the degree of effort. Our results suggest that (i) different systems imply a different mix of the two; and (ii) the pork barrel/effort trade-off is influenced by

the cultural characteristics of the polity (using the terminology of Djankov et al. (2003), civicness influences not only the intercept but also the slope of the society's 'institutional possibility frontier').

This has two implications. First, there is not one system that dominates the other: the choice must depend on the weight that the society attaches to pork barrel and effort. Second (and maybe less intuitively), even for a given social loss function, the best electoral system in a low civicness country may be different from the best one for a high civicness country.

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tional mean independence assumptions," *Journal of Econometrics*, vol. 68, pp. 115–132.

Table 1: Summary statistics

	Mean	S.D.	Min	Max	Obs.
Individual covariates					
Pork barrel*	9.60	18.77	0	100	1597
No. of bills approved	0.41	1.06	0	11	1597
No. of bills proposed per year	2.31	3.32	0	42	1597
No. of bills proposed per year (*net of pork barrel*)	2.11	3.15	0	41	1597
Gender (% of men)	0.89	0.32	0	1	1597
Age	55.11	8.48	38	88	1597
Years of schooling	16.76	2.35	5	18	1470
Mover	0.16	0.37	0	1	1597
Member of a localistic party	0.10	0.30	0	1	1597
Previous experience in local government	0.30	0.46	0	1	1597
Nation-wide political relevance	0.27	0.44	0	1	1568
Parlamentary experience (no. of years)	4.10	5.57	0	41	1597
Regional variables					
Referendum turnout	79.77	7.71	64.23	89.55	1584
Blood donators	1.14	0.52	0.10	2.37	1581
Non-sport newspaper diffusion	7.96	3.28	2.60	14.56	1584
Per capita GDP (thousands of euros)	23.44	6.16	13.05	32.31	1584

All individual covariates are legislature-specific, unless specified otherwise. * Pork barrel measured as the share of bills proposed by each Senator as main sponsor. All regional variables apart from GDP are time-invariant.

Table 2: Individual covariates, by electoral system

	Majoritarian	Proportional	Difference
Pork barrel	11.61	6.57	5.04***
No. of bills proposed per year	2.36	2.24	0.12
Gender (% of men)	0.92	0.84	0.08***
Age	54.11	56.62	-2.50***
Years of schooling	16.67	16.93	-0.26*
Mover	0.11	0.24	-0.13 ***
Member of a localistic party	0.12	0.07	0.05**
Member of mixed group	0.08	0.04	0.04***
Previous experience in local government	0.31	0.30	0.02
Nation-wide political relevance	0.27	0.26	0.01
Parlamentary experience (no. of years)	3.10	5.61	-2.51***

Significance level at 1% (***), 5% (**), 10% (*).

Table 3: Estimation results - pork barrel

	(1)	(2)	(3)	(4)	(5)	(6)
Shift to proportional	-32.92*** (6.67) [0.004]	-33.27*** (6.85) [0.004]		-9.03*** (1.86) [0.004]	-9.78*** (1.99) [0.004]	
Civicness	-0.48*** (0.18) [0.024]			0.66 (2.65) [0.808]		
Shift*Civicness	0.35*** (0.09) [0.000]	0.35*** (0.09) [0.004]	0.36*** (0.09) [0.000]	3.73** (1.61) [0.012]	4.07** (1.62) [0.000]	4.26** (1.53) [0.000]
Civicness indicator	Referendum	Referendum	Referendum	Blood	Blood	Blood
Observations	1447	1447	1447	1445	1445	1445
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis; wild-bootstrapped p-values in brackets. All regressions include individual characteristics of senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 4: Estimation results - productivity

	(1)	(2)	(3)	(4)	(5)	(6)
Shift to proportional	-3.74*** (1.14) [0.004]	-3.91*** (1.13) [0.004]		-1.09*** (0.25) [0.004]	-1.15*** (0.27) [0.004]	
Civicness	0.01 (0.03) [0.652]			-0.42 (0.32) [0.272]		
Shift*Civicness	0.04*** (0.01) [0.004]	0.05*** (0.01) [0.004]	0.04*** (0.01) [0.004]	0.79*** (0.23) [0.000]	0.80*** (0.24) [0.000]	0.77*** (0.24) [0.000]
Civicness indicator	Referenda	Referenda	Referenda	Blood	Blood	Blood
Observations	1447	1447	1447	1445	1445	1445
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis; wild-bootstrapped p-values in brackets. All regressions include individual characteristics of senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 5: Selectivity bias test (Nijman and Verbeek, 1992)

Dependent variable:	Pork barrel			Senators' productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
Civicness indicator: Referendum turnout						
$H_0 : \gamma = 0$						
p-value	0.932	0.726	0.434	0.484	0.651	0.416
Civicness indicator: Blood donators						
$H_0 : \gamma = 0$						
p-value	0.790	0.752	0.420	0.558	0.672	0.432
Regional dummies:	NO	YES	YES	NO	YES	YES
Legislature dummies:	NO	NO	YES	NO	NO	YES

