

Submission Number: PET11-11-00056

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This paper studies party discipline in congress within a political agency framework with retrospective voting. The party leaders want their party to control both the executive and legislative branches of government. Party discipline then implies more aligned incumbents' preferences and serves as an incentive device to enforce office-motivated congress members to perform in line with the party leadership's objective. I show first that the same party is more likely to control the two branches of government (i.e., unified government) the stronger the party discipline in congress. Second, the leader of governing party imposes more party discipline under unified government than the opposition leader does under divided government. Moreover, my results indicate that the incumbents' aggregate performance increases with party discipline, so a representative voter is getting better off.

JEL classification: D72.

Keywords: Party discipline; Political agency; Retrospective voting; Office-motivated politicians.

*The author is grateful to Luis Corchón, M.A. de Frutos and Ignacio Ortuño Ortín for helpful comments, suggestions and encouragement. The author also thanks David Austen-Smith, Carmen Beviá, Anna Bogomolnaia, Antonio Cabrales, Jacques Crémer, Daniel Diermeier, Philippos Louis, Rebecca Morton, and seminar and conference participants at several institutions for useful comments and suggestions. The project grant ECO2008-02738 of the Spanish Ministry of Science and Innovation is gratefully acknowledged. The usual disclaimer applies.

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1. Introduction

In modern democracies, party discipline is defined as the ability of party leadership to control its legislature. Party discipline usually refers to the competence of a party leader to get its partisan congress members to support the party line rather than to follow the special interests of their home districts. Party discipline has been a topic of frequent study in the empirical literature (see Heller and Mershon 2008, Krehbiel 2000, McCarty et al. 2001, Snyder and Groseclose 2000, among many others).

A number of authors have produced several formal models of party discipline. For example, some scholars elaborated on informational argument, pointing out that strong party discipline informs voters about the future policy of the candidate who, once elected, cannot deviate from the party official platform (see Ashworth and Bueno de Mesquita 2004, Castanheira and Crutzen 2010, Cox and McCubbins 1993, Snyder and Ting 2002). In other studies, party discipline is modeled as the ability of party leadership to control its members in the legislature such that they vote in line with the party ideological position (see Colomer 2005, Eguia 2011, Iaryczower 2008, McGillivray 1997, Patty 2008, Volden and Bergman 2006). In these models, the party leaders' objective is to discipline their partisan members who might have different ideological preferences. In a different vein, Grossman and Helpman (2008) defined party discipline as a party's ability to induce ex-post adherence to a pre-announced position. In other words, a level of party discipline determines the "extent of commitment to party platforms".¹

This paper complements the aforementioned literature by analyzing party discipline under assumption of office-motivated party leaders who want their party to control both the executive and the legislative branches of government. In my framework, party leaders impose party discipline over their partisan congress members in order to motivate the latter to perform in line with the party objective of controlling the two branches of government rather than to only seek reelection in their home districts. The paper therefore emphasizes the role of party discipline as an incentive device that motivates congress members to perform in the interests of their party leadership.

I build a political agency model of interaction between office-motivated politicians (the executive, the opposition leader and the congress member) and their constituency in the presence of a moral hazard problem.² The representative voter cares about the politicians' per-

¹Grossman and Helpman (2008), p. 330.

²For the sake of tractability, I assume that there is a single national district and the congress therefore consists of one congress member.

formances, which are observable but not contractible. The executive, as a leader of governing party, cares about her party controlling the executive and legislative branches of government. It means that the executive seeks to be reelected herself and also wants her partisan ally to win in the congressional election. The leader of the opposition also wants her party to win the executive and legislative elections, so she wants the incumbent executive to be thrown out of office (which would lead the opposition to win the presidential election) and wants the congress to be controlled by her partisan ally.

Consider first a benchmark case with no party discipline in the congress. The incumbent congress member is office-motivated and cares only about his own reelection chances. The representative voter applies optimal retrospective voting rules to reward the incumbents. As usual, the executive will be reelected if her performance exceeds an optimal threshold. The reelection of the congress member will be conditioned on his own performance and also on the executive's performance in order to incentivize the executive who cares about the reelection prospects of the congress member. Moreover, the voter will use different retrospective voting rules in the case of unified and divided government. Indeed, under unified government, the executive wants her partisan congress member to be reelected in the coming election. The incumbents' preferences are therefore positively aligned, which implies positively correlated optimal retrospective voting rules. In the case of divided government, the executive prefers the congress member to be thrown out of office for the executive's partisan ally to win the congressional election. The incumbents' preferences are thus negatively aligned, and so are the optimal retrospective voting rules.

