

The Political Economy of Ordinary Politics: Presidential-Legislative Relations in Multiparty Settings*

Cesar Zucco Jr.

CSDP — Woodrow Wilson School

Princeton University

zucco@princeton.edu

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Presidents need legislative support to govern effectively (i.e., to pass the measures that will improve economic performance) and to fulfill their campaign promises. However, in Latin American multiparty systems, presidents frequently lack legislative majorities. In order to forge and maintain the coalitions that will support them, presidents can either compromise on policy or offer side payments in order to secure legislative support for their own agendas. This paper rests on the assumption that the way in which presidents use the resources under their control to obtain legislative support is a central aspect of executive-legislative relations, at least as important as ideology and policy compromises.

That presidents use part of the resources at their disposal to obtain legislative support is relatively uncontroversial, but the same cannot be said of *how* this process works. Presidents, especially in multiparty systems, are confronted with a wide range of potential beneficiaries, and have to decide with whom these resources will be shared, and how much each one will receive. In this paper, I propose a model of resource allocation to garner needed support that yields the most cost effective (i.e., the cheapest) distribution of resources from the president's point of view.

My focus on the costs of coalition making is justified by the assumption that presidents would rather have as much of their resources as possible allocated to “electoral investments,” understood as anything that will improve their popular support, ranging from effective government to vote buying.¹

*Job Market Paper # 2 is a condensed version of Chapters 3 and 4 of my dissertation, the full text of which is available online. This paper — especially Section 2.2 and Appendix A — includes material coauthored with Paulo Melo-Filho, Ph.D. Candidate in the Economics Department at UCLA.

¹As Dias-Cayeros & Magaloni (2003) have argued, electoral investments will generally include a provision of a mix of local public, universal public and private goods to the electorate. The exact mix to be provided depends, among other

Whether presidents' ultimate goals are from advancing their own careers or securing their place in history, it makes immediate sense to focus on improving their reputations and increasing electoral capital. However, presidents are forced to spend part of their resources buying the support of parties and politicians that hold the key to governability. I refer to resources expended this way as "coalitional investments."² Obviously, electoral and coalitional investments are not always necessarily at odds with each other, but I assume that any president would rather spend more on the former and less on the latter, if possible.

The model shows that if presidents control goods that suit parties as well as goods that suit individual legislators, it is more cost effective from the president's point of view to use both simultaneously, even if dealing with parties is, in some sense, "cheaper." This result has important political implications. It suggests, for instance, an economic rationale to buying votes from individual legislators, which is generally frowned upon on moral grounds. Moreover, as I explain later in the paper, it indirectly implies that if presidents follow the cost saving incentives they face, they will act in a way that weakens parties.

The paper proceeds as follows. The next section provides a brief and informal overview of the model and places it in the context of the literature that inspired it. The subsequent section deals with the model itself, and presents the president's decision problem for the simpler case in which he/she can only bargain with parties, and another version where the president can bargain with parties *and* legislators. Section 3 compares and discusses several general predictions of both versions of the model and briefly compares Brazil and Uruguay, exemplar cases of each version. In Section 4, I analyze how well the model's specific predictions fit real world data, and the last section concludes with a summary of the model's main implications.

1 Winning Hearts and Minds in Congress

Latin American presidents control a vast array of politically important resources, ranging from high level appointments to extensive control over the execution of the budget that entails control over the provision of *pork* to individual legislators. These resources can be "invested" in a range of activities, from building an effective bureaucracy, to obtaining support from the electorate, and to securing things, on the levels of political competition and economic development.

²This assumption deserves a lengthier discussion, but in the current paper it serves two purposes. It provides the motivation for a cost minimizing approach to coalition formation, and also provides a possible bridge between the literature on executive-legislative relations with a parallel one focused on the executive's electorally motivated spending decisions, such as electorally guided spending in social programs and the provision of different types of goods to the electorate, as mentioned in Section 1.

support — or at least acquiescence — from other political elites. This paper focuses on the last of these tasks, and pays particular attention to the distinction between bargaining with individual legislators and bargaining with parties.

This idea that the “horse-trading” between presidents and *individual* legislators is central to politics is very widespread at least in Bolivia, Brazil and Ecuador. In Brazil, for instance, it has become even more ingrained after the infamous *mensalão* scandal of 2005, where President Lula’s chief of staff allegedly paid legislators for supporting the government. Journalists, pundits, businessmen, and even politicians frequently claim that the practice of “giving-to-receive”³ is a “waste” of national resources, and call for measures aimed at strengthening parties and marginalizing the individually motivated, rent-seeking legislator.⁴ In Ecuador, Mejía Acosta (2004) argues that presidents are forced into negotiation with individual legislators and into “ghost” coalition making because of the high costs parties pay for being associated with the government. In Bolivia the importance of individual legislators vis-a-vis parties increased dramatically toward the end of the 90s (Mayorga 2006). All these countries have highly fragmented legislatures, leading to the prevalence of mainly post-electoral coalition governments.

A series of papers, mainly by Pereira and his coauthors (Pereira 2002, Pereira & Rennó 2003, Pereira & Muller 2004), have recently looked into this issue in some more detail for Brazil, the most researched of these cases. They have picked up on a theme first discussed by Ames (1987*b*), and have shed some additional light on the president’s strategic use of his control over whether legislator amendments to the budget are actually funded. This research has mostly corroborated the stylized facts that legislators blackmail the executive into giving them more resources, a view of presidential-legislative relations widely regarded as true inside the country.

However, not everyone shares this view. In what is probably the majority position among *Brazilian scholars*, Figueiredo & Limongi (2002) claim that parties play a much greater role than commonly assumed. Based on a research agenda that spans more than 15 years,⁵ F&L confidently claim that the concentration of power in the executive and the centralization of power inside the legislature “make any individual action by legislators innocuous.” In this context, “the rational course of action for legislators is to act through parties” (Figueiredo & Limongi 2002, p.306), rather than to bargain directly with the executive.

From the president’s perspective, F&L add, it is also in his best interest to negotiate with parties

³The expression *é dando que se recebe*, a quote from St. Francis of Assisi, was allegedly first used in this context by Deputy Roberto Cardoso Alves during the 1988 constitutional assembly, and quickly became one of the most infamous political phrases in the country.

⁴Gingerich (2006) has recently made the opposite argument, that closed-list can foster party led corruption initiatives.

⁵A considerable portion of their earlier research can be found in Figueiredo & Limongi (1999).

rather than with individual legislators. Accordingly, party level bargaining yields more stable and predictable support and reduces transaction costs (p.334). For this particular issue, they make the same intuitive argument as does Mejía Acosta (2004), who analyzes the Ecuadorian president's decision between purchasing votes in the "retail" market and buying them "wholesale" from parties. He concludes that whenever they can, presidents prefer wholesale.⁶

Certainly, none of the authors mentioned above would claim that the choice between negotiating individually or with parties is an "either/or" decision, and most would accept that the president has different tools, some of which are better suited for negotiation with parties and others that suit bargaining with individual legislators. There is ample evidence, for instance, that when dividing up cabinet positions, presidents assign ministries to parties which then indicate the person who should take the job,⁷ but it is also true that lower ranking positions and smaller pieces of pork are generally negotiated with individual legislators. Until now, most studies have either analyzed these issues separately, as both the cabinet formation (Deheza 1997, Amorim Neto 1998, Altman 2000, Amorim Neto 2006) and the individual vote buying literature do (Ames 1987a, Ames 2001, Samuels 2003, Pereira & Muller 2004), or ambiguously, as do Alston & Mueller (2006) who treat parties and legislators interchangeably.⁸

If one decides to take parties and legislators simultaneously into account, as I do, variables such as number, size, cohesion, and position of parties enter the analysis and consequently, the problem quickly becomes intractable, offering no clear insights into how party system variables affect the distribution of resources. The multiple interactions between variables make their final effects hard to disentangle, especially in cases with multiple parties. In this context it is very hard to answer, for instance, whether it is cheaper to buy off many small disciplined parties or fewer undisciplined parties.

To deal with this difficulty, I propose a stylized depiction of legislative behavior that attempts to isolate ideology from the more mundane vote buying, on which the model concentrates. In it, the president faces a legislature composed of parties, which are depicted as distributions of individuals with some exogenously defined level of "affinity" towards the government, understood as their *ex ante* propensity to vote with the president.

Each legislator can be placed on this affinity scale, and is indexed by his/her affinity towards the president. There is some cut-point in the affinity scale that separates those who support and those

⁶His argument is that the costs *for the parties* of publicly allying themselves with the president might lead them to "raise" their wholesale price .

⁷Media coverage of Brazilian politics, for example, provides many instances of parties requesting more cabinet representation. In addition, many former cabinet members in Bolivia and Uruguay pointed out in interviews that they had not been ministers on their own right, but rather served in the cabinet as "men of their party."

⁸A noteworthy exception is the recent paper by Pereira, Power & Raile (2006), who call attention to the existence of a presidential "tool box" and different styles of coalition management.

who oppose the president. By transferring resources under his control to parties and/or directly to legislators, the president increases legislators' utility and draws more legislators to his side of the cut-point, thus "buying" the votes he needs in order to pass legislation. What makes the model interesting is that presidents control two different types of goods, one that suits parties, and another that suits individual legislators. The president's problem, in this scenario, is to decide, given the *ex ante* distribution of affinities, how each of his political goods should be allocated in order to minimize the total costs of securing a certain level of support.

This cost minimization setup was inspired by the incipient but promising literature that has analyzed the strategy behind Latin American presidents' spending decisions, and tries to explain when, where and on whom the president will spend his resources (Schady 2000, Dias-Cayeros, Magaloni & Estévez 2003, Dias-Cayeros & Magaloni 2003, Calvo & Murillo 2004). This literature follows seminal research such as Cox & McCubbins (1986) and Dixit & Londregan (1996), from whom I borrowed part of the technical setup of the problem.⁹ The main way by which I depart from these works is that while they address *electorally* guided spending, I adapt and apply the approach to a *legislative* context.

The focus on the use of resources within legislatures is in some sense analogous to what is done by Groseclose & Snyder Jr (1996), the culmination of a long research tradition in legislative coalition formation in a U.S. context. They claim that cost-effectiveness, rather than ideology (Axelrod 1970) or universalism (Weingast 1979), explains why super-majorities form so often in the U.S. Congress, even when the classical works predicted that minimal winning coalitions should be prevalent (Riker 1962, Shepsle 1974, Baron & Ferejohn 1989). Like G&S, I assume that minds — if not hearts — can be bought in the legislature, and I also share their interest in the *costs* of coalition building. However, the disproportionate share of resources presidents control in Latin American countries renders their setup with two competing vote-buyers inappropriate. Hence, in my model, which I now turn to, the president is the sole vote buyer.

2 The Model

The model's constituent parts are a president, legislators grouped in parties, and "political goods" which are transferred according to a certain "technology". Two versions of the model are presented, one in which there is only one type of good and another in which there are two types of goods. The president is the sole decision maker, but before discussing his strategy it is important to present the

⁹A very comprehensive literature review of this tradition can be found in Dias-Cayeros & Magaloni (2003), and for that reason is not repeated here.

other parts of the model.

Legislators: Legislators decide how to vote based on *political favors* they can receive from the president, and on their *affinity*, which can be understood as an exogenous bias of the legislator with respect to the president, and which is represented by X .

Here, notation deserves special attention. Affinity is measured in a scale in which higher values indicate greater *distance* from the president, and consequently a larger bias *against* the president. Strictly speaking, X is really “disaffinity”, or more objectively put, the negative of affinity. However, for ease of presentation, and due to the lack of a better alternative, I have retained the term *affinity* in this text, and ask readers to pay special attention to its counter intuitive operationalization.

