

On the Role of the Intra-Party Agency Problem in Shaping Rent Extraction across Electoral Rules

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Abstract

This paper focuses on candidate selection procedures to analyze how the intra-party agency problem between parties and their politicians affects rent extraction across electoral rules. Parties are allowed to choose the number of candidates that participate in the intra-party race to become party representatives. We show that parties are more effective in controlling their politicians under proportional representation than under plurality rule. Our findings imply that rent extraction is more sensitive to the intra-party agency problem than to the electoral rule. The paper presents empirical evidence in favor of the above propositions.

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1 Introduction

Two fundamental aspects of electoral competition are the inter-party race to win the electorate's support and the intra-party competition to win the right to represent a party at the general election. Both of these aspects are characterized by a clear agency problem between principals (voters or parties) and their agents (parties or politicians). If most of the literature in political economy has focused on the agency problem between voters and parties,¹ the intra-party agency problem between parties and their own politicians has been left to the sidelines. Yet, as argued by the political science literature,² this dimension may be of first order importance too.

To add an intra-party dimension to the political agency problem, we assume, contrary to Downs (1957a and 1957b) and most subsequent research, that parties are *organizations* of actors characterized by *different objective functions*. In opening the political party's black box, we follow Caillaud and Tirole (1999, 2002) and let parties have a two-tier structure, with the rank-and-file (RF) on the one hand and politicians on the other. Only politicians are assumed to compete for a legislative seat.

Given that the RF belong to the party but do not run for election, we assume that they care only about the electoral prospects of the party.³ To the contrary, politicians are supposed to be purely opportunistic: all they care about is winning a seat in order to be able to extract rents. This misalignment of preferences is the source of the intra-party agency problem.

In this paper, the party's governance structure is decided at the party's annual conference. Governance is therefore in the hands of the RF, given that they largely outnumber the politicians: *the party's candidate selection rights are held by the RF*.⁴

Once we assume that the RF have full control of their party, an obvious question

¹See Persson and Tabellini (2000) for a survey.

²See for instance Schlessinger (1984), Aldrich (1995) and Hix (2004)

³This implies that the RF do not care about rents and therefore that incumbents cannot tempt them into any rent sharing agreement. The purpose of this assumption is only to sharpen our results. See section 4 for a discussion and see Tirole (1996) for a formal analysis of the interaction between individual and group reputation.

⁴The opposite assumption is at the heart of the contribution of Persson and Tabellini (2000).

is: through which mechanisms can the RF discipline their politicians? The dominant incentive scheme to discipline and motivate individual politicians is the prospect of a legislative seat. Parties cannot be expected to use any direct financial incentives, given that in most democracies the retribution associated to those seats is paid by the State and not the party. Then, two ways to reduce the intra-party agency problem are greater intra-party screening and intra-party monitoring.

We focus on monitoring through intra-party yardstick competition. The dimension of the agency problem we address is the moral hazard one, in the form of individual rent extraction. We refer readers to Carrillo and Mariotti (2001) for an analysis of the role of intra-party screening.

Prima facie, one should expect increased intra-party competition to tame rent extraction by politicians. Nevertheless, increasing competition may also lead to perverse incentives, as is well known in the labor economics literature (see e.g. Chan 1996). If greater competition may reduce rent extraction (through a career-concern effect), introducing (too much) intra-party competition may have the opposite effect, if making the race too tough demotivates incumbents.

Then, two key questions need to be addressed when carrying out comparative politics exercises on rent extraction by individual politicians: 1) What is the effect of increased intra-party yardstick competition on rent extraction? 2) Does this effect differ across electoral rules? These are the questions the paper addresses.

We concentrate on *legislative* elections across the two most widely used electoral systems: British-style plurality rule or first-past-the-post (FPTP) and Dutch-style closed-list proportional representation (PR).

Empirically, Persson, Tabellini and Trebbi (2003) find that these two polar systems are associated with roughly the same level of rents: “a comprehensive electoral reform, going from a Dutch-style electoral system with closed party lists in a single national constituency to a UK-style system with first-past-the-post in one member districts [...] would have counteracting effects on corruption, producing a net result close to zero” (Persson et al. 2003, p. 983). Thus, a casual look at this evidence may lead us to believe that the global relationship between electoral systems and rent extraction is not very strong.

Yet, a closer look at these data reveals that there is a lot of variability in corruption *within* electoral systems:⁵

	FPTP	PR	Overall
Stdev	1,22	1,74	1,57
Mean	1,98	2,15	2,10
Median	1,5	1,6	1,5
Min	0,7	0,0	0,0
Max	3,8	5,2	5,2

Table 1: Summary statistics for corruption index across electoral rules.

What we argue in this paper is that an obvious rationale for this variance within systems is the existence of an intra-party agency problem. Its understanding is crucial to further our knowledge about the link between political institutions and economic outcomes.

Once we examine the incentives politicians face within these two electoral rules, FPTP and PR can be distinguished according to two criteria: 1) the pool of prizes (legislative seats) from which each incumbent can hope to draw her own prize; and 2) the total number of competitors each incumbent faces. Under FPTP, single-member district elections, the contest is typically run at the level of the district and is winner-takes-all with one prize only. The only competitors incumbents face are district-specific, be they internal to their party or representatives of other parties.

Under PR, all the politicians that have been granted the right to represent their party compete in a single, nationwide district. There is therefore a higher number of prizes from which each politician can hope to draw her own seat. On the other hand, each politician is challenged by a much larger pool of competitors, given that the competition is at the level of the nation.

Thus, the two electoral systems interact with the intra-party agency problem along two different lines: *the steepness of competition*, which is greater under FPTP (given that there is only one seat to be won per district), and *the number of competitors each player faces*, which is greater under PR (given that all competitors face each other in the nationwide district).

We build on the textbook setup of Persson and Tabellini (2000). There are two parties. One is assumed to be the incumbent. It controls the whole legislature. Each of its

⁵The index we use here is Persson, et al. (2003)'s CPI9500.

incumbent politicians faces a trade-off: increasing today's rents increases her immediate payoff, but it decreases tomorrow's chances of being allowed not only to stand for re-election, but also to stand for election in the most favorable position possible.⁶

Results

Equilibrium rents turn out to be increasing in the total number of competitors an incumbent faces inside her own party under FPTP, whereas the relationship is U-shaped under PR. Thus, optimizing parties should never resort to intra-party yardstick competition under FPTP, whereas under PR there exists an optimal level of intra-party competition. Furthermore, we show that, for any given identical degree of competition across electoral rules, *PR is always associated with less rent extraction than FPTP*.

The intuition for these results is straightforward, once we build on the two countervailing effects of increased competition highlighted above. Under PR, intra-party yardstick competition has a negative overall effect on rent extraction, at least until the degree of competition does not exceed a certain threshold – see section 3. This is because the rent-reducing incentive effect of increased competition more than counter-balances the negative incentive effects associated with the decrease in the ex-ante probability of being selected for the general election.

To the contrary, under FPTP, because there is only one seat to win per district and therefore incumbents do not enjoy the partial insurance tool of party lists, an increase in intra-party competition immediately discourages incumbents – through a reduction in the ex-ante probability of selection – and increases equilibrium rent extraction.

If lists reduce the accountability of individual politicians to voters, as stressed by Persson and Tabellini (2000), our results show that parties can exploit these same lists to keep politicians on their toes.