Assume now that party leaders (i.e., the executive and the opposition leader) can impose costly party discipline over their partisan congress member. The executive will impose party discipline over her partisan congress member in the case of unified government, while the opposition leader – in the case of divided government (when the congress is controlled by her partisan ally). Party discipline means that the congress member supports the goals of his party leadership. In my framework, this implies that the congress member will share his party leader's objectives of controlling the two branches of government. Strong party discipline thus leads to further alignment of the incumbents' preferences. Indeed, in the case of unified government, the disciplined congress member wants the executive to be reelected in the coming elections, so the incumbents' preferences are getting even more positively aligned. Under divided government, in reverse, the congress member prefers the executive to be thrown out of office that makes the incumbents' preferences even more negatively aligned. The voter thus adopts more correlated (positively under unified government or negatively under divided government) retrospective voting rules to motivate the congress member to perform better,

for the sake of his party as well as for himself.

The party leaders choose to impose party discipline in order to somehow "delegate" the party goal of controlling the two branches of government to their partisan congress members. Strong party discipline means more aligned incumbents' preferences. In turn, the latter implies more correlated retrospective voting rules, which finally motivates the congress member to exert higher effort. The executive therefore can "free-ride" on the congress member's performance, which leads to the lower executive's effort. Nonetheless, a stronger party discipline increases the incumbents' aggregate performance making the voter better off. Moreover, if party discipline were cheap to impose, the party leaders would choose to discipline their partisan congress member as much as possible since the probability of controlling the two branches of government increases with party discipline. Indeed, under unified government the reelection outcomes of the incumbents are positively correlated. Stronger party discipline increases further this correlation. Therefore, the incumbents are more likely to be reelected together. In the case of divided government, the reelection outcomes are negatively correlated, and they become even more negatively correlated the stronger the party discipline. It is more likely then that the congress member is reelected while the executive is thrown out of office.

My results indicate that the leader of the governing party, i.e. the executive, imposes more party discipline under unified government than the opposition leader does under divided government. The reason is that a stronger party discipline allows the executive to free-ride on the congress member's performance and reduces the executive's effort (and the associated cost). Thus, the executive takes into account this effect while choosing the level of party discipline in the congress, which results in a stronger party discipline under unified government as in comparison with divided government.

The retrospective voting approach in political agency framework used here started with the seminal work of Barro (1973), to be followed by Ferejohn (1986), Persson et al. (1997), Austen-Smith and Banks (1989), Banks and Sundaram (1993, 1996), and others. In addition to a sound theoretical framework, this approach has received considerable empirical support (see, for example, Peltzman 1992 and Besley and Case 1995a, 1995b, 2003). Besley (2006) "emphasizes the empirical potential of these models in explaining real world policy choices."³ In a recent article in the *New York Times*, Glaeser pointed out that the "president ... is both our leader and our employee. We (the voters) chose him, our taxes pay his salary, and we can fire him in four years."⁴ The political agency approach may therefore be appropriate for

³Besley (2006), p. 3.

⁴Edward L. Glaeser "Lower (and More Realistic) Presidential Expectations," January 20, 2009. Available

modeling political interactions between politicians and voters. Even so, elected politicians can only be offered implicit incentive schemes; it is difficult to reward public policies with explicit contracts.

The rest of the paper is organized as follows. Section 2 outlines a model. Section 3 presents the formal analysis. Finally, Section 4 concludes the paper.

2. Model

Consider a single national district where an executive E and a congress member C implement policies on behalf of a representative voter.⁵ There is no ideological heterogeneity in politicians' and voter's policy preferences.⁶ Each politician $i \in \{E, C\}$ performs a policy task determined by her unobservable effort $e_i \in [0, \bar{e}] \subset \mathbb{R}$ and her random ability $a_i \sim N(0, \sigma^2)$.⁷ The cost of effort of politician i is given by $\frac{e_i^2}{2}$.⁸ Ability and effort are additive. Politician i 's performance

$$p_i = e_i + a_i$$

(but not its composition between effort and ability) is observed by the representative voter.

I assume that there are two political parties and each politician is affiliated with one of these parties. The state variable $\Gamma \in \{U, D\}$ is introduced where $\Gamma = U$ corresponds to the case of unified government (i.e., the same party controls the two branches of government) and $\Gamma = D$ corresponds to the case of divided government (i.e., one party controls the presidential office and the other party the congress).