I assume legislator’s voting behavior is determined *exclusively* by the benefits received and how she¹⁰ votes, not being directly affected by policy.¹¹ With C representing the level of political benefits received by a legislator, her utility is defined as:

$$U = \begin{cases} v(C) + X & \text{if voting against the president} \\ v(C) & \text{if voting with the president,} \end{cases} \quad (1)$$

with $v(0) = 0$, $v'(C) > 0$ and $v''(C) < 0$.

For any given level of political benefits provided, a legislator with $X > 0$ would prefer to vote against the president. However, a legislator with $X > 0$ who receives no political benefits ($C = 0$) would be willing to vote with the president *in exchange* of receiving some $C > 0$, as long as $v(C) - X \geq 0$.¹²

Parties: Legislators are divided into J identifiable parties, with each legislator belonging to only one party.¹³ Each party is composed of a continuum of legislators with mass $N_j > 1$, whose affinities (X s) are distributed according to the density function $\phi_j(X)$ (with cdf $\Phi_j(X)$). The distribution of legislators among parties and, therefore, the affinities distributions for the different parties are

¹⁰For clarity, I refer to legislators using feminine pronouns, and to the president using masculine pronouns.

¹¹This implies that legislators do not care about the outcome of the vote, which I believe is an empirically sound assumption. Typically, since the president is the *de facto* main legislator in all Latin American countries, he, and not legislators, is held accountable for policy outcomes. Legislators are generally evaluated by their local constituencies, which tend to be more concerned with local service. In this sense Pereira & Rennó (203), for instance, showed that local concerns — including the capacity to “deliver” — are generally the most important factor driving the reelection of legislators. To the extent that policy matters, occasionally particular votes are of interest to unions or other organized pressure groups, which might try to shame legislators for how *they* voted, but not for the policy outcome itself.

¹²For simplicity, I assume that whenever a legislator is indifferent, she votes with the president.

¹³Though I refer to parties, these could be thought of as any kind of political groups, such as parties, regional groups or factions.

exogenous. For simplicity, I also assume that $\phi_j(X)$ has a compact support, with lower and upper limits given by \underline{X}_j and \overline{X}_j respectively.¹⁴

Political Favors In the single good model, the president controls the allocation of *club goods* (M), which he can use to obtain political support in the Congress. Club goods are allocated to parties (collectively) and benefit all of its members. Though this is not a straight out cash transfer, it has a political value and a monetary equivalent that can be continuously set by the president. This type of good is intended to represent cabinet positions or other high level appointments that can benefit the party as a whole. In the real world, these jobs actually go to specific people, thus benefiting some legislators more than others. However, the important point is that the president negotiates how to allocate these resources with the party, and not with individual legislators and that ministers use their positions to hire co-partisans and provide other political resources for their party.¹⁵

In the two goods model, in addition to club goods the president also controls the allocation of *private goods*, the provision of both of which depend on his discretionary decision. Differently than with club goods, private goods are allocated individually, and only benefit the recipient. These *private* goods can be thought of as Pork, even though from the perspective of voters pork usually is a local public good, as far as other legislators are concerned it only yields electoral benefits to the individual legislator who can claim credit for it.

Transfer Technology From the president's perspective, the main difference between these two goods is their respective "transfer technology". For club goods, when the president provides M_j to party j , each legislator in that party receives the same amount $m_j = \mu_j(M_j)$, where $\mu_j(0) = 0$ and $\frac{1}{N_j} < \mu'_j(M_j) < 1$. This *transfer technology* captures both the club nature of the good and the idea that there are economies of scale in providing of goods to parties. For the private goods, I assume the amount received by the legislator is exactly equal to the amount transferred by the president.

From the legislator's perspective, political benefits are additive. Therefore, the total amount that enters their utility function is simply $C = m + p$, where m and p denote the monetary equivalent of the benefit received from each type of benefit provided by the president. For the president, both types of goods are taken from the same single pool of resources. Therefore, the assumptions on $\mu_j(\cdot)$ guarantee that there are economies of scale when using club goods but, if the president wants to benefit a specific legislator, it is better to use private goods because the economies of scale would be

¹⁴It can be the case that $\underline{X}_j = -\infty$ and/or $\overline{X}_j = \infty$.

¹⁵In this respect, many interviews I conducted with former cabinet members in three countries, as much of the media coverage in these countries suggest that ministries are a collective affair. Except for apolitical nominations, ministries are always allocated to parties or at least to some significant and identifiable group within a party.

wasted with “free riders”.

The President The president does not seek to maximize the number of votes in congress, but rather to minimize the costs of passing legislation provided he obtains the necessary level of support, which is represented by Q . For any given distribution of affinities (X), the president can induce more legislators to vote with him by providing political favors either to parties, or directly to legislators.

In both the single good and two good version of model the president allocates some amount of the club good to each party, which is represented by M_j . In the two good version, the president can also allocate the private goods to individual legislators in each party. As the final decision of how much private goods will be handed out depends both on party attributes and on affinity, which indexes individual legislators, the amount distributed to each party is represented by $P_j(X)$.¹⁶

These handouts are given in exchange for the votes of all legislators in the party with $v(C) \geq X$. In this way, every legislator whose utility when voting with the president and receiving the transfers is at least as high as when voting against him without transfers, must take part in the deal and vote with the president. An increase in transfers causes some votes to switch to the president’s side.¹⁷ Exactly how the votes change depends on party and legislator specific parameters, and this will drive the president’s decision on how to best spend his resources.

2.1 The Decision Problem with One Good

The president does not seek to maximize the number of votes in congress, but rather to minimize the costs of passing legislation provided he obtains a necessary level of support Q . Before any club good is allocated, the cutpoint between those who vote with and against the president is the same in all parties ($X = 0$).¹⁸ However, once some M is allocated, the cutpoint in each party is allowed to differ to X_j and the number of votes the president receives from each is given by $N_j\Phi_j(X_j)$. The president must then choose an allocation of resources — which implies setting the optimal X_j for each party — that ensures that number of votes he receives meets the minimum support threshold Q .

To ensure the allocation of resources is the one that uses up the least amount of resources, the president decides which party to “invest” his resources by observing the rate of return of each party. This rate of return is defined by a series of exogenous factors such as size, average affinity and

¹⁶Actually, legislators in the same party j and with the same X could, in principle, receive different amounts of P . However, because a continuum of legislators is assumed, the president’s optimal allocation will always give the same amount $p_j(X)$ for all of them, as I show later.

¹⁷Again, I assume that legislators who are indifferent will take part in the arrangement, voting with the president.

¹⁸If $Q \leq \sum_{j=1}^J N_j\Phi_j(0)$, the problem becomes trivial. In this case, since legislators with $X \leq 0$ are always better off voting with the president, he does not need to expend any resources in order to have the votes he needs.

dispersion, but also by the endogenous allocation of the club good itself. So, as in Cox & McCubbins (1986), even though the president will make transfers to the party which yields him the highest rate of returns, this president's transfer itself affects the marginal rate of return from parties.

Proposition 1. *If M_j^* denotes the optimal allocation of resources to party j , and X_j^* the cutpoint between party j members that vote with and against the president given M_j^* , then $X_j^* = v(m_j^*)$.*

Proof— The proposition follows directly from the definitions presented above: It is known that if M_j^* is the optimal allocation of M to party j , $m_j^* = \mu(M_j^*)$ is the amount actually received by each legislator. Also, $v(m_j^*)$ was defined as the utility each legislator in party j derives from consumption of m_j^* . Without any transfers $X_j = 0 \forall j \in J$, so it follows that after optimal transfers the cutpoint $X_j^* = v(\mu_j(M_j^*)) = v(m_j^*)$. ■

This proposition reveals that by choosing how much gets distributed to each party, the president is in fact setting cut-points between those who vote with him and not, within each party. The existence of these cutpoints is the key to building the solution to the problem because in order to understand how this decision is made it is best to consider the effects of marginal changes in the allocation of club goods. To this effect, I follow Dixit & Londregan (1996) and use a graph (Figure 1) to clarify the argument.

Consider that the president's initial strategy is such that the cutpoint for a party j is at X_j , with the lightly shaded area designating legislators who vote with the president. An extra dollar allocated to this party increases each and every legislator's utility, prompting those "close" to X_j to shift sides and with the president. Therefore, the new cutpoint \tilde{X}_j lies to the right of the initial one. When M_j is very small, the magnitude of the shift — or the distance between the old and new cutpoints — is given by the extra consumption each legislator enjoys $\mu'_j(M)$ multiplied by the marginal utility of consumption $v'(C_j)$.

The number of legislators who switch is given by $N_j \int_{X_j}^{\tilde{X}_j} \phi_j dX$, which is the dark shaded area in Figure 1. Since the shift is *marginal*, this area can be approximated as the product of the shift in the cutpoint $v'(C_j)\mu'(M)$ and the density at the initial cutpoint $N_j\phi_j(X_j)$. Note, however, that changes in M_j affect several terms in both of these expressions, so in order to make these effects more transparent it is useful — though a bit cumbersome — to write the marginal effect of spending on votes obtained from party j as:

$$\frac{\partial v_j}{\partial M_j} = N_j \phi_j [v(\mu(M_j))] v' [\mu(M_j)] \mu'(M_j) \quad (2)$$

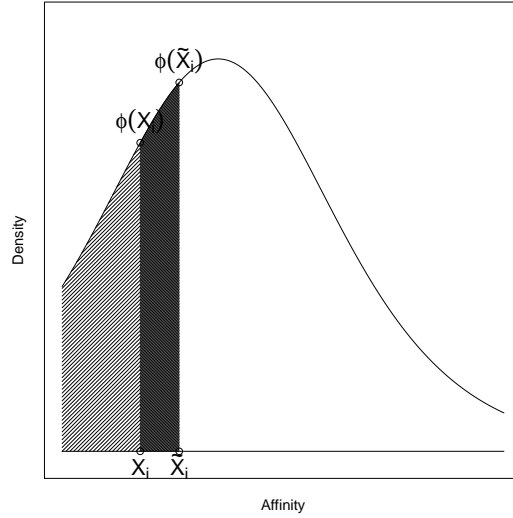


Figure 1: Marginal Return of Spending

This expression makes use of the fact that $C = \mu(M_j)$ and that $X^* = v(m_j)$, and is essential to the solution of the president’s decision problem, as is made clear by Prop. 2.

Proposition 2. *Let X_j^* be the cutpoint in party j resulting from the optimal allocation of resources. It follows that if the decision problem has an interior solution it is such that:*

$$\sum_{j=1}^J N_j [\Phi_j (X_j^*)] \geq Q \quad (3)$$

$$\frac{\partial v_j}{\partial M_j} = \frac{\partial v_k}{\partial M_k} \quad \forall j, k \in J \quad (4)$$

Proof— From Proposition 1, it is known that $X_j^* = v(m_j^*)$. For M_j^* to be optimal, the marginal return in votes to the dollar must be equal across all parties,¹⁹ and the president must obtain a minimal threshold Q of votes. From the definitions and preceding discussion, it is known that Eq. 3 reflects the latter while Eq. 4 reflects the former. ■

The density of the party at the margin is what determines the “rentability” of the president’s transfers, and for this reason the cutpoints in each party are not necessarily the same — and probably will not be. Therefore, the last legislator bought in each party will not exhibit the same affinity towards the president.

Within each party, those legislators beyond the cutpoint do not vote with the president, but receive

¹⁹I express this optimality condition in terms of the marginal return in votes due to its intuitive appeal in this case. However, in the computations I actually use the marginal cost of votes, which is simply the inverse of Eq. 2.

the transfers nonetheless, as any other member of the party. The existence of these “free-riders” of sorts is main driving force behind the differences between this version of the model, and the two good version, which I now turn to.

2.2 The Decision Problem with Two Goods

As before, the president needs to choose an allocation of resources that meets the minimum support threshold. However, while in the one good model the president’s problem consisted of choosing one cutpoint within each party (X_j^*), in the current version there are two cutpoints to be chosen (\tilde{X}_j and X_j^*).