In a nutshell, the main theoretical message of this paper is that *rent extraction is more sensitive to the intra-party agency problem than to electoral rules*. Moving from one polar case (that of Persson and Tabellini, in which candidate selection rights are (implicitly) held by the leading politician) to the other extreme (the one examined in this paper, in which control rights are held by the RF) makes the electoral rule voters prefer in terms

⁶Under closed-list PR, the most favorable position is obviously that of head of a party's electoral list.

rent minimization switch from FPTP to PR.

Our findings are also closely related to Caillaud and Tirole’s remark that “the moderation of competition through the sharing of spoils from office helps enhance the chances of victory for the candidate and thus the party [...]” (Caillaud and Tirole 2002, p. 1455). This paper proves that this holds even when *the sharing of any rent is ruled out*, by construction.

These theoretical results have some important implications for empirical research. They suggest that previous empirical models may suffer from an omission of relevant explanatory variable problem: two countries using the same electoral system may be characterized by different rent extraction levels if their parties differ in their degree of intra-party discipline and competition. This may explain the wedge in perceived political corruption observed over the 90s between, say, Belgium and Sweden. It may also be at the core of the weak evidence relative to the global relationship between electoral rules and corruption highlighted by Persson et al. (2003, p. 983).

A second issue is endogeneity, if countries where strong intra-party discipline cannot be achieved are also those where electoral reforms are enacted, as in Italy after 1992. Hence, adding variables that capture governance aspects of political parties among the regressors may substantially improve our understanding of the relationship between corruption and electoral systems.

Roadmap

The rest of the paper is structured as follows. Section 2 presents the model. The next section is the core of the paper and analyzes the effect of intra-party yardstick competition on equilibrium rents. Section 4 presents some empirical facts that corroborate our theoretical assumptions and results. The next section discusses our key modelling assumptions and the last section concludes. The Appendix contains the paper’s main proofs.

2 The Model

The basic structure of the model is borrowed from Persson and Tabellini (2000). We refer readers to section 4 for a discussion of the paper’s main assumptions.

The game is a two-period one. The economy is made of 3 districts indexed with J . Each district contains a continuum of voters of mass 1. The preferences of the electorate in district J and period t are given by:

$$w_t^J = 1 - b + \alpha s_t^J \tag{1}$$

where we have normalized without any loss of generality individual income to 1, b is the per capita cost of a legislator's office, s_t^J are the services provided by the legislator seating on district J 's parliamentary seat in period t and $\alpha > 1$ is the voters' (constant) marginal utility from those services. $\alpha > 1$ implies that voters would always favor public over private consumption, were there to be no rents.

As is the case in modern democracies, we assume that the budget associated to each legislative seat, b , is fixed and independent of the behavior of any individual legislator. It can be thought of as the budget available to legislators to carry out their own research or develop their own positions on the issues they will be called to vote on. It includes all administrative and staff costs: b is both a legislator's budget and the per capita cost of the seat to the electorate. The services s_t^J can be interpreted as information on specific issues, support for the electorate's preferred policies, etc.

Politicians belong to one of two parties competing in elections. As in Snyder and Ting (2002), we assume that politicians do not face any cost from running, so that there are always more candidates than available positions. If the set of available candidates is exogenous (and large), the set of candidates that each party is willing to let run the intra- and inter-party electoral race is *endogenous* and a function of the party's desire to maximize its electoral score.⁷

One of the parties is assumed to be the incumbent in period 1. It controls the whole legislature in that period. Letting S denote the utility a party gets from having one of its politicians winning a legislative seat, the fact that the RF care only about their party's

⁷See Caselli and Morelli (2004) for an analysis of how barriers to entry may impact on the average competence of politicians. In this paper these two dimensions are independent, given that politicians do not know their own competence.

global electoral appeal implies that parties maximize their global vote share:⁸

$$\sum_J p^J S$$

where p^J is the probability that voters in district J vote for the incumbent party – see equation (5) below.

Given the focus of our paper, we assume that politicians are purely rent-seeking in the sense that they have no preferences about ideology and the services offered in equilibrium.⁹ All they care about is the amount of rents they can extract from the budget they control. They attribute no utility to their party winning a seat if it is not given to them.

Politicians have to decide which balance to strike between spending their budget to provide the electorate with some services and diverting the funds for their own personal use. The more politicians favor rent diversion over the provision of s_t^J , the less they are likely to be re-elected next period and thus be in a position to extract further rents. Incumbents maximize:

$$E(v^J) = r_1^J + \tilde{p}^J r_2^J \quad (2)$$

where we have assumed no discounting, without any loss of generality and where \tilde{p}^J stands for the probability that incumbent J will be re-elected in period 2. This probability turns out to be a function of both the electoral rule and the degree of intra-party competition – see section 3 below.

The budget constraint is given by:

$$s_t^J = \eta^J (b - r_t^J) \quad (3)$$

where η^J is the realization of a random variable affecting the returns to the budget of district J 's legislator and r_t^J are the rents extracted in period t by that politician.

We restrict individual rents to be smaller than the budget attached to each legislative seat: $0 \leq r_t^J \leq \bar{r} < b$. This ensures that the career-concern dynamics we wish to analyze

⁸Remember that we assumed that the party's rules and goals are decided by the RF at the annual conference.

⁹See Castanheira et al. (2005) for an analysis of the political agency problem when politicians are both office- and ideologically motivated.

are always meaningful (i.e. that s_2^J is an increasing function of η^J for any $r_2^J \in (0, \bar{r})$). We return to this point in section 2.2.

Borrowing from the terminology of Persson and Tabellini (2000), η^J can also be described as the *competence* of district J 's politician in delivering her services. Together with the rents, it is the key variable of the model. We assume that the realization of η^J determines the competence of politician J in both periods 1 and, provided she is re-appointed, 2.¹⁰ η^J is distributed according to a uniform distribution with support on $[1 - 1/2\xi; 1 + 1/2\xi]$: a politician's competence is independent of the district she is in charge of. We assume that an interior solution to the politicians' problem always exists and, to ensure that competence never takes on negative values, that $\xi \geq 1/2$.

Information Set

The politicians wishing to represent the incumbent party at the general election are the incumbents and (at least as many) new candidates. Each politician is characterized by a certain level of competence. Neither the politicians nor the voters observe the vector of competences.

In order to focus on intra-party competition, we strip down inter-party competition to a minimum. Voters are assumed to be able to form an estimate of the competence of *each member of the incumbent party* that may stand for election. To the contrary, they receive a *single* signal about the competence of the *whole of the opposition party*.¹¹

Their estimate of the competence of the 3 incumbents – which we label as $\hat{\eta}^J$ – is derived from each politician's performance relative to the use of her budget. Indeed, because voters observe s_1^J and know b (but not η^J), they can solve the problem faced by this politician, and compute an estimate of the politician's first period rents, \hat{r}_1^J . Plugging

¹⁰Hence competence is not affected by seniority and there is no on-the-job learning. Adding either feature to the model would not alter our results. It would simply make any incumbent's re-election more likely.

¹¹This assumption – together with the one about the incumbent party controlling the whole of the legislature – is also technical: if voters were to receive a signal about each candidate's competence, the model would become all but untractable, because the electorate's optimal voting strategy would be conditional on a (potentially) infinite number of possible vectors of realizations of each candidate's competence. Our restriction avoids this problem while retaining the fundamental disciplining role of inter-party competition.