The presidential and congressional elections are held simultaneously. In each election the candidates (an incumbent and a challenger) are affiliated with opposite parties. The incumbents and the challengers are identical in all respects except party label.

online at <http://economix.blogs.nytimes.com/2009/01/20/lower-and-more-realistic-presidential-expectations/> (accessed December 1, 2010).

⁵An extended version of the model is available upon request, where there are several districts and a representative voter of each district elects a congress member for the national legislature. This extension adds no interesting features to the analysis but considerably complicates algebra. One district is assumed in order to keep the analysis clean and the results tractable.

⁶Since there is no heterogeneity in policy preferences, I can, without loss of generality, assume a representative voter.

⁷Assuming non-zero average ability of the politicians leads to more complicated algebra but similar results. The analysis of this case is available upon request.

⁸A simple cost specification $\frac{e_i^2}{2}$ allows a closed-form solution in this framework. The results would be qualitatively the same for a strictly convex and increasing cost function.

Politicians Consider first a contest for the presidential office. I assume that the incumbent executive is a leader of one political party and a challenger is a leader of the other political party. As party leaders, they care about their party's chances of controlling the two branches of government.⁹ Their goal is to maximize the probability of their party winning in the presidential and congressional elections. So the net objective function of the incumbent executive E , denoted Ψ_E^Γ in state Γ , is given by

$$\begin{aligned}\Psi_E^U(e_E, e_C) &= Pr(E \text{ is reelected and } C \text{ is reelected}) - \frac{e_E^2}{2}, \\ \Psi_E^D(e_E, e_C) &= Pr(E \text{ is reelected and } C \text{ is not reelected}) - \frac{e_E^2}{2}.\end{aligned}$$

First, in each state the executive E wants to be reelected herself. Second, in the case of unified government, $\Gamma = U$, the executive E prefers the congress member C to be reelected too. In the case of divided government, $\Gamma = D$, E wants an incumbent congress member to be thrown out of office. This will imply that a challenger (from E 's party) will be elected in the congressional election.

A leader of the opposition, denoted by O , is a challenger for the presidential office and has the same objective (in reverse). She wants the both incumbents to be dismissed in the case of unified government, $\Gamma = U$, that would imply her own appointment for the executive office and her partisan's election for the congress. In the case of divided government, $\Gamma = D$, the opposition leader wants the congress member C to be reelected while the executive E to be thrown out of office that would lead to her party controlling the two branches of government. O 's objective function, Ψ_O^Γ , is

$$\begin{aligned}\Psi_O^U(e_E, e_C) &= Pr(E \text{ is not reelected and } C \text{ is not reelected}), \\ \Psi_O^D(e_E, e_C) &= Pr(E \text{ is not reelected and } C \text{ is reelected}).\end{aligned}$$

The party leaders can impose a certain control, known as party discipline, over its congress members. In modern democracies, party discipline usually refers to the competence of a party leader to get its partisan congress members to support the party goals rather than to follow the special interests of their home districts. In the absence of party discipline,

⁹Several authors made similar assumptions about politicians' partisan preferences. Fr chet te et al. (2008) assumed that the party leader's objective is to maximize the reelection chances of the party's incumbent politicians. In turn, Brollo and Nannicini (2010) assumed that an executive wants to maximize "the political capital represented by aligned mayors" by increasing the likelihood that a municipality is run by a mayor aligned with the central government. Zudenkova (2011) considered politicians with aligned preferences that care about their party's overall representation in the executive and legislative branches of government, and not just their own reelection prospects.

a congress member just wants to satisfy the wishes of a representative voter in his home district in order to be reelected in the coming elections. In the context of my model, no party discipline would mean that a congress member C 's objective is simply to maximize his reelection probability $Pr_C(e_C)$. Assume now that party leaders can ensure party discipline by imposing the party objective (i.e., their own objective) to their partisan congress members. In particular, a party leader $j \in \{E, O\}$ can impose the level of party discipline $\vartheta_j \in [0, 1]$ to get her partisan congress member to support the official party goal of controlling the two branches of government. I assume that this level of party discipline determines the strength with which a congress member C shares the preferences of his party leadership. Party discipline is costly to enforce; the cost is $\frac{k\vartheta_j^2}{2}$ with $k > 0$, and can be interpreted as the expenses for party whips whose primary task is to ensure party discipline in a legislature (usually by offering rewards or threatening punishments to party members).¹⁰ The opposition leader O can't impose party discipline in the case of unified government since a congress member C belongs to the governing party. O can, however, ensure party discipline in the case of divided government by making her partisan congress member C support the party objective of holding the two branches of government. In turn, the executive E can control her partisan congress member only in the case of unified government. Under divided government, E has no partisan member in the congress. Thus, it follows that the congress member's net objective, denoted by Ψ_C^Γ , becomes