Proposition 3. *The president’s optimal decision will be such that for each party j there will be a cutpoint X_j^* such that a legislator from that party with affinity X will vote with the president if and only if $X \leq X_j^*$. There will be also another cutpoint $\tilde{X}_j \leq X_j^*$, such that only the legislators with $\tilde{X}_j < X \leq X_j^*$ will receive transfers of private goods.*

Proof— Suppose that when the president is deciding optimally, party j receives $m_j^* \geq 0$ and $p_j = 0$ for all its legislators (no member receives private transfers). Then, each legislator in the party receives $m_j^* = \mu_j(M_j^*)$, and votes with the president *if and only if* $X \leq v(m_j^*)$. Thus, $X_j^* = \tilde{X}_j = v(m_j^*)$, and the president will receive $N_j \Phi_j(v(m_j^*))$ votes from the party.

Now, suppose that the president needs $Q_j > N_j \Phi_j(v(m_j^*))$, and that to obtain these additional votes he uses private transfers to certain members of party j . Legislators in the party for whom $X \leq \tilde{X}_j = v(m_j^*)$ are already voting with the president, so only those with $X > v(m_j^*)$ will be targeted with private goods. Suppose that the president targets a legislator with affinity $X' > \tilde{X}_j$. Define $p^*(X')$ as the minimum payment he must make to win her vote. Then, $p^*(\cdot)$ which must satisfy $v(m_j + p^*(X')) = X'$, and consequently $p^*(X') = v^{-1}(X') - m_j$. Since $v(\cdot)$ is strictly increasing, so is $v^{-1}(\cdot)$, and therefore $p^*(\cdot)$ is strictly increasing. This means that the president will distribute private goods to the legislators with the lower X ’s among those for whom $X > v(m_j^*)$, as they require less such transfers to vote with the president than legislators with higher X . Hence, the president will give private goods to legislators with $X > \tilde{X}_j$ up to a cutpoint X_j^* that ensures that $Q_j = N_j \Phi_j(X_j^*)$. Consequently, $X_j^* \geq \tilde{X}_j$. ■

Proposition 4. *Let M_j^* be the optimal provision of club goods to party j , with $m_j^* = \mu_j(M_j^*)$, and $p_j^*(X)$ the optimal provision of private goods. Then,*

- $\tilde{X}_j = v(m_j^*)$, and
- $v(m_j^* + p_j^*(X)) = X, \forall X \in [\tilde{X}_j, X_j^*]$.

Proof— These follow directly from the proof of Proposition 3. ■

This characterization of the optimal cutpoint allows to state the president's decision as

$$\min_{\tilde{X}_j, X_j^*} \sum_{j=1}^J (M_j + P_j) \quad (5)$$

s.t

$$\sum_{j=1}^J N_j \Phi_j(X_j^*) \geq Q \quad (6)$$

$$\tilde{X}_j = v(\mu_j(M_j)) \quad (7)$$

$$P_j = \int_{\tilde{X}_j}^{X_j^*} N_j [v^{-1}(X) - v^{-1}(\tilde{X}_j)] \phi_j(X) dX. \quad (8)$$

where the constraints represent the requirement that president obtain a minimum threshold of support (Eq. 6), and what else has already shown to be true about the cutpoints X_j^* and \tilde{X}_j in Proposition 4. Note that Eq. 8 is different from what is shown in Proposition 4 simply because the amount of private transfers made by the president to members of a given party (P_j) was re-written as a function of club goods.

The optimality conditions actually used to solve the problem are the first order conditions of this minimization problem. In this respect, the first constrain translates directly into the minimum support condition, which simply states that the president must ensure he receives at least Q votes. While this condition is stated generically exactly as in Eq. 3, note that in contrast with the single good model, X_j^* now depends on the allocation of two different goods.²⁰ Hence, this two good version of the model requires an additional condition dealing the *marginal rate of substitution* between in private and club goods, thus referring to the optimal provision of favors *within each party*. As in the single good model, there is also a condition that deals with the optimal allocation of resources *across parties*, and reflects the notion that the *marginal cost* of support from each party should be the same.

Proposition 5. *If the president's decision problem has an interior solution, it is such that within*

²⁰Eq. 6 can be restated as $\sum_{j=1}^J [N_j \int_{-\infty}^{\infty} 1\{v(m_j + p_j(X)) \geq X\} \phi_j(X) dX] \geq Q$, which makes this fact clear.

parties, the optimality condition is

$$N_j \left[\Phi_j(X_j^*) - \Phi_j(\tilde{X}_j) \right] \mu_j'(M_j^*) = 1; \quad (9)$$

and across parties the optimality condition is

$$v^{-1}(X_j^*) - v^{-1}(\tilde{X}_j) = v^{-1}(X_k^*) - v^{-1}(\tilde{X}_k) \quad j, k = 1, \dots, J. \quad (10)$$

Proof— Follows from the first order conditions of president's problem (see Appendix A).²¹ ■

The *within parties* condition deals with the balance between private and club goods that are provided to the members of a given party in exchange of votes. The idea is that given the number of votes the president will need from some party j , X_j^* is defined, but that the president could provide different mixes of goods to obtain these votes. As \tilde{X}_j determines the total amount of club goods that is transferred to party j as well as the legislators that will also receive private goods, Eq. 9 shows that \tilde{X}_j will be such that the president is marginally indifferent between providing either type of good. For example, if the LHS of equation 9 is less than one, the president should decrease M_j , because the cost in private goods to keep the same votes would be lower than the economy afforded by club goods.

The *across parties* condition, on the other hand, deals with the fact that president must compare the marginal cost of buying votes from different parties. From Proposition 4, it can be said that

$$p_j^*(X) = \begin{cases} v^{-1}(X) - v^{-1}(\tilde{X}_j), & \text{if } X \in [\tilde{X}_j, X_j^*]; \\ 0, & \text{otherwise.} \end{cases}$$

Therefore, Equation 10 simply states that the marginal cost of a vote must be equal across parties if members of the party are receiving club goods (i.e., there is an interior solution). The marginal cost associated with party j is measured as how much of private goods the president needs to give to the marginal legislator of that party, thus $p_j^*(X_j^*) = v^{-1}(X_j^*) - v^{-1}(\tilde{X}_j)$.²²

Together, Equations 6, 9, and 10 fully characterize the president's allocation of resources that minimizes the cost of obtaining the minimum threshold of support, as long as such problem has an interior solution.²³ These conditions yield results in which not all parties receive club goods, but

²¹The formal proof of this proposition is credited to Paulo Melo-Filho.

²²Although M_j changes when X_j^* increases, it can be shown that the *within parties* optimality condition guarantees that the marginal effect of the change in M_j is compensated by the change in P_j

²³Corner solutions require small tweaking of these conditions. While these situations have been appropriately dealt with in the simulations presented in the following section, a proper discussion was omitted due to space constraints.

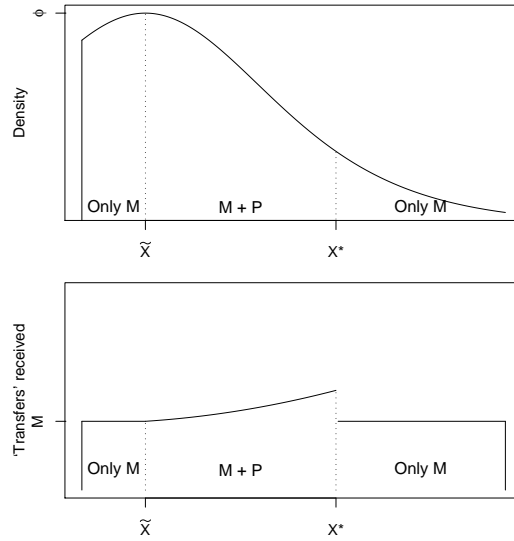


Figure 2: Solution

some members of all parties receive some amount of private goods. This is because in Eq. 9, whenever $M_j > 0$, one cannot have $\tilde{X}_j = X_j^*$, which implies $P_j > 0$. In fact, the marginal legislator in each parties receives the same amount of private transfers. Or in other words, if party j has legislators been bought, some of them must be receiving private goods.

Some additional features of this general solution are shown on Figure 2, which depicts a stylized party. Legislators to the left of X^* will vote with the president, while legislator’s to the right will not. Legislators between \tilde{X} and X^* and are the ones that also receive private goods.

The president starts off using club goods to buy the bulk of his coalition. Then, according to the model, even if there are economies of scale derived from using club goods, the marginal legislator will always be bought off using private goods. The intuition behind this result is that club goods also benefits members of the party who will not vote with the president, so to reduce this “waste,” the president is better off providing a more targeted good even if, in a sense, it is “more expensive.” This feature is crucial to the main numeric result I show in the next section.

3 Comparing Models

The model just presented can generate two types of results: generic comparative statics and specific predictions about allocation of resources. In this section and the next, I deal only with results of the first type. The main goal here is simply to compare what — according to this model — happens when the president controls one versus two types of goods, and to examine how certain politically

meaningful parameters of the models affect the optimal distribution of resources.

In the simulations that follow, I assume $\phi_j \sim \text{logistic}(\alpha_j, \beta_j)$,²⁴ define the utility function as $U(C) = C^\alpha$ (with $\alpha = \frac{1}{2}$), and the club good technology function as $\mu(M_j, N_j) = \frac{kM_j}{N_j}$, with $k = 3$. These are numeric assumptions necessary to solve the model, and are consistent with the theoretical specification presented in the previous section. More details are available online in a supplemental appendix.²⁵

3.1 The Costs of Coalition: The president's perspective

My stylized president is a cost minimizer, and as such, he is concerned with obtaining the necessary support while transferring the least possible amount to potential allies. I now explore what factors contribute to making coalitions more or less expensive.

I present the model's answers to this question using a hypothetical legislature with 600 members divided into four parties (A, B, C and D) with 150, 100, 200 and 150 members each. Affinity towards the president follows a logistic distribution within each party with means 1, 2.8, 3.5 and 4, and cohesiveness — measured as the spread of the distribution — of 1, 1, 1.5 and 2.²⁶ I then simply feed these parameters to the model²⁷ and reported the results.

Using this exact same legislature for both the case in which the president can offer only party goods and also the case in which he can offer goods appropriate to both parties and individual legislators, the main result is simply that the costs of coalition formation, namely the amount of resources the president has to pay to obtain the same threshold of support ($Q = 2/3 \times 600 = 396$), is smaller when he has two types of goods, than when he has one.

This first point is straightforwardly exemplified by Table 1, which shows that a cost saving president will use both types of goods if they are available. In fact, this is simply a restatement of the general result discussed in Section 2.2, that in the two good model private goods (P) will always be used. The intuition is that since private goods can be targeted, the president can reduce what he has to spend by allocating resources to individual legislators instead of to parties with relatively low affinity for him that contain numerous “free-riders” who will not actually vote with the president despite the

²⁴Note that the logistic density is parametrized by its location (α), which is analogous to the mean, and a *scale* parameter (β) defined as $Var(X) = \frac{\pi^2\beta^2}{3}$. When I manipulate the spread of the parties I, refer to the parameter β , and not the actual standard deviation.

²⁵The supplement to this paper is available at www.princeton.edu/~zucco/jm/jmp2appendix.pdf.

²⁶Note that for the reason mentioned in footnote 24, these measures of spread correspond to standard deviations of 1.8, 1.8, 2.7, and 3.6.

²⁷The algorithm used to obtain the results is mostly a direct implementation of the optimality conditions described in the previous section, adapted to deal with the possible corner solutions that arise whenever a party receives no M . Technical details are given in the supplemental appendix to this paper, available at www.princeton.edu/~zucco/jm/jmp2appendix.pdf.