\widehat{r}_1^J into the district-specific budget constraint (3), voters can form an estimate of η^J as follows:

$$\widehat{\eta}^J (b - \widehat{r}_1^J) = s_1^J \Leftrightarrow \widehat{\eta}^J = \frac{\eta^J (b - r_1^J)}{b - \widehat{r}_1^J} \quad (4)$$

The estimate of the competence of each new politician i from the incumbent party, denoted by η^{Ji} , and that of the opposition party, denoted by η^O , is simply a realization from a uniform distribution on $[1 - 1/2\xi; 1 + 1/2\xi]$.¹²

We should stress that the voters' preferences and their information set make the optimal re-election rule of the electorate *independent* of the electoral system. We believe this to be a desirable feature of the model. It implies that any result derived below can be ascribed solely to the role of intra-party competition in shaping the incentives of politicians across electoral rules. To say it another way, this strategy allows us to disentangle the effect of the intra-party agency problem from that of voter behavior across electoral rules.

We also view these restrictions as a realistic simplification of the real world: even in small democracies using PR such as the Netherlands or Belgium, voters cast their ballot having information on a very small subset of candidates only.

2.1 Timing

The timing of the game is presented in figure 1 below and is similar to that of standard career-concern models. There are two main periods:

Period One:

At the beginning of the first period, parties choose their internal governance structure and Nature randomly selects an incumbent party. Three politicians belonging to the incumbent party fill the three legislative seats. Once in office, they simultaneously set their first period rents. After all incumbents have set first period rents, their competences are realized without anybody observing them. Finally, the vector of signals is realized and voters observe both s_1^J and this vector.

Period Two:

¹²Allowing these other politicians to exert some type of effort to signal their competence prior to the general election at the beginning of period 2 does not change any of the results below, given that it does not alter any of the mechanisms that are at the heart of our results.

At the beginning of the second period, elections are held. Voters decide whether or not to vote for the incumbent party. The newly elected politicians set second period rents. Service provision for the second period is residually determined and the game ends.

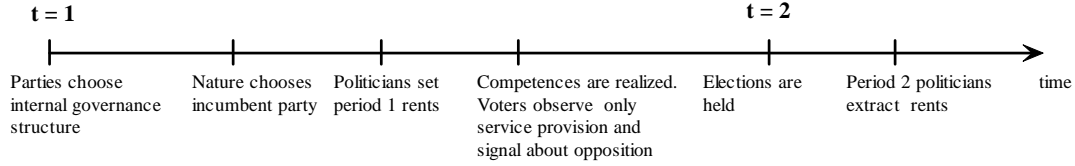


Figure 1: Timing of the Game

The game we analyze is therefore a pure career-concern one, given that none of the actors observes the vector of individual competences *before* choosing their action. We refer readers to Snyder and Ting (2002), Hindriks and Lockwood (2004) and Beniers (2005) for an analysis of the political agency problem under hidden information.

2.2 Optimal Voting Strategy of the Electorate

The key determinant of the voter’s re-election rule is the expected competence of the politician that will fill the second period legislative seat. In this two-period game, politicians cannot be given any incentives to refrain from rent extraction in period 2:¹³ rents will be set to their maximum, $r_2^J = \bar{r}, \forall J$. Given that $\bar{r} < b$, the welfare of the electorate in district J in period 2 is increasing in the competence of the legislator that wins district J ’s seat.

Yet, the details of electoral rules may influence how effectively voters can control individual politicians. We therefore need to be more specific about these details. Electoral systems can be classified according to three major characteristics: ballot structure, district magnitude and electoral formula. In this paper, the two electoral rules we focus on share the same ballot structure, which is such that voters cannot cast their votes for individual politicians, but only for parties. To say it another way, voters have no say neither on the names that appear on the ballot nor on the ranking of these. In the terminology of Carey and Shugart (1995), we are focusing on electoral rules that are “party-centered”. District

¹³Section 4 proves that one could easily extend the game to an infinite horizon economy in which politicians face fixed term limits.

magnitude and the electoral rule allow us to differentiate between the two systems. Under plurality rule, district magnitude is such that there is only one seat to be assigned per district and the electoral rule is winner-takes-all. Under proportional representation, we assume there is only one, nationwide district assigning all the legislative seats and the electoral rule is such that the share of the seats going to one party is strictly proportional to its share of the national vote. These two systems are by far the most common ones: they account for roughly eighty percent of all modern democracies Persson and Tabellini (2003) and Persson, Tabellini and Trebbi (2003) consider in their empirical studies of electoral systems.

Under PR, we assume that the number of a district coincides with that of a seat. We also make the following assumptions about how legislative seats are filled in period 2:

- 1) a party's seat share is strictly proportional to its vote share;
- 2) a party's seats are filled by the politicians on its electoral list in the order of the list;
- 3) the seats attributed to the incumbent party coincide with the number of the district (the first seat the incumbent party may win is the one attached to district 1, the second is the one attached to district 2 and the last seat is the one attached to district 3).

Under these rules, we prove in Appendix 1 that the following voting rule is the one the electorate follows in the whole of the paper.

Lemma 1 *The electorate in district J will vote for the incumbent party provided it believes that the representative of the incumbent party who may be given district J 's seat in the second period has a higher estimated competence than that of the member of the opposition who may be attributed that seat.*

Formally, the rule followed by voter i in district J is:

$$p^{iJ} = \begin{cases} 1 & \text{iff } E(\eta^J) \geq \eta^O \\ 0 & \text{otherwise} \end{cases}$$

where $E(\cdot)$ denotes a voter's estimate of a politician's competence.

Proof. See the Appendix ■

We also have:

Lemma 2 *If an incumbent is allowed to stand for re-election, the probability that district J votes in favor of the incumbent party is given by:*

$$p^J = \left[\frac{1}{2} + \xi \left(1 - \frac{b - \widehat{r}_1^J}{b - r_1^J} \right) \right] \cdot \Pr \left(1 - \frac{1}{2\xi} \leq \widehat{\eta}^J < 1 + \frac{1}{2\xi} \right) + \Pr \left(\widehat{\eta}^J \geq 1 + \frac{1}{2\xi} \right) \quad (5)$$

where \widehat{r}_1^J is the electorate's estimate of the incumbent's rent extraction choice.

Proof. See the Appendix ■

2.3 Equilibrium Probability of Re-Election

Can we say something about the value p^J takes in equilibrium? The answer turns out to be yes. In equilibrium, all voters' conjectures must be consistent with the politicians' optimal behavior. Therefore, we must have that $\widehat{r}_1^J = r_1^J$, which in turn implies that

$$\Pr \left(1 - \frac{1}{2\xi} < \widehat{\eta}^J \leq 1 + \frac{1}{2\xi} \right) = \Pr \left(1 - \frac{1}{2\xi} < \eta^J \leq 1 + \frac{1}{2\xi} \right) = 1$$

and

$$\Pr \left(\widehat{\eta}^J > 1 + \frac{1}{2\xi} \right) = \Pr \left(\eta^J > 1 + \frac{1}{2\xi} \right) = 0.$$

Thus, in equilibrium, $p^J = 1/2$, and every incumbent is re-elected with probability 1/2. This is not surprising, given that the realized competence of both incumbents and challengers is unknown (to everybody) at the beginning of the game and that they are equal in expected terms.