Table 6: Selectivity bias test (on inverse Mills ratio)

Dependent variable:	Pork barrel			Senators' productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
Civicness indicator: Referendum turnout						
$H_0 : \rho = 0$						
p-value	0.268	0.125	0.734	0.969	0.911	0.396
Civicness indicator: Blood donators						
$H_0 : \rho = 0$						
p-value	0.080	0.180	0.828	0.632	0.954	0.420
Regional dummies:	NO	YES	YES	NO	YES	YES
Legislature dummies:	NO	NO	YES	NO	NO	YES

Table 7: Estimation results - 2016 referendum turnout

	Pork barrel			Productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
Shift to	-30.51	-31.37		-3.36	-3.54	
Proportional	(6.14)***	(6.34)***		(1.04**	(1.03)**	
Turnout	-0.33			0.01		
	(0.24)			(0.03)		
Shift*turnout	0.37	0.38	0.39	0.05	0.05	0.05
	(0.10)***	(0.10)***	(0.09)***	(0.02)**	(0.02)**	(0.01)**
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis. All regressions include individual characteristics of Senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 8: Estimation results with standardized civicness variable - pork barrel

	(1)	(2)	(3)	(4)	(5)	(6)
Shift to proportional	-5.21*** (1.02)	-5.15*** (1.10)		-4.77*** (1.17)	-5.12*** (1.26)	
Civicnss	-3.70** (1.42)			0.343 (1.37)		
Shift*civicness	2.68*** (0.69)	2.72*** (0.69)	2.76*** (0.67)	1.92** (0.83)	2.09** (0.83)	2.19** (0.79)
Civicness indicator	Referendum	Referendum	Referendum	Blood	Blood	Blood
Observations	1447	1447	1447	1445	1445	1445
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis. All regressions include individual characteristics of senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 9: Estimation results with standardized civicness variable - productivity

	(1)	(2)	(3)	(4)	(5)	(6)
Shift to proportional	-0.17 (0.17)	-0.25 (0.18)		-0.19 (0.15)	-0.24 (0.16)	
Civicness	0.10 (0.20)			-0.22 (0.16)		
Shift*civicness	0.34*** (0.11)	0.35*** (0.11)	0.34*** (0.11)	0.41*** (0.12)	0.41*** (0.13)	0.39*** (0.13)
Civicness indicator	Referendum	Referendum	Referendum	Blood	Blood	Blood
Observations	1447	1447	1447	1445	1445	1445
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis. All regressions include individual characteristics of senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 10: Estimation results with alternative productivity measure

	(1)	(2)	(3)	(4)	(5)	(6)
Shift to	-2.84**	-2.98**		-0.84***	-0.88***	
proportional	(1.13)	(1.13)		(0.23)	(0.25)	
Civicness	0.02			-0.38		
	(0.03)			(0.30)		
Shift*civicness	0.03**	0.04**	0.03**	0.67***	0.67***	0.64***
	(0.01)	(0.01)	(0.01)	(0.20)	(0.22)	(0.22)
Civicness indicator	Referendum	Referendum	Referendum	Blood	Blood	Blood
Observations	1447	1447	1447	1445	1445	1445
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

SE clustered at regional level in parenthesis. All regressions include individual characteristics of senators and regional covariates. Significance level at 1% (***), 5% (**), 10% (*).

Table 11: Placebo test

	Pork barrel	Productivity
Legislature XII	-9.94	-4.08
	(11.12)	(2.56)
Legislature*Civicness	0.195	0.04
	(0.13)	(0.03)
Civicness indicator	Referendum	Referendum
Regional dummies	YES	YES
Legislature dummies	NO	NO

Legislature XII is a dummy taking value of 1 from the beginning of Legislature XII onward. SE clustered at regional level in parenthesis; regional and individual characteristics of Senators included. Significance level at 1% (***), 5% (**), 10% (*).

Table 12: Movers

| Dependent variable: | Pork barrel towards: | | | | |
| | District of election | | | District of residence | |
	(1)	(2)	(3)	(4)	(5)
Shift to proportional	-33.27*** (6.85)	-34.33*** (9.49)	-14.10 (22.74)	-13.42 (19.50)	-10.46 (21.72)
Civicness (election)				-0.08 (0.14)	
Civicness (residence)				-0.10 (0.14)	
Shift*Civicness (election)	0.35*** (0.09)	0.36*** (0.12)	0.11 (0.23)	-0.07 (0.16)	-0.08 (0.18)
Shift*Civicness (residence)			0.01 (0.13)	0.19 (0.18)	0.16 (0.16)
Mover	-3.53*** (1.45)				
Civicness indicator	Referendum	Referendum	Referendum	Referendum	Referendum
Observations	1447	1233	213	213	213
Regional dummies	YES	YES	YES	NO	YES
Sample:	Full	Non-Movers	Movers	Movers	Movers

All regressions include individual characteristics of Senators. Standard errors clustered at regional level in parenthesis. Significance level at 1% (***), 5% (**), 10% (*).