Table 1: Results with One and Two Goods

One Good				Two Goods			
Party	P	M	Votes with President	Party	P	M	Votes with President
A	—	432.76	131	A	185.12	101.30	141
B	—	592.37	80	B	161.68	263.77	84
C	—	1187.85	124	C	360.66	140.93	107
D	—	522.14	61	D	218.50	0.00	64
Total	—	2735.12	396	Total	1431.97		396

payments made to their party.

Figure 3 takes a closer look at other factors that affect the amount the president has to spend, allowing the size, position, and spread of selected parties to vary one at a time. Note that in these graphs, the vertical axes represent the *overall* costs the president pays, and not what is given to the party whose attributes are being varied.

Though the choice of which party’s position to vary was arbitrary, the results for changes in the position of parties — Figure 3(a) — are very general, as is shown by the similarity in both graphs. Simply put, if *any* party is made closer to the president, the overall costs drop.²⁸

The effects of size and spread, however, deserve closer attention. The final effect of these two parameters on costs depends on their interaction with the position of the party. To illustrate the point, I show what happens to the total costs paid by the president as the size and spread — Figures 3(b) and 3(c) — of the parties closest and farthest are allowed to vary.

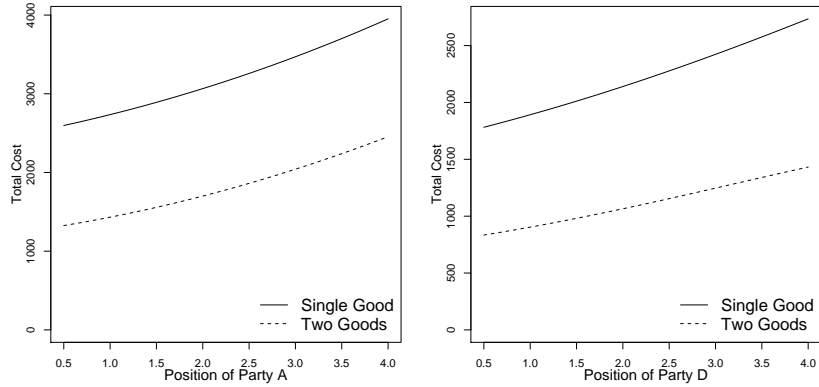
The larger and more cohesive the party closer to the president is, the lower are the costs of coalition building, while the opposite holds if the party in consideration is the one farthest from the president. In this case, coalition costs increase as the party grows and diminish as it becomes less cohesive.

Together, these results create a fairly intuitive picture. The President is better off with parties closer his own position, benefits from a more cohesive and larger party aligned himself, and from more dispersed and smaller opposition parties.

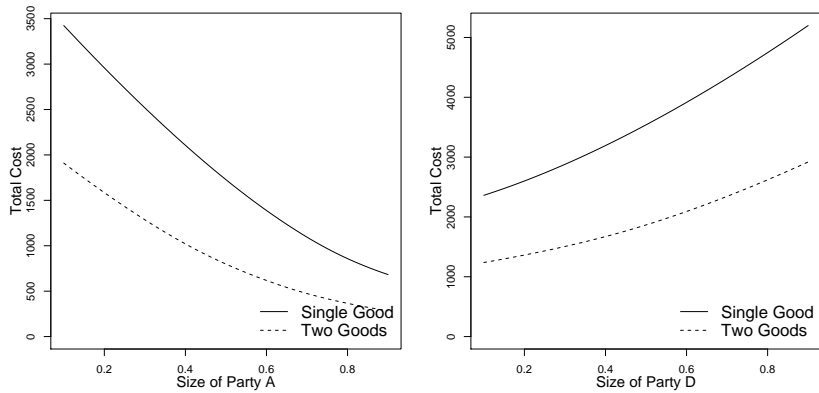
3.2 The Parties’ Perspective

In my model, parties are not strategic in the sense that they do not choose the parameters (size, position, and dispersion) that can affect their lot. At least in the short run, it is plausible to treat parties as non-strategic with regard to size and discipline, and it is also reasonable to treat affinity

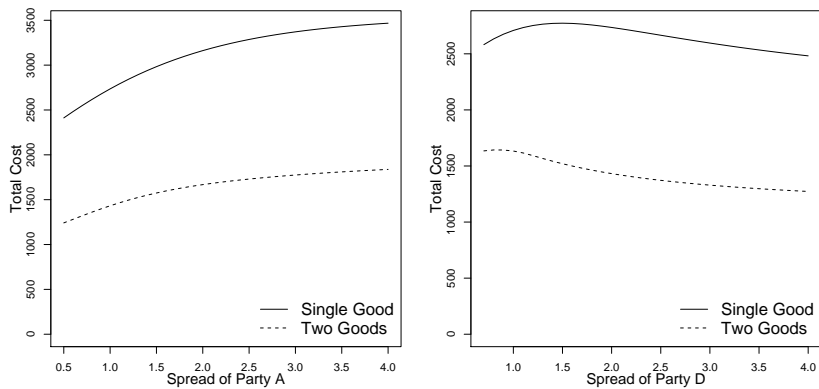
²⁸Allowing position to vary, party A and party D in effect cease to be the “closest” and “farthest” parties from the president. In this sense, showing both graphs is redundant. I kept them mostly for symmetry, and also to stress the generality of the result.



(a) Changes in the mean **position** of party A and D



(b) Changes in the **size** of party A and D



(c) Changes in the **spread** of party A and D

Figure 3: Costs of Coalition Given Parties' Positions, Size, and Dispersion of Affinities

Notes: Graphs on the left show changes in Party A (closest to the president), while those on the right show effects of changes in Party D (farthest from the president). *Total cost* is displayed on the vertical axis and the value of the parameter of interest on the horizontal axis. The simulations included four parties, and all other parameters were held constant except in the case of party size, where the other parties' seat share is allowed to vary, holding constant their relative sizes.

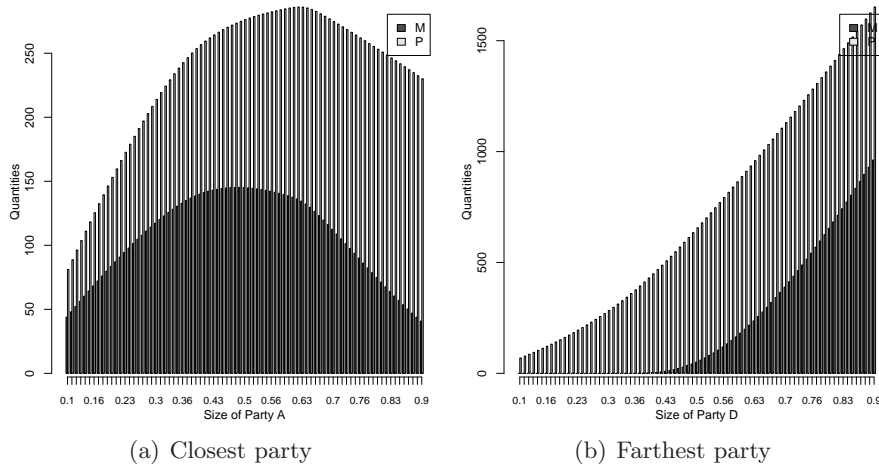


Figure 4: Effects of Size on Payment to Parties

Notes: Figures show the effect of increase in size on parties close and far from president. Quantities of M and P are shown separately (unstacked). Simulations used four parties and all parameters besides size of the selected party were held constant at values described above. Results shown are from the two good model, but hold with the single good model as well.

as exogenous because only if parties were perfectly disciplined could party leaders control expressed affinity. Keeping in mind that these parameters are given, I now analyze how the party’s payoffs are affected by variations in these parameters.²⁹

Looking back at Table 1, it is clear that in the two-good model the amount given to parties as club goods is *smaller* than in the single good model for *every* party. Hence, as a corollary of the main result, the president’s gain is the party’s loss: fewer resources are distributed overall, and part of what gets distributed is not done through party structures.³⁰ The substantive implication is that parties then have less ability to deliver selective incentives to party members, and the natural consequence is the further weakening of parties as organizations.

It is also possible to go beyond the total coalition costs and to investigate how size and spread affect the transfers received by individual parties. Results for size are consistent across both versions of the model, and are contingent on the position of the party. For parties close to the president, there is an “optimal” size for the party. If it were larger than this, it would actually receive fewer resources (Figure 4(a)). Granted, the *share* of resources the party receive does rise monotonically with its size (not shown). However increase in size of the party closest to the president dramatically reduces total

²⁹For the most part, I use the same setup described above. However, some of the comparative statics shown in this Section required small changes in the original setup — all clearly indicated — to allow for direct comparison between parties.

³⁰The reader might also have noticed that in Table 1, the amount given out as private goods is greater than what is given out as club goods. This is *not* a general result, and is contingent of the value of k , which indicates the magnitude of economies of scale for using club goods. However, the overall coalition cost is always lower in the two-goods model.

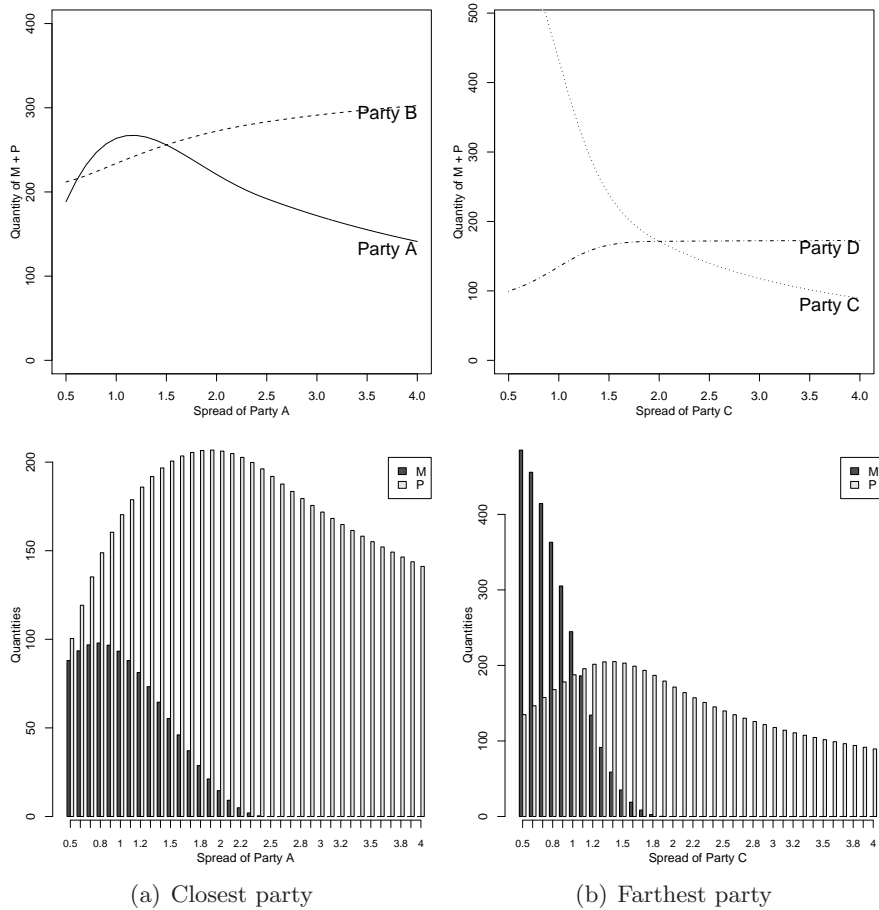


Figure 5: Effects of the Dispersion of Parties on Payments to Them

Notes: Figure shows pairwise comparison of parties “close” (A and B) and “far” (C and D) from the president. The two parties being compared in each simulation are identical, except for the spread of one of them (A and C) that is allowed to vary. Both simulations included four parties, but only the results for those being directly compared are shown. The lower two graphs show only the party whose spread was allowed to vary. All results displayed refer to the two-good model, but are similar to those obtained with the single-good model.

costs, and for this reason, after a certain point, the party itself ends up receiving less in absolute terms. For parties farther away from the president, the result is simpler: the larger the party is, greater are the transfers it receives (Figure 4(b)).