Nevertheless, as will become clear from the sections below, the probability that the incumbent will keep her job in the second period is a function not only of p^J , but also of the electoral rule and the internal governance structure of the party. Hence the label \widetilde{p}^J in each incumbent's objective function – see equation (2).

3 Intra-Party Competition

In this section, we let each incumbent be challenged both by the other incumbents and by new candidates for the right to represent their party in the safest electoral slots. Under this new scenario, the party can select which candidate can run in the general election.

The obvious rule it follows to rank its candidates and therefore to select the three that are allowed to stand for election is *intra-party yardstick competition in terms of each individual expected competence*.

Intra-party competition shapes the electoral game differently under the two electoral rules. Under FPTP, incumbents seldom compete against each other. To exemplify, in US congressional elections, candidates for a district seat have to be registered residents of that district. Thus, under FPTP, incumbents can only face the intra-party competition of new candidates within the same district.

To the contrary, under PR, as in The Netherlands or Israel, each incumbent faces the competition of all other incumbents on her list, on top of that of new candidates. If she wants to run in the election as her party's top-of-the-list candidate, she has to appear as being more competent than the other two incumbents and all other intra-party challengers. If she manages to beat every opponent but one, she will have to settle for the runner-up position. If she appears as more competent than her opponents but two, she will have to settle for the last position on the list. Finally if three or more challengers appear to be more competent than her, she will be ousted from the election.

We first solve for the equilibrium of the game under symmetry, that is, under the assumption that there is the same total number of players across the two electoral rules. Then, we look for the *endogenously optimal* number of new candidates parties should allow to enter the intra-party race under the two electoral rules and compare equilibrium rent extraction in that case.

3.1 Plurality Rule

Let N denote the total number of challengers an incumbent politician faces when allowed to stand for re-election.

We first solve for the game with 1 new candidate, then turn to the general case.

When there is 1 new candidate, $N = 2$: to retain their legislative seat, incumbents have to beat an internal challenger, whose expected competence we label η^{J1} , on top of the representative of the opposition. The incumbent in district J solves:

$$\underset{r_1^J}{Max} r_1^J + \Pr \left[\widehat{\eta}^J \geq \underset{r_1^O}{Max} (\eta^{J1}, \eta^O) \right] \cdot \bar{r}$$

Since η^{J1} and η^O are i.i.d., this boils down to:

$$\underset{r_1^J}{Max} r_1^J + \left(\Pr \left[\widehat{\eta}^J \geq \eta^O \right] \right)^2 \cdot \bar{r} \quad (6)$$

Exploiting lemma 2, it is immediate to check that this problem yields:

$$r_1^{JPLUR}(2) = b - \xi \bar{r} \quad (7)$$

where $r_1^{JPLUR}(2)$ is the equilibrium level of rents incumbent J extracts when $N = 2$.

Straightforward computation show that equilibrium rent extraction in this case is exactly equal to that under plurality rule when the incumbent politician faces the competition of the opposition only (i.e. when $N = 1$). The result may be surprising at first glance, given that having added an extra competitor to the game does not affect equilibrium rents. But the apparent absence of any effect is treacherous. Indeed, for any total number N of competitors (the opposition plus $N - 1$ new candidates), the first order condition to an incumbent's problem can be rewritten as:

$$1 + N \left(\Pr \left[\widehat{\eta}^J > \eta^O \right] \right)^{N-1} \frac{\partial \Pr \left[\widehat{\eta}^J > \eta^O \right]}{\partial r_1^J} \cdot \bar{r} = 0, \quad (8)$$

We thus have:

Lemma 3 *Equilibrium rents under FPTP are given by:*

$$r_1^{JPLUR}(N) = b - N (1/2)^{N-1} \xi \bar{r}. \quad (9)$$

Furthermore, rents are monotonically and strictly increasing in N , the total number of competitors each incumbent faces in her district, for $N \geq 2$.

Proof. By direct differentiation of (9) ■

As we said in the introduction, an increase in competition can have two opposing effects on rent extraction: higher competition may lead to higher effort provision, that is, less rent extraction; but more competition may also demoralize agents and thus lead to more rent extraction. What lemma 3 tells us is that the second, negative effect of increased competition dominates under plurality rule. Given that there is only one seat available,

the greater is the number of competitors, the smaller is the ex-ante probability of winning the seat, all else given. Under plurality rule, the main effect of an increase in intra-party yardstick competition is to demotivate incumbents who, as a consequence, extract more rents in the first period.

3.2 Proportional Representation

Under PR, the three incumbents compete against each other and against three internal new candidates. Given our assumption about district size under PR, the new candidates are not attached to a specific district but can replace an incumbent in any district.

Let us focus on one of the three incumbents, 1, say. Let \mathcal{P} denote the probability that an incumbent is re-elected under intra-party yardstick competition. Then \mathcal{P} is given by:

$$\begin{aligned} & \Pr [\text{Incumbent 1 beats everybody}] \\ & + \Pr [\text{Incumbent 1 beats opposition and all but one internal challenger}] \\ & + \Pr [\text{Incumbent 1 beats opposition and all but two internal challengers}]; \end{aligned}$$

and the problem all three incumbents solve is:

$$\underset{r_1^J}{\text{Max}} r_1^J + \mathcal{P} \cdot \bar{r}$$

In the Appendix, we prove that the following holds:

Lemma 4 *Equilibrium rents under PR are given by:*

$$r_1^{JCOND}(N) = b - (1/2)^{N-1} \xi \bar{r} \cdot \left[\frac{1}{2}N^3 - \frac{5}{2}N^2 + 5N - 2 \right] \quad (10)$$

Equilibrium rents are U-shaped in the number of competitors each incumbents faces.

Contrary to what we had under FPTP, under PR we find that the positive, rent reducing effect of intra-party competition first dominates until the point where competition becomes ‘excessive’ and rent extraction becomes a positive function of intra-party yardstick competition.

3.3 Comparative Politics

Given that the effect of relative performance evaluation differs across the two electoral systems, we identify next the conditions under which one of the two rules performs better in terms of rent extraction. It turns out that for an equal and given total number of competitors incumbents face under both rule, PR always performs better than FPTP. That is, we have the first central proposition of the paper:

Proposition 1 *Consider any political game in which the total number of competitors the three incumbents face is the same across the two electoral rules. Then, intra-party competition for the right to stand at elections implies that PR leads to less rent extraction than FPTP.*

Proof. First, ensure that the total number of politicians competing for a seat is the same across electoral rules. Comparing equilibrium rents in (8) and (10) under this condition yields immediately the result. ■

To exemplify, if $N = 2$ under plurality rule, we need to have $N = 6$ under PR. Then the two lemmas above imply that $r_1^{JPR}(6) = b - 1.4375\xi\bar{r} < b - \xi\bar{r} = r_1^{JFPTP}(2)$.

What is the intuition behind this finding? Comparing the two problems politicians have to solve under the two rules, it is immediate to realize that *elections under PR are equal to elections under FPTP with a higher number of competitors but additional prizes for the second and third places*. Thus, as long as parties do not let ‘too many’ new candidates compete in the intra-party race, the higher number of prizes available under PR implies that the positive incentive effect of increased competition more than compensates its negative demotivating effect and therefore that rents are, initially at least, decreasing in intra-party yardstick competition. To say it another way, the *steepness* of competition under FPTP implies that increasing competition is always harmful to the party. To the contrary, under PR, even though the number of competitors is greater than that under FPTP, the presence of *multiple* prizes implies that the initial effect of an increase in competition is beneficial to the party and the electorate.