Table 13: Electoral cycle

Dependent variable:	Pork barrel		Senators' productivity	
	(1)	(2)	(3)	(4)
Shift to	-32.62	-25.29	-5.56	-2.10
proportional	(11.66)***	(6.31)***	(3.79)	(0.83)**
Shift*	0.35	0.27	0.06	0.02
civicness	(0.15)**	(0.08)***	(0.05)	(0.01)**
Regional dummies:	YES	YES	YES	YES
Year of legislature:	First	Others	First	Others
Test of equality of coefficients				
p-value:		0.17		0.16

Civicness indicator: Referendum turnout. All regressions include individual and regional covariates. Standard errors clustered at regional level in parenthesis. Significance level at 1% (***), 5% (**), 10% (*).

Table 14: Electoral cycle

Dependent variable:	Pork barrel		Senators' productivity	
	(1)	(2)	(3)	(4)
Shift to	-20.70	-27.52	-1.85	-3.16
proportional	(14.24)	(6.07)***	(1.39)	(1.31)**
Shift*	0.21	0.29	0.03	0.04
civicness	(0.18)	(0.08)***	(0.02)	(0.02)**
Regional dummies:	YES	YES	YES	YES
Year of legislature:	Last	Others	Last	Others
Test of equality of coefficients				
p-value:		0.62		0.73

Civicness indicator: Referendum turnout. All regressions include individual and regional covariates. Standard errors clustered at regional level in parenthesis. Significance level at 1% (***), 5% (**), 10% (*).

Table 15: Swing districts

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:			Pork barrel			
Shift to proportional	-34.94** (11.34)	-33.00** (11.14)		-29.49* (13.98)	-29.34* (14.35)	
Civicness	-0.81* (0.42)			0.24 (0.39)		
Shift*Civicness	0.36** (0.15)	0.34* (0.15)	0.35** (0.14)	0.30 (0.17)	0.30 (0.17)	0.31* (0.17)
Type of district	Swing	Swing	Swing	Non-Swing	Non-Swing	Non-Swing
Civicness indicator	Referenda	Referenda	Referenda	Referenda	Referenda	Referenda
Observations	590	590	590	857	857	857
Regional dummies	NO	YES	YES	NO	YES	YES
Legislature dummies	NO	NO	YES	NO	NO	YES

All regressions include individual characteristics of senators. SE clustered at regional level in parenthesis. Significance level at 1% (***), 5% (**), 10% (*).

Appendix

Proof of Proposition 1

As outlined in the text, Party's A maximizes the following equation (taking the opponent's platform as given):

$$(R+r)E\left[p^A(q^A, q^B)\right] \tag{17}$$

From equations (5) (6) and (9), it is easy to show that:

$$p^A(q^A, q^B) = \frac{1}{2} + \frac{d}{3s}\sum s^i(W^i(q^A) - W^i(q^B))$$

where s$\equiv \frac{\sum_i s^i}{3}$.

By equation (3):

$$
\begin{aligned}
\sum s^i W^i(q^A) &= (1 - \tau + h\ln(g))\sum s^i(1 + 2\alpha^i) + \\
&+ b^1(s^1 + \alpha^2 s^2 + \alpha^3 s^3) + b^2(\alpha^1 s^1 + s^2 + \alpha^3 s^3) + b^3(\alpha^1 s^1 + \alpha^2 s^2 + s^3)
\end{aligned}
$$

Owing to Assumptions 1 and 2, it is always optimal for the party to set b^1 = b^3=0, as the marginal benefit of increasing b^2 is always higher.

Notice also that it is optimal to set $\tau = 1$, as the benefit of increasing b$^2(\alpha^1 s^1 + s^2 + \alpha^3 s^3)$ is higher than the cost of increasing taxes ($\frac{\sum s^i(1+2\alpha^i)}{3}$). Therefore, maximizing (17) is tantamount to maximize:

$$(R+r)\left[\frac{1}{2} + \frac{d}{3s}\left(h\ln(g)\sum s^i(1 + 2\alpha^i) + b^2(\alpha^1 s^1 + s^2 + \alpha^3 s^3)\right)\right]$$

subject to:

$$g + b^2 + r \leq 3.$$

which implies (assuming an internal optimum[29]):

---

[29]The condition for an internal optimum is:

$$\frac{h\sum s^i(1 + 2\alpha^i)}{\alpha^1 s^1 + s^2 + \alpha^3 s^3} - 3 < R - \frac{3s/2d}{\alpha^1 s^1 + s^2 + \alpha^3 s^3} < 0$$

which is verified for suitable values of h and R.