The results for spread have flavor a similar to the ones for size. Parties close to the president are better off with an intermediate level of cohesion (Figure 5(a)), while parties more distant from the president are better off when they are more tightly united (Figure 5(b)). The intuition here is that for opposition parties, cohesion provides protection from having individual legislators bought off, and forces the president to go the club good route.

There is an additional interesting feature of the size result for parties close to the president and

the spread result for both types of party: The dispersion or size that maximizes the amount of private goods received by party members is different from the one that maximizes club goods, as shown in the lower panel of Figure 5. Though for the purposes of the model these attributes are exogenously given, this discrepancy can be interpreted as a potential source of conflict between party leaders and the rank-and-file of the parties, as party leaders prefer more discipline, which maximizes payment to the party, but back benchers prefer less.

3.3 “One Good” and “Two Good” Polities

Brazil and Uruguay provide an interesting contrast with respect to how executive-legislative relations work in multiparty presidential settings. While in both countries the use of cabinet positions and other high level jobs as a means of cementing and maintaining government coalitions *with parties* has been well documented (Altman 2000, Amorim Neto 2006, to cite just two), the two countries differ markedly in the governments’ ability and incentives to exchange resources for support with *individual legislators*. In this section,³¹ I explore this contrast simply to show that the two versions of the model described here correspond roughly to real world cases, and that both cases briefly analyzed here are compatible with some noteworthy implications of the model.

In Uruguay, as in other Latin American presidential systems, the president controls most state resources³² and typically lacks a majority. He is thus forced to negotiate alliances with other factions in his own party as well as factions in other parties.³³ As in Brazil, the political resources controlled by the president are used as a means to obtain and maintain legislative support from *parties*. What is different from other countries is that there are no instruments for the executive and *individual legislators* to exchange resources for support.

In a very comprehensive analysis of Uruguayan politics in the 1980’s and 1990’s, Buquet, Chasquetti & Moraes (1998) identify a packet of more than 300 jobs around which coalitions are built. These are the most visible prizes sought by politicians, and were almost uniformly listed by several former occupants of high profile posts that I interviewed in Montevideo in 2005. Besides the capac-

³¹This section draws on a set of more than thirty interviews conducted with former ministers, and current and former legislators in Uruguay, during the second semester of 2005.

³²As in Brazil, Uruguayan presidents exercise much control over the executive branch. It should be noted, however, that the main state companies are autonomous entities, for which the president can appoint, but not discharge, directors. Additionally, there is a constitutional mandate that grants the minority (opposition) representation on the boards these entities. Finally, an important distinction between the two countries is that ministers are, at least in principle, subject to censuring by Parliament. Though all this limits presidential discretion, the constitution also prescribes to the president the power to dissolve congress under very special circumstances.

³³Since return to democracy in 1985, Uruguayan electoral politics has been dominated by three large parties, but the basic unit of political organization is the party faction. Buquet, Chasquetti & Moraes (1998) have estimated the Effective Number of Parliamentary Factions to be between 4 and 8 during this period, and until the election of Tabaré Vasquez, the president’s party, and not to say his faction, never had a majority.

ity to appoint other party members to key posts, to deliver visible goods to the electorate, and to take credit for policies and projects, some of these positions, (certain ministries, for instance) are particularly valuable because they allow hiring of hundreds of low level temporary employees (known as *becarios*), and/or they manage projects funded by multilateral institutions such as the BID and World Bank. Ministries are so important for potential allies that even in a country with a very stable administrative structure such as Uruguay, in the rare instance in which an extra ministry was created, it was done mostly to accommodate political interests.³⁴ As a former *Blanco* minister bluntly stated about his own party's leader,

In politics, and to Lacalle as a savvy politician, the large ministries are what is really interesting. The ones with national projection, that act in the whole country, that have many jobs to distribute, that have visibility, and that grant the possibility of doing things. But, fundamentally, where one can put reliable people, where there are more jobs to fill, a national scope, for instance, the Health Ministry or the Ministry of Transportation and Public Works, the ones that deal with more resources, because that is power.

All accounts indicate that the distribution of these jobs is done behind closed doors, between the president and a handful of faction leaders. In this, the process is no different from what happens in Brazil, or even Bolivia, for that matter: it is done *with leaders*, who bargain *as leaders* of their political groups, and never as individual legislators. There are, however, two important caveats pertaining to how this process works in Uruguay.

First, such exchanges with party leaders are usually enough to assure support, at least in the medium term, from the whole faction. Discipline is very high in the Uruguayan congress (Buquet, Chasquetti & Moraes 1998); factions can demand the replacement of their appointee; and when parties break with the government, all their members leave the cabinet. In Brazil, in contrast, party discipline is weaker. Ministers often remain in office even after their parties formally break with the government, thus effectively splitting the party between pro and anti-government factions. Ministers sometimes even change parties to retain their posts. During Lula's first term, for instance, Helio Costa provides an example of the former, and Ciro Gomes and Miro Teixeira of the latter.

The second difference is that in Uruguay, according to almost all interviewees, ministerial appointments are the *sole* instrument the president has, besides compromising on policy initiatives, to put together its voting base in Congress. In Brazil, the situation is very different. Pereira (2002) describes

³⁴In 1995, President Batlle created the Ministry of Youth and Sports to assign an extra seat to Lacalle's faction in the National Party. In the word of a preeminent *Blanco* politician, "(...) the Ministry of Sports was created, and was given to a *Herrerista*, and that was a political solution because the *herrerismo* has been left with less ministries than what corresponded to them proportionally. Besides, there existed an old idea of creating a Ministry of Sports and Youth."

how the Cardoso government set up an office especially to follow how legislators voted, and how many projects of benefit to them were being implemented by the government.³⁵ Accordingly, once this system was put in place, the government began to monitor legislators, and was able to manage resource distribution more effectively. In 2006, I interviewed former occupants of that office under Cardoso, who had since then become parliamentary advisors to PSDB (Cardoso's party). They denied the system (SIAL) had ever monitored the exchange of pork for support. They showed me documentation of the system in which there was absolutely no mention to legislators' individual amendments to the budget,³⁶ and insisted it was simply a way to improve coordination among different offices within the executive branch. It should be noted, however, that the inclusion of information regarding the amendments *would* have been easy — real time budgetary data was already available — and very compatible with the goals, processes, and mechanisms described. I also visited the office under Lula right after the fall of José Dirceu — Lula's first Chief of Staff — and the occupants then admitted only to having heard rumors about the existence of something along the lines of the SIAL (Interviewee 13 2005). The *unofficial* word in the corridors of Congress was that the system had been dismantled by Dirceu, who had a different approach to dealing with Congress.

Though the sheer existence of a single screen on which is was possible to cross-tabulate individual amendment implementation data with each legislator's voting records is disputable, and even if such a system existed some would question its relevance in determining how parliament behaves (Figueiredo & Limongi 2002), there is quite a lot of evidence that individual level exchanges are common in Brazil. There are strong empirical regularities between important votes and implementation of individual amendments (Pereira & Muller 2004, Alston & Mueller 2006), such exchanges are commonly mentioned in the news (Souza 2005), legislators openly complain when the government does not authorize expenditures they expect (Krakovics 2004, for a typical example), and come election time, incumbent legislators like to claim credit for having included amendments in the budget, "fought" for the resources, and actually obtained the funds to spend "back home."

In Uruguay, these exchanges at the individual legislator level simply do not happen. Granted, a few interviewees pointed to the same notorious politician from the interior of the country who has quite a

³⁵These projects are added to the budget as amendments. In Brazil, the president controls whether these projects are really funded or not, even though they have been approved by Congress. Eduardo Graeff, the person at the time responsible for this alleged system, revealed in an interview with Carlos Pereira how the system operated.

³⁶The SIAL, which translates roughly as *Legislative Monitoring System*, is defined and described alongside a parallel system SAAP (*Parliamentary Action Monitoring System*), in an internal document of the presidency, issued in 2002, of which I was given a copy. This document, "contains information about the mechanisms of legislative articulation that the Chief of Staff of the Presidency uses to deal with Congress" (Presidência da República 2002, p.2). The SIAL was a system by through which all the ministries could communicate, and the executive branch could arrive at a "government position" on all matters that pass through Congress. The SAAP was clearly described as a database about legislators, including initiatives, speeches, votes, and electoral data.

reputation as an avid bargainer. There were several episodes in which he was said to have attempted to extract further concessions from the government, both in terms of appointments of supporters to key positions in the central government, and also for lower level employment of his supporters in his home region. These exchanges were not entirely on personal grounds, since he was, in fact, leader of a party faction, which at one time was quite relevant. The fact that several interviewees pointed to this very same case over and over also suggests it is quite exceptional, and was looked down upon by the rest of the political establishment. This is a quite different attitude than the one prevalent in Brazil, where pork seeking behavior is generally regarded as a fact of life. As a general trend, exchanges based on private goods that can be linked to a particular legislator or region are very rare in Uruguay. In fact, any bargaining between the executive and individual legislators is very rare. In the words of a former *Colorado* minister:

This very rarely happens, except if it a very special legislator, a very important legislator, the only one holding off, that the leader of the other party requests “talk to this guy, he is a bit reluctant,” but this is not a usual thing.

The Brazilian example shows that much of the provision of individual benefits to legislators is done through the political use of the budget. In this, Brazil and Uruguay are very different. In Uruguay each budget spans five years, and is passed during the first year of each presidency. There are yearly *rendición de cuentas* bills, where expenditures can be added, removed, or rearranged, and which sometimes function as *de facto* yearly budgets. Both the five year budget bill and these yearly revision bills are great opportunities for congress to attempt to extract more resources from the government.³⁷ Through logrolling within Congress, legislators do manage to include matters that interest them, as the literature and many interviewees suggest. As one important *Colorado* leader commented on the inclusion of budgetary matters of interest to individual legislators

It exists, and they are legitimate interests of each department. However, it is not normal that it be used as a type of blackmail. It is not as explicit, nor as public as it is in the United States. Usually, parties handle this sort of thing internally.

Still, in Uruguay there is no such thing as an individual amendment to the budget, as in Brazil, and most legislators could not claim direct credit for particular budget items, even if they could prove they had been responsible for their inclusion. With 44 of 99 lower house legislators elected in the

³⁷Moraes, Chasquetti & Bergara (2005) have shown that the congress in Uruguay greatly affects the final composition of the budget, while Morgentstern (2004) wrote that legislators commonly combined requests for certain expenditures with threats to make cuts in parts of the budget that are dear to the executive (p.178).

electoral district of Montevideo, where 40% of the population resides, with all the 30 Senators elected in the country at large,³⁸ and with all legislators elected in a closed list PR electoral system, the great majority of the legislators are not accountable to any specific geographic location. Most legislators are generalists, and even though parties sometimes assign legislators to policy area and/or a geographic location, it is not typically expected that the legislator will lobby the executive or seek to include narrow local measures in the budget.

In this context, it makes sense that Uruguayan legislators do not pay attention to the execution the budget at all, though this at first came as a surprise to me.³⁹ Curiously, this is not because the government executes the budget exactly as approved by the legislature. Most interviewees were very much aware of the budget cuts made by the executive, and most former ministers had stories about their budget being withheld by the economic and planning ministries. As a former *Blanco* minister described,

There is what the [budget] law says, there is what the [Economy] Ministry authorizes me to spend and that eventually is appropriated by decree, and there is what the ministry effectively hands me. It [the Economy Ministry] can say “yes, yes, I will give it to you, but now I do not have it, next month I will give it to you.” This way, it is the Economy Ministry that decides it all.