This intuition can also be shown in a graph that plots equilibrium rent extraction as a function of N under the two electoral rules:¹⁴

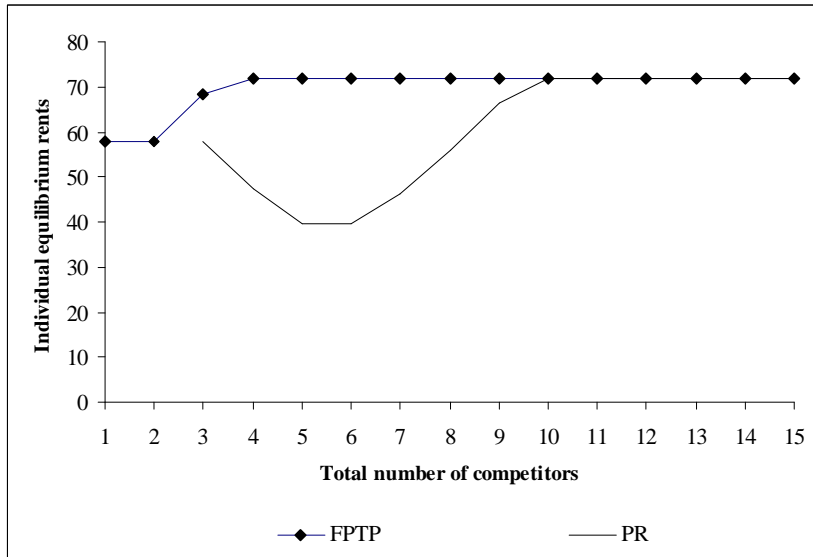


Figure 2: Individual Rents and Electoral Rules

Turning to the optimal level of competition parties should strive for under each electoral rule, exploiting lemmas 5 and 6 it is immediate to see that parties should not resort to intra-party competition under FPTP. To the contrary, there is an optimal level of intra-party competition under PR, which in our case is given by $N = 6$. This gives us the our second key proposition:

Proposition 2 *Optimizing parties should use intra-party yardstick competition only under PR.*

Proof. Immediate from above. ■

Our results strengthen Caillaud and Tirole’s remark that “the moderation of competition *through the sharing of spoils from office* helps enhance the chances of victory for the candidate and thus the party [...]” (Caillaud and Tirole 2002, p. 1455, italics added) by showing that this holds *even when the sharing of any rent is ruled out* by construction.

¹⁴In the simulation, b equals 100, maximum rents \bar{r} are allowed to equal 80 and $\xi = 45/80 > 1/2$.

3.4 Key Determinant of Rents:

Electoral Rule or Intra-Party Agency problem?

We assumed that parties fully control the writing up of electoral lists. To the contrary, previous results by Persson and Tabellini (2000) point out that when a party's candidate selection rights are held by the leading politician, rent extraction is lower under FPTP than under PR. Thus, the next question we should ask is: is rent extraction more sensitive to electoral systems or to the identity of the owner of the candidate selection rights? It is straightforward to solve our model under the assumptions of Persson and Tabellini to check that, when the leading politician is free to select the party candidates, rents are higher under PR than under FPTP. Label the case in which the leading politician controls candidate selection as that of 'centralization' of candidate selection rights. Exploiting proposition (1) and the findings of Persson and Tabellini, we have the final key proposition of the paper:

Proposition 3 *Individual rent extraction is more sensitive to the intra-party agency problem, that is, the degree of centralization of candidate selection rights, than to the electoral rule itself.*

This result fully justifies the present theoretical undertaking. Proposition 3 may be interpreted as pointing to the fact that recent empirical studies may suffer from an omission of relevant explanatory variable problem. The paper thus provides a theoretical rationale as to why there is more variance in rent extraction *within* rather than *across* electoral rules. It may also go some way towards explaining why Persson, Tabellini and Trebbi (2003) were led to conclude their empirical analysis by remarking that the archetypical FPTP and PR systems are associated with roughly the same level of rents.

4 Evidence

The key upshot of our theory is that empirical research on the political agency problem may suffer from an omitted variable problem and from endogeneity issues.

In addition, the use of new explanatory variables such as the one we suggest below may allow researchers to avoid a problem that has plagued these studies so far: multicollinear-

ity. Indeed, the correlation between the variables used to characterize political systems currently runs at around 0.9 (see Persson et al. 2003, p. 966), whereas the correlation with the variable we propose below is much lower (see table 2 below).

The testable implications of this paper are:

H1: The more decentralized the candidate selection procedure, the lower rent extraction should be;

H2: For a given and equal level of intra-party competition across electoral rules, PR is associated with less rent extraction than FPTP;

H3: Optimizing political parties should never resort to intra-party yardstick competition under FPTP but should exploit it under PR;

H4: Rent extraction is more sensitive to the intra-party agency problem than to the electoral system.

Hypotheses *H1* and *H4* turn out to be the ones we can test most easily and directly with the data available.

4.1 The Data

To create a variable that captures the degree of centralization of candidate selection, we borrow Lundell's (2004) dataset on the centralization of candidate selection for 18 experienced OECD democracies.¹⁵ The small number of observations is due to two main reasons. Four countries (Finland, Germany, Norway and the USA) were excluded by Lundell because candidate selection in these countries is regulated by law instead of being left to the parties' own devices. For the remaining OECD countries, the problem is data availability.

Why should we interpret an index of the decentralization of candidate selection procedures as one that measures the degree of control of politicians by parties? Because, as argued by Lundell himself, the more decentralized is the selection procedure, the more weight a party's base – the RF in our terminology – has in the selection of electoral candidates and the less power an incumbent has in making sure she is allowed to stand for

¹⁵This dataset is readily available in the Appendix of Lundell (2004). In future work, we plan to extend this dataset to a larger number of democracies.

re-election irrespective of her previous performance.

Lundell’s original classification ranges from 1, the most decentralized candidate selection procedure, to 5, the most centralized procedure. He attributes a value of 1 to a party if the selection is carried out at “local party meetings, by local selection committees or by primaries open for all party members”. Thus, in this case, leading politicians have relatively little control on who is allowed to compete for the right to represent a party at elections. At the opposite range of Lundell’s scale are parties in which selection is made “by the party leader, by the national executive organ, by a national selection committee, or by primaries at the national level.” (Lundell 2004, p. 31). The implicit assumption behind the second part of Lundell’s criteria is that parties resorting to selection at the national level open the door to effective control by the party’s leading politicians.

In constructing our variable, we reverse Lundell’s original ranking and scale it so as to have a variable that ranges from 0, the most centralized selection process possible, to 1, the most democratic and decentralized system, where the RF can be expected to rule.¹⁶

Lundell’s data set refers to the centralization of candidate selection procedures for each political party in each country considered. To have an index of intra-party discipline at the country level, we aggregate the data relative to each party within a single country. Our aggregate measure of intra-party discipline is the unweighted average of the party-specific data. For obvious reasons, we label our variable RF. The expected sign of its coefficient is negative: the more decentralized is the candidate selection procedure (the higher is RF), the lower rents should be.