$$
\begin{aligned}
g^{prop} &= \frac{h\sum s^i(1+2\alpha^i)}{\alpha^1 s^1 + s^2 + \alpha^3 s^3} \\
r^{prop} &= \frac{3s}{2d(\alpha^1 s^1 + s^2 + \alpha^3 s^3)} - R \\
b^{2,prop} &= 3 + R - \frac{3s/2d + \sum s^i(1+2\alpha^i)}{(\alpha^1 s^1 + s^2 + \alpha^3 s^3)}
\end{aligned}
\tag{18}
$$

Consider now party A's problem in a majoritarian system. Given Assumption 2 and equations (5) (6) and (10), the probability of winning is given by:

$$
p^A(q^A, q^B) = \frac{1}{2} + d(W^2(q^A) - W^2(q^B))
$$

where:

$$
W^2(q^A) = (1 + 2\alpha^2)(1 - \tau + h\ln(g)) + b^2 + \alpha^2 b^1 + \alpha^2 b^3.
$$

Obviously, in this case too $b^1 = b^3 = 0$. Moreover, in this case too it is optimal to set $\tau = 1$ (as $1 > \frac{1+2\alpha^2}{3}$). Therefore party A's problem is to maximize:

$$
(R + r)\left[\frac{1}{2} + d\Big((1 + 2\alpha^2)h\ln(g) + b^2\Big)\right]
$$

Subject to:

$$
g + b^2 + r \leq 3.
$$

which implies (assuming an internal optimum):

$$
\begin{aligned}
g^{maj} &= h(1 + 2\alpha^2) \\
r^{maj} &= \frac{1}{2d} - R \\
b^{2,maj} &= 3 - h(1 + 2\alpha^2) - \frac{1}{2d} + R
\end{aligned}
\tag{19}
$$

We are in a position to compare the equilibrium outcomes under the two electoral regimes. Looking at the public good:

$$
\frac{g^{prop}}{g^{maj}} = \frac{s^1\frac{1+2\alpha^1}{1+2\alpha^2} + s^2 + s^3\frac{1+2\alpha^3}{1+2\alpha^2}}{\alpha^1 s^1 + s^2 + \alpha^3 s^3}
\tag{20}
$$

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but $\frac{1+2\alpha^1}{1+2\alpha^2} > \alpha^1$ and $\frac{1+2\alpha^3}{1+2\alpha^2} > \alpha^3$, therefore $g^{prop} > g^{maj}$. As for the rent:

$$\Delta r = r^{prop} - r^{maj} = \frac{3s}{2d(\alpha^1 s^1 + s^2 + \alpha^3 s^3)} - \frac{1}{2d} > 0$$

because $\sum_i s^i > \alpha^1 s^1 + s^2 + \alpha^3 s^3$. Finally, as

$$3 = g^{maj} + r^{maj} + b^{2maj} = g^{prop} + r^{prop} + b^{2,prop}$$

it follows that $b^{2maj} > b^{2prop}$.

Proof of Proposition 2

Looking at equation (7), it is apparent that g^{prop}/g^{maj} decreases with α^2. Now look at what happens with α^1 (the results concerning α^1 can be straightforwardly extended to α^3). From equation (7), one has that $\frac{\partial(g^{prop}/g^{maj})}{\partial\alpha^1} < 0$ if and only if:

$$\alpha^2 > \frac{s^2 - s^1 - s^3}{2s^2}. \tag{21}$$

r^{maj} does not depend on altruism and r^{prop} is clearly decreasing in α^1 and α^2. Finally,

$$\frac{b^{2prop}}{b^{2maj}} = \frac{3 + R - \frac{3s/2d + h\sum s^i(1+2\alpha^i)}{(\alpha^1 s^1 + s^2 + \alpha^3 s^3)}}{3 + R - \frac{1}{2d} - h(1 + 2\alpha^2)}$$

Therefore a *sufficient* condition for $\frac{\partial(b^{2prop}/b^{2maj})}{\partial\alpha^1} > 0$ is that $\partial\frac{\sum s^i(1+2\alpha^i)}{(\alpha^1 s^1 + s^2 + \alpha^3 s^3)}/\partial\alpha^1$ is negative, which happens as long as condition (9) is satisfied. In turn, $\frac{\partial(b^{2prop}/b^{2maj})}{\partial\alpha^2} > 0$ is positive if and only if

$$\sum_{i=1,3} s^i \left[-\frac{1}{2d} + \alpha^i(3 + R) - h(1 + 2\alpha^i) \right] > 0,$$

which is true provided

$$\alpha^i > \frac{h + 1/2d}{3 + R - 2h} \quad \text{for i=1,3}$$

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