Though it is clear that “the Economy Minister controls the tap,” most interviewees thought determining priorities in the budget was the exclusive right of the executive branch, that it was not done on political grounds, and that the economic/fiscal situation was the most important determinant of this decision.

Obviously, this quick comparison does not imply causality of any kind. If not for any other reason, one can easily claim that the lack of individual bargaining with legislators in Uruguay is caused by, and not a cause of, strong parties which, in turn, owe their existence to the electoral system. Similarly, parties in Brazil have always been weak, and it is impossible to ignore the role the country’s extremely permissive electoral system plays in this reality. My model is static, so it does not account for the emergence of either system. Much to the contrary, it simply states that *if* individual level bargaining exists, presidents will pursue it, thus diverting resources away from parties. Hence, the two points to be made with this rather cursory analysis are quite simple: *Empirical correspondents to both models*

³⁸The 31st Senator is the vice president of the Republic, who is constitutionally assigned the role of president of the Senate.

³⁹Some legislators, in fact, were surprised to find out that this is an important part of what legislators do in neighboring Brazil. One *Colorado* legislator even took note of it, and commented that he thought it was a good suggestion and something to be pursued.

shown in Section 2 exist; and evidence from two of these cases is at least compatible with implications derived from the formal model.

Uruguay is an example of a country in which there are no instruments to allow the president and individual legislators to bargain, and it is also a country where parties/factions have retained their role as main agents in the political process. Conversely, Brazil is a case of much feebler parties, and one where there is plenty of individual level bargaining. This simple evidence is compatible with several implications of the models discussed in this paper, namely that when presidents have the opportunity to bargain with legislators, they will do so, because it is cost effective; that when this type of bargaining happens, there is a greater chance for disagreement between party leadership and its rank-and-file; and that the absence of individual legislative bargaining should be associated with strong parties, and vice-versa.

4 Specific Predictions

In the previous section, I explored some comparative static predictions of the model using a hypothetical example with four parties. The model, nonetheless, is flexible enough to simulate actual party systems, and consequently the environment in which presidents operate. To achieve this, it is only necessary to provide the set of *inputs* that characterize a party system, namely how many parties there are, as well as their size and distribution of affinity towards the president.

Given these inputs, the model yields the optimal allocation of the two different types of goods to parties and legislators, as well as the share of legislators in each party that support the president under the optimal distribution profile. Then, in order to evaluate whether these predictions (or *outputs*) are realistic, they are compared with actual data. Before showing and discussing the model's predictions, however, I first briefly describe the empirical correspondents of the model's inputs and outputs, and provide an alternative model to serve as a baseline comparison to my model's predictions.

All data used in the section are from Brazil, and were observed yearly. While inputs could be obtained since at least 1989, one of the outputs, namely resources distributed to individual legislators, is only available after 1995. Therefore, the period studied is confined to the years from 1996 to 2006, with the exception of 2002 for which data on budget execution is not available.

4.1 Inputs

The number of parties is relatively straightforward as, in principle, all parties in the legislature can be included in the model. Availability of data, however, restricts the set of parties to the eleven largest.

Together, these parties controlled between 95% and 98% of seats in the Brazilian lower house in every year of the period studied.

The size of each party was operationalized as the number of members in each party at the time of the first roll call of the legislative year, as defined by Limongi & Figueiredo's roll call data set for years until 2003, and from roll call data collected directly from the *Câmara de Deputados* website for the remaining years.

Recall that parties are defined in the model as distributions of affinities. I first estimated the affinity of individual legislators from survey data⁴⁰ and then fit a logistic distribution to these estimates,⁴¹ which completes the stylized picture of the Brazilian legislature at the beginning of each year.

4.2 Outputs

In this Section, there are three outputs of interest, namely how much resources should be distributed to parties (cabinet posts), how much should be distributed to individual legislators in each party (pork allocation), and how many votes, in average, each party should contribute to the president (voting behavior).

With respect to the first of these quantities, the model's club goods output to each party is a continuous value $M \geq 0$. The real world correspondent to club goods are high level positions in the administration which, as discussed in preceding chapters, are typically handed out to parties.⁴² Though the relevant positions frequently extend beyond just ministries,⁴³ the composition of the cabinet can be systematically analyzed and is a good proxy for the overall distribution of club goods. Cabinet membership was coded as of March of each year since January and February are usually "dead" months in Brazilian politics. Data was originally compiled by Octavio Amorim Neto, and updated by the author.

Similarly, the model also makes predictions about the distribution of private goods to the members of different parties, which is also a continuous value $P > 0$. As the empirical correspondent of these private goods, I use deputies' individual amendments to the budget.⁴⁴ More specifically, I computed the share of the total amount actually expended on individual amendments, that could be identified

⁴⁰This was done in Chapter 2 of my dissertation, (Zucco Jr. 2007) part of which was incorporated into my Job Market Paper #1, available at www.princeton.edu/~zucco/jm/jmp1.pdf.

⁴¹The particularities of this estimation are described in the .

⁴²In some cases the relevant collective of legislators is not strictly a party. In Uruguay it is a party faction, and in Brazil and Bolivia it is frequently a party from a certain region of the country. The main point is that these goods are typically handed collectively to a group of legislators.

⁴³Some agencies and/or companies can be especially interesting to politicians, such as utilities, banks, transportation authority, development agencies, among others.

⁴⁴Budgetary data were obtained from databases provided by the Brazilian's Lower House *Consultoria de Orçamento e Fiscalização Financeira*, and is described in detail in Chapter 2 of the dissertation

as having been proposed by the members of a given party. This value was then compared to the share of private goods (P) received by the members of each party under the model's optimal distribution profile.

In the real world, these amendments are not all that individual legislators obtain from the government. Though other mechanisms besides presentation and implementation of individual amendments to the budget exist, I cannot account for them with the data at hand. Individual legislators frequently influence appointments to lower level positions in the bureaucracy, especially in agencies with offices in their home states, and sometimes extract concessions. However, as with cabinet posts, amendments are an important part of what legislators fight for, and can be systematically analyzed.

Finally, the model also predicts how many legislators in each party will vote with the president. As its empirical correspondent I use the average over all roll calls taken in the year of the number of legislators in each party voting with the president.

The results for cabinet membership are reported as the share of parties correctly predicted to be in and out of the cabinet. For the other two outputs analyzed, I report the R^2 of a regression of the data on the prediction.⁴⁵ Thus, in all cases there exists an indicator of fit that is measured from a minimum of zero to a maximum of one.

4.3 The yardstick

While one can look at the outputs and understand what the model is predicts it is not evident how to judge the quality of these predictions. In fact, yardsticks against which to measure any prediction are almost always objects of debate. In the present case the problem is compounded by the fact that I analyze three different predictions, and to the best of my knowledge, no other theory yields these predictions simultaneously.

Aware of this difficulty, I established an alternative model whose predictions can be compared to my own. This baseline model posits that minimal connected winning coalitions will form (Axelrod 1970),⁴⁶ and that parties included in the cabinet vote with the president and have access to pork. This simple baseline model uses information on size and mean ideological position of parties, which is analogous to the inputs taken by my model, and very much superior to simply generating random baseline predictions. While it might be naive to expect that all members of the coalition will back the president and all members of the opposition will oppose him, this is not much different from treating parties

⁴⁵ Given that some of the quantities involved in arriving at the predictions have no natural metric, this regression setup helps account for differences in scales.

⁴⁶ I add parties to the government, by proximity to the president, until the coalition reaches a pre-set threshold. While the concept itself generally refers to a 50% threshold, for symmetry I use the same value Q as used in the model.

as unitary actors, as other models do (Pereira & Muller 2004). Moreover, full compliance of the coalition members is a natural reference point that has been used by other authors (Pereira, Power & Raile 2006).

The fit of the baseline predictions could be improved with the addition of other covariates, and regressions that predict each of the quantities of interest well can easily be specified.⁴⁷ However, that would not provide a fair appraisal of my model's predictions. The point of my model is not simply to make perfect predictions, but rather to take a bold step toward a more theoretically based approach to the theme. While the results it yields are far from perfect, and while some technical aspects of the model's resolution are quite complicated, it is built from a rather simple substantive assumption (cost minimization), the intuition behind its optimality conditions is very straightforward, and it yields several different testable and internally coherent predictions. Therefore, these predictions should be tested against an alternative model that rests on similarly simple assumptions.

In concrete terms, with respect to cabinet membership parties are predicted to be either in or out of the cabinet, so I simply count the number of wrong predictions, and compare that with the accuracy of the model's predictions. For pork and votes with the president, I use the predicted values of a regression of the data on a dummy that indicates whether or not a party was in the cabinet as the baseline predictions. As in the case of the model's predictions, the fit relative to the data is measured by the R^2 of a regression of the actual data on the prediction.

4.4 Results

Yearly observations of the input variables were fed into the optimization routine that searched for the best allocation of both types of resources.

The algorithm used and the other numeric specifications are the same as those used in Section 3. Thus, besides the input parameters of interest that represent a stylized party system, the model takes two additional parameters, namely α and k . Parameter α is the exponent on the utility function of legislators, and to ensure that utility increases at a decreasing rate with political favors received ($v'(C) > 0$ and $v''(C) < 0$), it must lie in the interval $\alpha \in [0, 1]$. Parameter k is the degree to which there are returns to scale from dealing with parties rather than with individuals. In order to assure that it is more economical to deal with parties than with individual legislators, it must meet the condition $k > 1$. For my present purposes, as long as k and α meet their respective conditions, their precise value is not of direct interest to the analysis, and in this sense, they are just nuisance parameters. The results reported below are for the k that yields the best "joint fit" to the data on

⁴⁷My Job Market Paper #1 provides more comprehensive statistical models of legislative behavior.

the criteria of interest (e.g. cabinet membership, pork allocation, and votes with president) with α fixed at $2/3$.⁴⁸ Granted, this “calibration” was done in a rather informal manner, as it was impossible to devise, at least at this time, a likelihood function that would allow for the actual estimation of α and k .

Table 2 summarizes the “quality” of the model’s predictions for the three outputs of interest, and compares them with the baseline predictions. For cabinet membership, the table shows the share of correct predictions. For pork allocation and votes with the president, figures reflect the R^2 of a regression of the data on the predictions. In all cases, higher values indicate a better fit.

Table 2: Summary of the Fit of Results: Model vs. Baseline Predictions

	Cabinet Membership		Pork Allocation		Votes With President	
	Model	Base	Model	Model	Model	Baseline
1996	0.82	0.64	0.91	0.54	0.88	0.52
1997	0.91	0.64	0.97	0.53	0.88	0.55
1998	0.91	0.55	0.90	0.59	0.85	0.56
1999	0.55	0.55	0.92	0.92	0.91	0.85
2000	0.73	0.55	0.95	0.80	0.80	0.81
2001	0.73	0.55	0.95	0.80	0.76	0.82
2003	0.91	0.73	0.78	0.35	0.65	0.01
2004	0.82	0.55	0.49	0.01	0.63	0.07
2005	0.82	0.55	0.24	0.02	0.68	0.07
2006	0.64	0.36	0.52	0.04	0.56	0.15
Average	0.78	0.56	0.76	0.46	0.76	0.44

Notes: Figures range from 0 to 1, with higher values indicating better predictions. For cabinet membership, figures are the share of correct predictions, with eleven parties were included in each yearly simulation. For pork allocation and votes with the president, figures reflect the R^2 of a regression of the data on the predictions.

In general, the table shows that the model’s predictions are always better or at least as good as the baseline predictions, for all outputs in all years, with the exception of votes with the president in 2000 and 2001. On average, the model greatly improves on the baseline predictions in all three outputs for the whole period studied.

Except for the cabinet membership predictions for 1999, predictions for the Cardoso period (prior to 2003) are quite good. Figure 6 shows results for 1998, a typical year in this period. Deviations from perfect predictions are very small, too small, in fact, to make any meaningful analysis of what the model failed to capture. Given that the model’s optimality predictions deviate more from what is actually observed during the Lula presidency (2003 onwards), this second period is, in a sense, more interesting to analyze. Hence, in Figure 7 I report results for all years from 2003 through 2006.