We would also like to stress that we believe that endogeneity is not a serious issue, given that Bille (2001) reports that intra-party arrangements regarding candidate selection procedures were stable over the period 1960-1990. Thus, control rights do not seem to have much variability across time.

The variables characterizing political systems we use in our regressions are taken directly from the dataset of Persson et al. (2003), for the relevant countries:¹⁷

¹⁶Specifically, we reverse Lundell’s classification, then subtract a value of 1 to each data point and finally divide it by 4. We re-scale the data so that all the coefficients in the regressions are directly comparable: all the other regressors we use also range between 0 and 1.

¹⁷This dataset is available on the web at

ICRG: this is ICRG's perceived corruption index, as averaged over the years 1990-98 by Persson et al. (2003); it is a continuous variable and ranges from 0 – no corruption – to 10 – maximum corruption;

MAGN: it is the inverse of district magnitude; Myerson (1993) argues that the larger is district magnitude, the lower corruption should be because of a lower political barriers-to-entry effect;

PINDP: it is a measure that should capture the negative incentive effects of electoral lists, as argued by Persson et al. (2003); it ranges from 1, for systems where all legislative seats are attributed through closed-list PR elections, to 0, for systems using single-member-district FPTP elections.

Why should we expect a variable such as RF to be a relevant explanatory variable in empirical research on political corruption? MAGN is a variable that captures the barriers-to-entry effect, that is, the effect of increased competition. PINDP captures the negative effect of lists. Yet, these two variables are orthogonal to the identity of the owner of the party's control rights in the selection of candidates. If we believe that this identity may have some explanatory power, we should add such a regressor empirical analyses of political corruption.

Other regressions were carried out using an alternative corruption index, the GRAFT index of Kaufman, Kraay and Zoido-Lobaton (1999) and using the other variables characterizing electoral rules of Persson et al.. The results of these regressions are very similar and not reported here.

Before turning to the regression results, table 2 shows how our RF variable does not suffer from the same high level of correlation that characterizes MAGN and PINDP (and the other variables used in previous research):

http://www.igier.uni-bocconi.it/whos.php?vedi=327&tbn=albero&id_doc=177

We refer readers to Persson et al. (2003) for a more detailed description of the variables.

	MAGN	PINDP	RF
MAGN	1.00	0.92	-0.23
PINDP	0.92	1.00	-0.23
RF	-0.23	-0.23	1.00

Table 2: Simple Correlations

Thus, the RF variable does not suffer from the multicollinearity problems faced by other widely used regressors.

4.2 Results

Because of our small sample, we refrain from using any advanced econometric technique and estimate our regression by simple OLS.¹⁸ The four regressions below are characteristic of the results we obtained using other combinations of the above-mentioned variables. Figure 3 is a scatter plot of the data we wish to focus on.

¹⁸Correcting for heteroskedasticity improves our results. Running robust regressions such as least median squares yields similar results. We also carried out regressions including the four additional countries in which candidate selection is regulated by law (Finland, Germany, Norway and the USA) by attributing to them a value for the RF variable equal to the mean and median – 3 in both cases – of the available RF sample observations. We also tried attributing to these countries values for RF that are consistent with the received wisdom about the functioning of the political market in these countries. These changes improve the results of the basic regression, if anything.

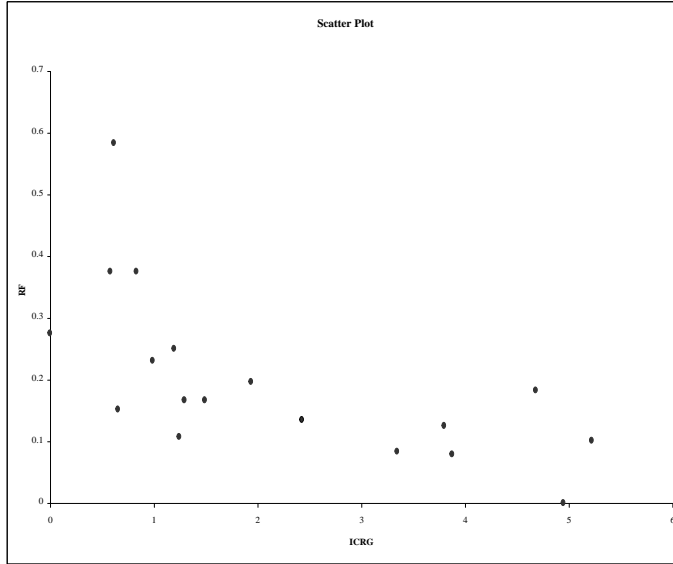


Figure 3: Scatter Plot of Rents against Intra-Party Discipline

Dependent variable	ICRG	ICRG	ICRG	ICRG
Constant	4.367586 (0.786)***	4.099631 (0.675)***	4.313962 (0.736242)***	3.755755 (0.566247)***
PINDP	-1.581944 (2.254)	-0.690816 (0.733)		
MAGN	0.496485 (1.849)		-1.028033 (0.880423)	
RF	-8.53334 (2.485)**	-8.47395 (2.441)***	-8.575559 (2.401623)***	-7.934913 (2.364517)***
F-Test	4.052053**	6.035906**	6.440402***	11.26158***
Estimation	OLS	OLS	OLS	OLS
Observations	18	18	18	18
Adjusted R-squared	0.350058	0.372041	0.390262	0.376412

Notes: Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

No controls used.

Table 3: Rent Extraction and Intra-Party Discipline

Hypothesis $H1$ is clearly borne out: only the RF variable (apart from the intercept) is statistically significant and its associated coefficient has the expected negative sign. Thus, the more the RF control the candidate selection procedure, the lower is rent extraction. Notice too that the significance and the value of the coefficient is extremely stable across the four specifications.

The above regressions also point to the validation of $H4$, if we take the statistical insignificance of both MAGN and PINDP at face value.

Nevertheless, the above conclusions must be weighted against the fact that our dataset contains only 18 observations and that the variables that characterize electoral systems such as MAGN and PINDP require a larger number of observations to be empirically useful, given that they are very close to dummy variables.

To conclude, whereas we must await further empirical work to have a more satisfactory empirical confirmation that the control of politicians by parties is the key element in the investigation of the determinants of rent extraction, we believe that the preliminary evidence provided here is far from inconclusive.

5 Discussion

5.1 Infinite Horizon Economy with Term Limits

Is our assumption of a two-period world crucial for our comparative politics results? The short answer is no.

Suppose we switch model to an infinite horizon economy with term limits after the second year for legislators. Then, the representative of the opposition, if elected, may stay in power for two periods and therefore will not set rents to their maximum in her first period in office. To the contrary, in the main body of the paper, second period rents are set at their maximum by all elected politicians, because the economy ends after that period. Yet, this modification does not alter any of the results derived above.

Indeed, suppose an incumbent is allowed to represent her party at the second period election. In this case, voters will re-elect the incumbent provided the value of the game associated to this decision is higher than that of the game associated with the casting of the ballot in favour of the opposition.

Formally, let the value of the game associated to the incumbent's re-election be V^I . Denote the value of the game when voters vote for the opposition with V^O . Then:

$$V^I(\hat{\eta}^I, t) = \hat{\eta}^I (b - \bar{r}) + \delta V^N(\eta^O, t + 1)$$

and

$$V^N(\eta^O, t) = \mathbb{E}_O \{ \eta^O (b - r^O) + \delta \text{Max}[V^I(\eta^O, t + 1), V^N(\eta^O, t + 1)] \}$$

where E_O denotes expectation over the competence of the representative of the opposition.