⁴⁸The value of α was set after some experimentation, but using values between $1/2$ and $1/3$ affects the results only marginally.

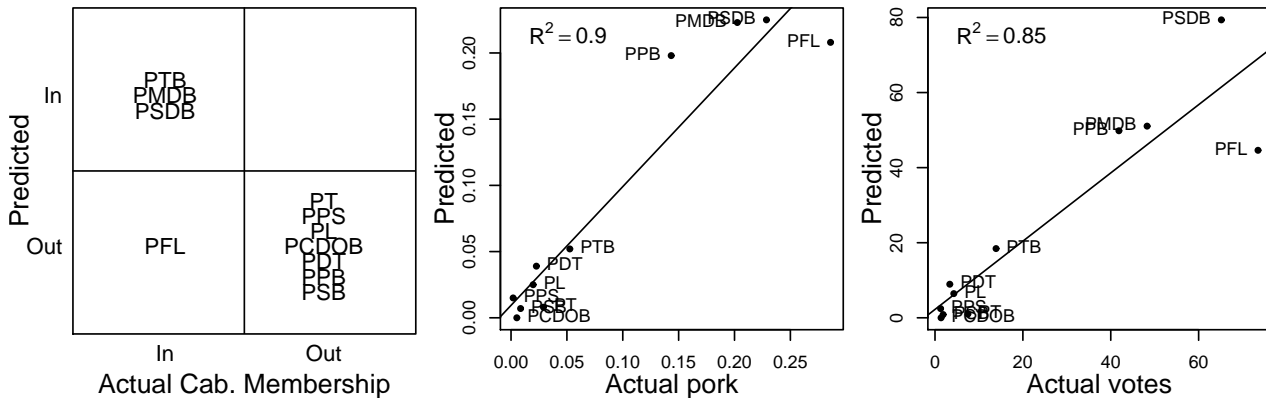


Figure 6: Typical Predictions and Data for the Cardoso Presidency (1998)

While the predictions for the Lula period were clearly inferior to those for the preceding president, a first look at the center column in Figure 7 shows that the PMDB alone accounts for most of the noise in the results. Closer examination shows that as a systematic pattern, the PMDB and the PTB received considerably less than the optimal share of pork predicted by the model in all four years. In contrast, despite all the talk about the PT’s (the president’s party) unwillingness to share the spoils with coalition partners, even though the PT received more than its optimal share in most years, the PP and the PL were the most overpaid parties in terms of pork.

Results for votes with the president add to the overall picture. Just as the PTB received less than the model’s optimal prediction regarding pork, it also voted less frequently with the president than would have been expected. The opposite holds for the PP and the PL, which received more pork than predicted, but which also lent more support than predicted. This particular result makes even more sense if one considers that the PP and PL, right-wing parties, were predicted to be out of the left wing president’s cabinet, but were actually included (the PP in 2006, and the PL in all years). One can say that in the case of these parties, Lula’s deviation from the optimal prediction was quite systematic. He allocated more resources and received more support from selected parties.

For the PT and the PMDB, the situation is a bit more intriguing. The president’s own party (PT) received more pork than predicted and delivered fewer votes. This is consistent with complains by coalition partners that government was not “sharing” enough resources with coalition partners. It also highlights the party’s failures to enforce its historically high levels of discipline once it finally came into power. As for the PMDB, while the optimal prediction suggests it should have received more pork, this shortfall did not cause the party to vote with the president less frequently than predicted by the model. The story here probably has to do with the fact that the PMDB was divided into two

factions throughout Lula's first term, with one of them backing the government and participating in the cabinet, and another having remaining in opposition.

Regardless of the merits of this explanation, it is interesting to note that after his tumultuous first term, Lula made it a top priority to have the whole PMDB on board for his second term. This means that this source of error in the predictions will probably not be repeated in the coming years, and the fit of the model's predictions will probably improve.

Another curiosity has to do with the PP, PL, and PTB, which were roughly equal sized parties, and shared an opportunistic character and center-right inclinations. By showing that the PTB was not getting its "fair" share of spoils during Lula's first term, my model corroborates one of the interpretations for why Roberto Jefferson, then the party's leader, blew the whistle on the *mensalão* scheme,⁴⁹ even though his party was one its alleged beneficiaries.

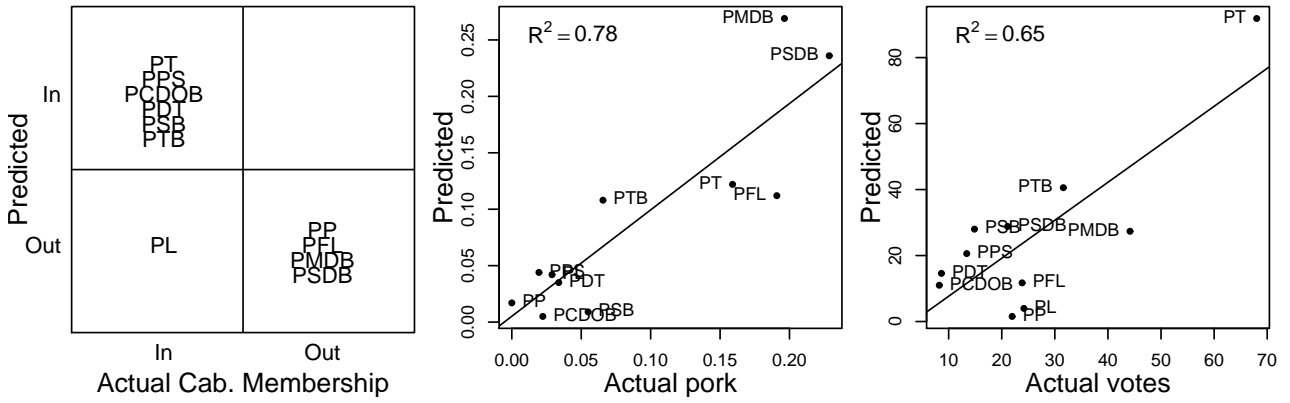
It is interesting to note that *both* the model and the baseline predictions perform better during the period when Cardoso was president than in Lula's presidency. This is especially true for predictions regarding pork, but can be noted as well in the other outputs. This difference suggests a shift in executive-legislative relations under the current president. Unfortunately, the intriguing question as to whether this shift is permanent cannot be answered with the data at hand, and it could simply reflect the temporary disarray caused by a new president, with little experience as an administrator, still learning on the job.⁵⁰ Recall that Cardoso had been at the heart of the executive for two years prior to taking office, and many of his allies had already been in government together during that period. Lula, in contrast, took office with no executive experience, and having to hold together a coalition composed of strange bedfellows. From this perspective, it is not surprising that Lula did not behave optimally in his first term.

My results show that presidential strategy was muddled at least in 2004 and 2005. While I have devoted quite a bit of effort to *describing* how results for these years deviate from what was expected, I have said nothing so far about the consequences of this deviation. It is very interesting to note that, in fact, the consequences of Lula's strategy in these years — or lack thereof — were clearly felt. Figure 8 shows that while for 2003 and 2006 the average number of legislators voting with the president is very close to the average level of support for the whole 1996–2006 period, in 2004 and especially 2005, the president enjoyed considerably less support. Yearly levels of support correlate with a measure of joint fit of the model⁵¹ (Corr. coefficient of 0.65, with a p.value of 0.04), and this

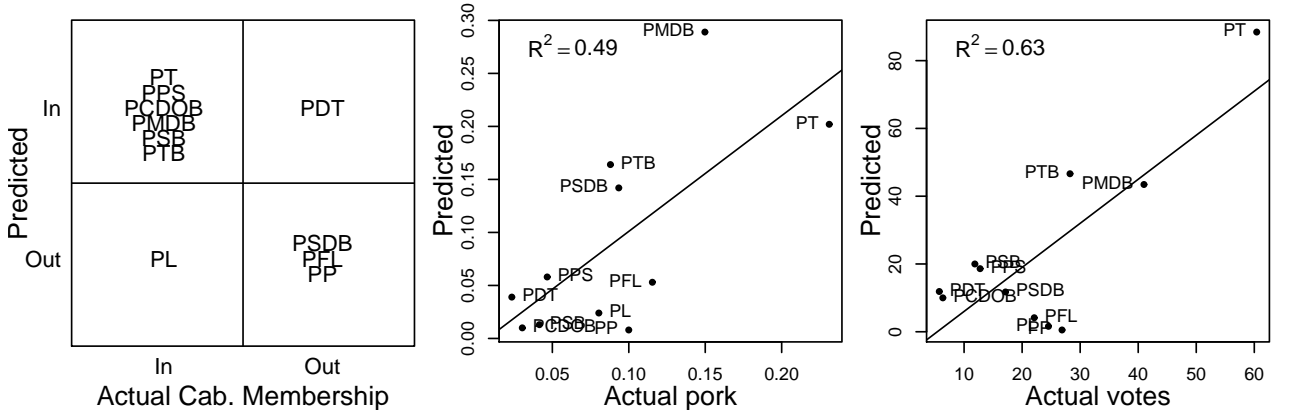
⁴⁹The *mensalão* was a scheme in place between 2003 and 2005, through which the executive is alleged to have used outright bribes to buy votes in the legislature. It is discussed in more detail in Chapter 5 of the dissertation.

⁵⁰This topic is discussed in Chapters 2 and 4 of the dissertation.

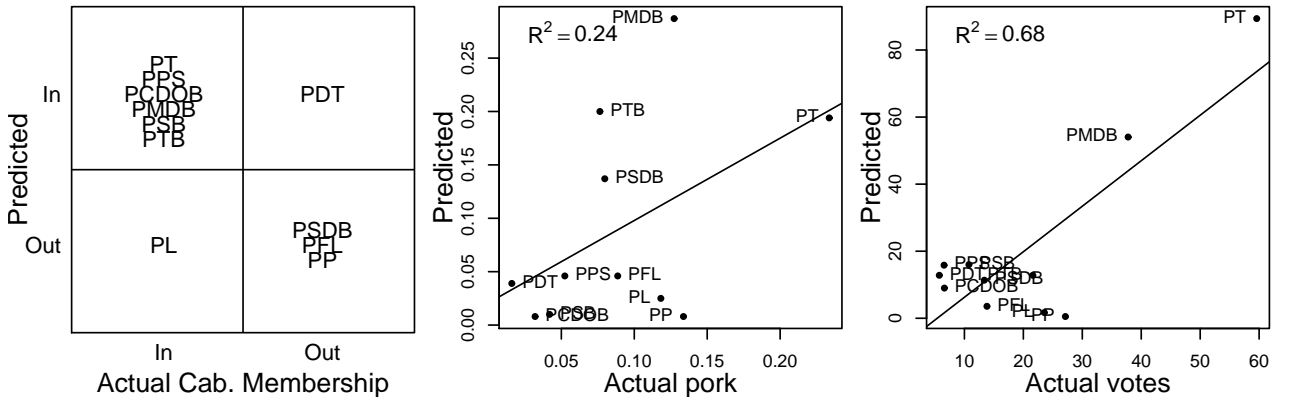
⁵¹Joint fit is simply the average of the fit in each of the three outputs of interest shown in Table 2.