The electorate will cast its ballot in favour of the incumbent if and only if:

$$V^I(\hat{\eta}^I, t) \geq V^N(\eta^O, t)$$

Given that all members of the opposition are i.i.d., we have

$$V^N(\eta^O, t) = V^N(\eta^O, t + 1) \equiv V^N(\eta^O),$$

and the re-election condition boils down to:

$$\hat{\eta}^I \geq \frac{(1 - \delta) V^N(\eta^O)}{b - \bar{r}}$$

Thus, having an infinite horizon model with term limits only modifies the cutoff point under which incumbents are ousted from office (in the main body of the paper the cutoff point is given by $\hat{\eta}^I \geq \eta^O$) but does not alter qualitatively any of our results. Focusing on a two-period model is therefore without loss of generality.

5.2 Ballot Structure

This paper assumes that the ballot structure is closed, that is, that voters are not given the right to select their preferred candidates, especially under PR. A branch of the political science literature – see e.g. Ames (1995 and 2001), Carey and Shugart (1995) and Golden and Chang (2001) – has emphasized that corruption and clientelism seem to be associated with ballot structures that give voters the right (or freedom) to vote for specific candidates, and not just their party. These systems are labelled ‘candidate-centered’ by Carey and Shugart (1995) and include open-list PR, for example.

Empirically, this problem seems to be especially true in countries (such as Brazil and Italy before the 1992 reforms) where individual politicians enjoy enough freedom to target their policy pledges to specific constituencies and therefore to create a large enough base of political supporters to guarantee their re-election. One may be tempted to interpret this as evidence that intra-party competition is not beneficial to the electorate, given that it leads to clientelistic and corrupt behavior.

But a careful reading of these contributions reveals that what matters is not the fact that lists are open as such, i.e. that intra-party competition is fierce, but rather that individual politicians are given the scope for individualistic and often clientelistic or corrupt

policies. To say it another way, it is the presence of a *common-pool problem* that is key. To reduce the extend of the moral hazard problem highlighted by these contributions, one should not reduce the extend of intra-party competition which, as this paper shows, can be highly beneficial to parties and voters. Rather, the solution lies in restricting the freedom politicians may enjoy in shaping the policies they propose to the electorate. This is also the message that comes out of the large literature on the political economy of public finance and budgetary procedures (see e.g. von Hagen and Harden 1995).

5.3 Objective Function of the RF

In the whole of the paper, it was assumed that politicians could not be forced to follow any instruction by the RF about rent extraction and that the RF only care about the global electoral prospects of their party. What happens if we modify the assumptions above? Suppose politicians are nothing but party puppets. Then, one needs to take a stand on the role of monetary rents.

5.3.1 RF Do not Care about Rents

Assuming the rank-and-file do not care about these or cannot pocket anything – because, say, rents are non-verifiable or non-observable – implies immediately that the party will request equilibrium rents to be set to zero. In this case, voters are indifferent between closed-list PR and plurality rule, at least from the point of view of rent extraction.

5.3.2 Rent-Sharing

An alternative and more interesting scenario is the one in which RF would like to pocket a share of the rents extracted by the politicians. Remember that politicians are nothing but party puppets. The RF attach now weights $\gamma \leq 1$ and $(1 - \gamma)$ to rent extraction and to the utility S they derive from their party winning a seat. Then, the problem to be solved under plurality rule and PR is identical and given by:¹⁹

$$Max_{\{r_1^J\}_{J=1}^3} \sum_J r_1^J + \left(\sum_J p^J \right) [\gamma \bar{r} + (1 - \gamma)S] \quad (11)$$

¹⁹The problem the party faces is independent of the electoral rule because under our setup parties want to maximize the number of seats they win.

Then, it is straightforward to check that equilibrium rent extraction at the district level in period 1 is equal to:

$$r_1^{J*} = b - \xi [\gamma\bar{r} + (1 - \gamma)S] \quad (12)$$

We thus have a final proposition.

Proposition 4 *If politicians execute mechanically the RF's orders and the RF attach a value to rent extraction, equilibrium rent extraction in each district is uncorrelated with electoral systems and is given by:*

$$r_1^{J*} = b - \xi [\gamma\bar{r} + (1 - \gamma)S] \quad (13)$$

What proposition 4 tells us is simply that, as we get closer to the assumption of perfect substitutability between parties and their politicians, equilibrium rent extraction becomes independent of the electoral rule. Proposition 4 can then be interpreted as a further justification of our desire to examine the consequences of departing from the assumption of parties as unitary actors.

6 Conclusion

This paper contributed to the ongoing line of research on the relationship between electoral systems and corruption or rent extraction by focusing on how the inclusion of a novel, intra-party, dimension of competition impacts on equilibrium rent extraction under plurality rule and closed-list PR, the two most widely used electoral systems. Our starting point was the observation that parties have a wider set of tools to discipline incumbents under PR than under plurality rule, because of the characteristics of the ballot structure under the former electoral rule.

The results of this paper imply that rent extraction is more sensitive to the intra-party agency problem than to electoral rules. The paper also offered some preliminary empirical evidence supporting this conclusion. Obviously, a conclusive test of our theoretical findings must await further data collection. We plan to do this in future research.

Where do we go from here? Other important questions that remain to be addressed are: how and why is party discipline achieved? Are there any other institutions that

may compensate for low intra-party discipline? How important are intra-party governance issues? Our feeling is that such issues require that we depart from the existing mainstream models of political economics that view parties and politicians as perfect substitutes and invest in a more detailed modelling of *intra-party politics* and its relationship with inter-party competition.

This has already been stressed by Roemer (2001) and is the path taken by, for example, Caillaud and Tirole (1999, 2002), Castanheira et al. (2005) and Beniers (2005). Caillaud and Tirole (2002) and Castanheira et al. (2005) focus on the party's optimal governance structure as a function of both intra- and inter-party competition in a stylized, FPTP electoral game. Beniers (2005) focuses on how a party's governance structure impacts on the likelihood that a parliamentarian belonging to the ruling majority who expressed dissent with his government's policies is not allowed to stand for re-election under his party's banner.

Making further headway on the above-mentioned topics and on other related questions would not only provide the literature with a more detailed analysis of party politics, but would also, as we highlighted repeatedly above, sketch the way towards a strengthening of available empirical findings and of the micro-political foundation of economic policy.

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7 Appendix : Proofs

7.1 Proof of Lemma 1

Plurality rule

Under first-past-the-post elections, voters in any district can influence the outcome of the election in their district only. Thus lemma 1 is the optimal voting rule under FPTP.

Closed-list proportional representation

Under closed-list proportional representation, the ballot structure is crucial in determining how votes in *all districts* translate into the elected legislator in *a specific district* and, as a consequence, proving that lemma 1 holds under PR too is slightly more involved than under first-past-the-post.