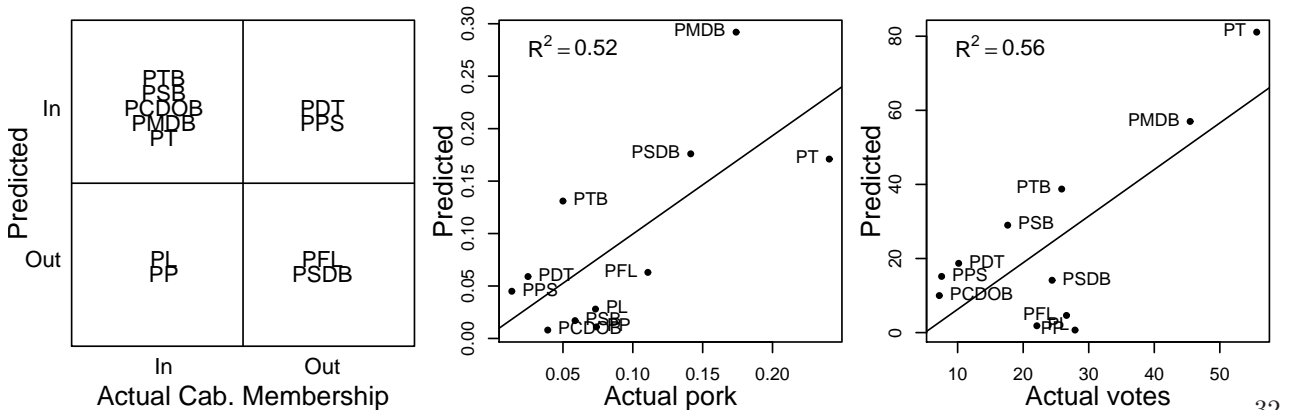
(a) Predictions and Data for 2003



(b) Predictions and Data for 2004



(c) Predictions and Data for 2005



(d) Predictions and Data for 2006

Figure 7: Predictions and Data for First Lula Presidency (2002-2006)

correlation is even stronger if one considers just the fit of the prediction of pork (Corr. coefficient of 0.83, with a p-value of 0.03).

These results indicate that Lula's behavior, at least in 2004 and 2005, was suboptimal and are compatible with the idea that presidents faces incentives to behave as the model predicts. If the president could subvert the structure of executive-legislative relations and get away with it while maintaining the same levels of support as before, it would indicate that other strategies were available, and that executive-legislative relations could be drifting into a different equilibrium. However, as Lula paid the price in lowered support for deviating from optimality, it is probably the case that these deviations will be corrected soon.

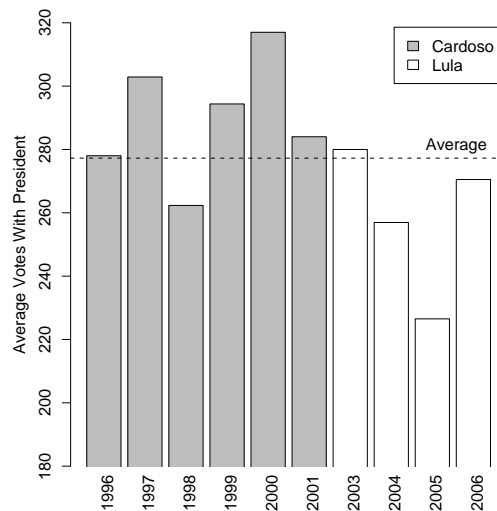


Figure 8: Average Number of Legislators Voting with the President

5 Conclusion

This paper proposed a generic framework in which the distribution of political favors (pork and cabinet positions) by presidents to a multiparty legislature in exchange for support is treated, from the president's perspective, as a problem of cost minimization. It also stated, analyzed, and solved the specific decision problem such a president faces, presented the model's main generic results, and analyzed its fit to real world data. The model is a step in the direction of unifying two parallel variants of the literature on coalition formation in presidential systems — one that stresses bargaining with parties and the other that emphasizes individual legislator behavior. In it, parties play an important role, even though bargaining with legislators also occurs. In principle, this is compatible both with a story where legislator's budget amendments are crucial to the exchange process and one in which

they are marginal, but it shows that parties, independent of any policy or ideological action, can be important simply as instruments to help distribute resources to legislators.

The most important result shown was that it is in the president's interest (i.e., it is cost-saving for the president) to bargain with parties *and* with individual legislators *if* both instruments are available. As a corollary, parties get fewer resources when individual-level bargaining exists. With fewer resources party organization suffers, which implies that the existence of individual level bargaining weakens parties.

The external validity of the model was assessed by empirically evaluating its predictions about cabinet membership, pork allocation, and voting behavior of parties in the legislature. The results suggest the model's predictions passed a minimal threshold of acceptability, and although we can never reach the point of confirming a theory, this paper shows that the theory is at least consistent with the data in a non-trivial way. The application of the model to different time periods and to different countries will shed further light on the limits of its scope.

In terms of the assumptions on which the model is built, the results suggest that presidents do behave *as if* they were cost minimizers. This tendency was more pronounced for the Cardoso government, but cannot be completely discarded for the Lula years. There is also important evidence that presidents' actual levels of support in the legislature increase when their behavior is closer to what is predicted by the model. That presidents lose from deviating from the model's predictions is consistent with the idea that these predictions indicate "optimal" behavior.

If the story told here is true, there are some important implications for real world politics. The "horse-trading" that accompanies coalition formation in multiparty presidential systems is frequently described in the media and regarded by the population as a "waste" of resources caused by self-interested politicians. The remedy commonly prescribed is the strengthening of parties and the marginalization of the "individually motivated" politician.

My model suggests, however, that the individually motivated politician might actually be more compatible with effective government than strong parties, as long as one equates "effective" with "cost saving." This, however, only refers to the exchange mechanism itself, and does not consider the fact that a system such as the Brazilian one invites corruption, and can produce a waste of resources in excess of any reduction in transaction costs between executive and legislature as well as other negative externalities that accompany a more venal approach to politics.⁵²

⁵²Since at least the early 1990's, scandals surrounding the country's budgetary process have been an almost constant feature of politics. In 1993, the arrest of the secretary of the budget committee José Carlos Alves dos Santos charged with murdering his wife, led to revelations about a kickback scheme involving long serving back-benchers. This case, which became known as the '*Anões do Orçamento*' (or "budget dwarfs," because of their short stature) scandal, culminated with Deputy João Alves trying to convince the country, in a public hearing, that the fortune he had amassed during his

This model might help explain why so many “modernizing” presidents in Latin America have resorted to “traditional” coalition building techniques (e.g. vote-buying of the sort described here) in the recent past. Also, if individual level bargaining helps lower costs to the president, it becomes an specially attractive option in times where fiscal austerity is the most immediate goal, which might help explain the resilience of this practice on the face of strong criticism from several sectors of society.

The mere existence of individual level bargaining diverts resources away from parties, and contributes directly to their further weakening. The intuitive implication, though relying on an extrapolation of the static model presented here, is that there is very little middle ground possible between a system with strong parties and a highly individualized political system with weak parties. Once the opportunity for individual level bargaining exists, it will tend to erode party structures. If this opportunity already exists, presidents themselves have no incentive to introduce institutional changes that would limit it, and neither do individual legislators who benefit from this bargaining.

These issues are inherently connected to important normative questions. How to balance effective government with adequate representation? Should we care about having strong parties? Answering these questions is beyond the scope of this paper, but it should be noted that no system is set in stone, and as this paper has shown, the behavior of legislators and presidents is consistent with the incentives they face.

A Proof of Proposition 5

A.1 Within Parties

Fix X_j^* , such that the total number of votes the president obtains in party j is also fixed. The relative allocation of private and club goods within party j will be the one that minimizes total payments made to the party. If $N_j\Phi_j(0) < Q_j \leq N_j$, define X_j^* such that $N_j\Phi_j(X_j^*) = Q_j$,⁵³ and express private goods as a function of club goods. The problem in Eq. 5 then becomes:

$$\text{Total Payments} = M_j + N_j \int_{v(\mu_j(M_j))}^{X_j^*} [v^{-1}(X) - \mu_j(M_j)] \phi(X) dX. \quad (11)$$

public life came from winning the national lottery many times. In recent years, the *Sanguessugas* the *Gautama* cases have centered around the budget making process. In the former legislators received kickbacks for using their amendments quota to include the purchase of ambulances in the budget, and in the latter a construction company paid legislators to include specific public works projects in the budget and then lobby the executive for actual disbursements.

⁵³For $Q_j = N_j$, define $X_j^* = \infty$ if the distribution ϕ_j has infinity support.

The first order condition yields

$$1 + N_j \left\{ -v'(m_j) \mu'_j(M_j) \left[v^{-1}(\tilde{X}_j) - \mu_j(M_j) \right] \phi(\tilde{X}_j) - \int_{v(\mu_j(M_j))}^{X_j^*} \mu'_j(M_j) \phi(X) dX \right\} = 0,$$

which can be re-written as

$$N_j \left\{ v'(m_j) \left[v^{-1}(\tilde{X}_j) - \mu_j(M_j) \right] \phi(\tilde{X}_j) + \left[\Phi_j(X_j^*) - \Phi_j(\tilde{X}_j) \right] \right\} \mu'_j(M_j) = 1,$$

and which after substituting $v(\mu_j(M_j)) = \tilde{X}_j$, and canceling terms, reduces to

$$N_j \left[\Phi_j(X_j^*) - \Phi_j(\tilde{X}_j) \right] \mu'_j(M_j) = 1.$$

The second order condition is given by

$$N_j v'(\mu_j(M_j)) [\mu'_j(M_j)]^2 \phi_j(\tilde{X}_j) - N_j \mu''_j(M_j) \left[\Phi_j(X_j^*) - \Phi_j(\tilde{X}_j) \right] \geq 0,$$

whose first term is always positive, while the second will be whenever $\mu''_j(M_j) \leq 0$. The case where $Q_j \leq N_j \Phi_j(0)$ is trivial. Since the legislators with $X \leq 0$ are willing to vote with the president without receiving any political favors, $M_j = P_j = 0$. Finally, it is not possible to have $Q_j > N_j$.

A.2 Across Parties

For simplicity, it is best to use only two parties in the analysis of the *across parties* condition, but the results can be extended for the general case with $J \geq 2$. Define $TC_j(Q_j)$ as the minimum cost to “buy” Q_j votes from party j .⁵⁴ From the quorum constraint $Q_2 = Q - Q_1$, so the president’s problem can be stated as

$$\min_{Q_1 \in [0, N_1]} \{ TC_1(Q_1) + TC_2(Q - Q_1) \}. \quad (12)$$

Now, note that $\frac{dTC_j}{dQ_j} = \frac{dTC_j}{dX_j^*} \times \frac{dX_j^*}{dQ_j}$. Applying the Envelope Theorem on Eq. 11, and using $N_j \Phi_j(X_j^*) = Q_j$, yields:

$$\begin{aligned} \frac{dTC_j}{dQ_j} &= N_j \phi_j(X_j^*) \left[v^{-1}(X_j^*) - \mu_j(M_j) \right] \left(\frac{1}{N_j \phi_j(X_j^*)} \right) \\ &= \left[v^{-1}(X_j^*) - \mu_j(M_j) \right] = p_j^*(X_j^*). \end{aligned}$$

⁵⁴Let $TC_j(Q_j) = \infty$ if $Q_j > N_j$.

Thus, the first order condition for Eq. 12 is

$$[v^{-1}(X_1^*) - \mu_1(M_1)] - [v^{-1}(X_2^*) - \mu_j(M_2)] = 0,$$

or just

$$p_1^*(X_1^*) = p_2^*(X_2^*),$$

and the second order condition is

$$\frac{dp_1^*(X_1^*)}{dQ_1} + \frac{dp_2^*(X_2^*)}{dQ_2} \geq 0.$$

For the general case, where $J \geq 2$, the first order conditions are

$$[v^{-1}(X_j^*) - v^{-1}(\tilde{X}_j)] = [v^{-1}(X_k^*) - v^{-1}(\tilde{X}_k)] \quad j, k = 1, \dots, J,$$

and the second order conditions

$$\frac{dp_j^*(X_j^*)}{dQ_j} + \frac{dp_k^*(X_k^*)}{dQ_k} \geq 0 \quad \forall j \neq k.$$

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