The electorate in district 1 has the easiest job. Voters are pivotal with probability one in their district whenever they decide to vote for the incumbent party. They also know that the second period politician can only be either the politician who is top of the list of the incumbent party, who has expected competence $E(\eta^1)$, or an opponent, who has expected competence η^O . Thus, supporting the incumbent party is optimal if and only if $E(\eta^1) > \eta^O$. To the contrary, if they vote no, their seat may be attributed to either the representative of the opposition that is top of the list (if neither district 2 nor district 3 vote in favor of the incumbent party), or it may be attributed to the politician that is top of the incumbent party list (provided either district 2 or district 3 or both vote in favor of the incumbent party). Voting against the incumbent party is therefore optimal if and only if $E(\eta^1) < \eta^O$. District 1 thus follows the voting rule of lemma 1.

What about the voters in district 2? Following the same line of reasoning as above, we have that district 2 is pivotal if and only if it votes in favor of the incumbent party and so does one and one other district only: district 2 is sure that the politician who is second on the incumbent party list will be given its seat. This is optimal if and only if $E(\eta^2) > \eta^O$. If district 2 is not pivotal, it may see its seat attributed to either the politician who is second on the incumbent party list or to a member of the opposition. Then, it is (weakly) optimal for the electorate in district 2 to vote in favor of (resp. against) the incumbent party if and only if $E(\eta^2) > \eta^O$ (resp. if $E(\eta^2) < \eta^O$). District 2 thus follows the rule

prescribed by lemma 1 too.

Finally, district 3 is pivotal whenever it backs the incumbent party and both districts 1 and 2 vote in favor of the incumbent party too. This choice is optimal if and only if $E(\eta^3) > \eta^O$. Whenever district 3 is not pivotal for the result of its election, it may be given to the third representative of the incumbent party or the opposition. Then, again, the voting rule described above is optimal for voters in the last district too.

7.2 Proof of Lemma 2

If incumbent J is allowed to stand for re-election, the electorate will vote in favor of the incumbent party provided $\hat{\eta}^J \geq \eta^O$. Given that the support of the distribution of η^O is $\left[1 - \frac{1}{2\xi}; 1 + \frac{1}{2\xi}\right]$, this event can be written as:

$$\begin{aligned} & \Pr \left[\hat{\eta}^J > \eta^O \mid \hat{\eta}^J \leq 1 - \frac{1}{2\xi} \right] \Pr \left(\hat{\eta}^J \leq 1 - \frac{1}{2\xi} \right) \\ & + \Pr \left[\hat{\eta}^J > \eta^O \mid 1 - \frac{1}{2\xi} < \hat{\eta}^J \leq 1 + \frac{1}{2\xi} \right] \Pr \left(1 - \frac{1}{2\xi} < \hat{\eta}^J \leq 1 + \frac{1}{2\xi} \right) \\ & + \Pr \left[\hat{\eta}^J > \eta^O \mid \hat{\eta}^J > 1 + \frac{1}{2\xi} \right] \Pr \left(\hat{\eta}^J > 1 + \frac{1}{2\xi} \right) \end{aligned}$$

The first term is equal to zero given that $\Pr \left[\hat{\eta}^J > \eta^O \mid \hat{\eta}^J \leq 1 - \frac{1}{2\xi} \right] = 0$. The last term is equal to $\Pr \left(\hat{\eta}^J > 1 + \frac{1}{2\xi} \right)$ given that $\Pr \left[\hat{\eta}^J > \eta^O \mid \hat{\eta}^J > 1 + \frac{1}{2\xi} \right] = 1$. Finally, exploiting our distributional assumptions:

$$\Pr \left[\hat{\eta}^J > \eta^O \mid 1 - \frac{1}{2\xi} < \hat{\eta}^J \leq 1 + \frac{1}{2\xi} \right] = \left[\frac{1}{2} + \xi \left(1 - \frac{b - \hat{r}_1^J}{b - r_1^J} \right) \right]$$

and we have proven lemma 2.

7.3 Proof of Lemma 4

Given our distributional assumptions, \mathcal{P} can be written as follows. The first term is given by:

$$\Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right]^2 \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-2}$$

for $J, K = 1, 2, 3$ and $J \neq K$

Similarly the second term is given by:

$$2 \left\{ \Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right] \Pr \left[\hat{\eta}^J < \hat{\eta}^K \right] \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-2} \right\} \\ + (N-3) \left\{ \Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right]^2 \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-3} \Pr \left[\hat{\eta}^J < \eta^O \right] \right\}$$

where the first line is the probability that incumbent J beats the opposition, all internal new candidates but only one of the two other incumbents; the second line is the probability that the incumbent beats the other two incumbents and the opposition but is beaten by one internal new challenger.

Finally, the third term is given by:

$$\Pr \left[\hat{\eta}^J < \hat{\eta}^K \right]^2 \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-2} \\ + 2(N-3) \left\{ \Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right] \Pr \left[\hat{\eta}^J < \hat{\eta}^K \right] \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-3} \Pr \left[\hat{\eta}^J < \eta^O \right] \right\} \\ + \frac{(N-3)(N-4)}{2} \left\{ \Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right]^2 \Pr \left[\hat{\eta}^J \geq \eta^O \right]^{N-4} \Pr \left[\hat{\eta}^J < \eta^O \right]^2 \right\}$$

where the first line is the probability that incumbent J beats the opposition, all internal new candidates but none of the two other incumbents; the second line is the probability that the incumbent beats the opposition and all other competitors but exactly one incumbent and one internal new candidate; the last line is given by the probability that incumbent J beats the other two incumbents, the opposition but is beaten by exactly two new candidates.

We now need to compute $\Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right]$. Reasoning as in lemma 2, it is straightforward to show that:

$$\Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right] \\ = \left[\frac{1}{2} + \xi \left(1 - \frac{b - \hat{r}_1^J}{b - r_1^J} \frac{b - r_1^K}{b - \hat{r}_1^K} \right) \right] \Pr \left(1 - \frac{1}{2\xi} < \hat{\eta}^J \leq 1 + \frac{1}{2\xi} \right) \\ + \Pr \left(\hat{\eta}^J > 1 + \frac{1}{2\xi} \right)$$

Note that $\Pr \left[\hat{\eta}^J < \eta^O \right] = 1 - \Pr \left[\hat{\eta}^J \geq \eta^O \right]$ and that $\Pr \left[\hat{\eta}^J < \hat{\eta}^K \right] = 1 - \Pr \left[\hat{\eta}^J \geq \hat{\eta}^K \right]$.

Note too that:

$$\frac{\partial \Pr \left[\hat{\eta}^J \geq \eta^O \right]}{\partial r_1^J} \equiv \frac{\partial p^J}{\partial r_1^J} = -\xi \frac{b - \hat{r}_1^J}{(b - r_1^J)^2} \Pr \left(1 - \frac{1}{2\xi} < \hat{\eta}^J \leq 1 + \frac{1}{2\xi} \right),$$

and:

$$\frac{\partial \Pr \left[\widehat{\eta}^J \geq \widehat{\eta}^K \right]}{\partial r_1^J} = - \left(\xi \frac{b - \widehat{r}_1^J}{(b - r_1^J)^2} \frac{b - r_1^K}{b - \widehat{r}_1^K} \right) \Pr \left(1 - \frac{1}{2\xi} < \widehat{\eta}^J \leq 1 + \frac{1}{2\xi} \right)$$

Then, exploiting the equilibrium conditions, tedious but straightforward computations yield:²⁰

$$r_1^{JCOND}(N) = b - (1/2)^{N-1} \xi \bar{r} \cdot \left[\frac{1}{2} N^3 - \frac{5}{2} N^2 + 5N - 2 \right].$$

²⁰These computations are available from the author upon request.