$$\begin{aligned}\Psi_C^U(e_E, e_C) &= \vartheta_E Pr(E \text{ is reelected and } C \text{ is reelected}) + Pr_C(e_C) - \frac{e_C^2}{2}, \\ \Psi_C^D(e_E, e_C) &= \vartheta_O Pr(E \text{ is not reelected and } C \text{ is reelected}) + Pr_C(e_C) - \frac{e_C^2}{2}.\end{aligned}$$

The reasonable assumption here is that even with party discipline the congress member still values his own reelection more than his party leadership's goal of controlling the two branches of government. That is why his own reelection probability is included in the objective function.

Note that the politicians' incentives are aligned as they share their party's common goal of controlling the two branches of government. Indeed, as a party leader, the executive (apart from her own reelection) cares also about her party chances of winning in the congressional election. Moreover, party discipline can be enforced in the congress such that the congress member performs not only in his own self-interests but also in the interests of his party leadership. In the case of unified government, the executive can introduce party discipline

¹⁰ A simple cost specification $\frac{k\vartheta_j^2}{2}$ considerably simplifies algebra and guarantees the second-order conditions to hold.

over her partisan congress member. Then the incumbents' preferences are positively aligned as each incumbent (apart from her own reelection) also wants her counterpart to be reelected. In the case of divided government, the opposition leader can enforce the party objective to her partisan congress member. The incumbents' preferences are then negatively aligned as each incumbent wants to be reelected herself and wants her counterpart to be thrown out of office (that would imply the reelection of her partisan ally).

Representative Voter The voter cares about the policy outcomes according to a linear utility function

$$p_E + p_C.$$

Policy performance is not contractible. Public policies are hard to reward directly with explicit contracts. It is more natural to assume implicit incentive contracting in this framework. More precisely, the politicians are held accountable for their performance at the moment of election. I assume that the voter uses retrospective voting to reappoint the incumbents, i.e., bases the reelection decision on the politicians' performances p_E and p_C to incentivize their efforts.

The incumbents care not only about their own reelection prospects but about their parties' chances of controlling the two branches of government. This gives the voter an additional tool to increase the politicians' accountability. As usual, the voter will reward politician i for her own performance p_i in order to give her an incentive to perform well. Moreover, since executive E cares about the reelection chances of congress member C , the voter will condition the reelection of the latter on the executive's performance p_E . This will provide an extra incentive for the executive who wants her partisan ally to win in the congressional election. In the same vein, since congress member C might also share his party leader's objective of controlling the two branches of government, the executive's reelection will be conditioned on a congress member's performance, p_C , to incentivize congress member C . Therefore, owing to the alignment of the incumbents' preferences, an optimal retrospective voting rule for incumbent i 's reelection might depend on both incumbents' performances p_E and p_C . I assume that the voter applies linear retrospective rules determined by scalars λ_E (for E 's reelection) and λ_C (for C 's reelection), $\lambda_E, \lambda_C \in \mathbb{R}$.¹¹ In particular, the voter conditions reelection of executive E on joint performance of the two incumbents given by a linear combination $p_E + \lambda_E p_C$. By analogy, reelection of congress member C depends on $p_C + \lambda_C p_E$. To prevent bizarre outcomes (such as incumbents with poor performances would

¹¹I consider linear retrospective rules for tractability reasons as they allow a closed-form solution.

be reelected while ones with better performances would not) the restriction $\lambda_E \lambda_C \leq 1$ is placed.

The voter knows that the only alternative to reappointing incumbents is to elect challengers of average ability who will exert equilibrium efforts e'_E and e'_C (where, e'_i denotes the voter's perception of e_i). Thus, the voter compares the incumbents' performances with their challengers' expected performances and votes accordingly. The executive E will be reelected if $p_E + \lambda_E p_C \geq e'_E + \lambda_E e'_C$. In turn, congress member C will be reappointed if $p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E$.¹²

The intuition suggests that the optimal retrospective voting rules will differ between the states. Indeed, in the case of unified government, the positively aligned incumbents' preferences imply that the executive has an extra incentive to perform well if the congress member reelection chances increase with the executive's performance. By analogy, if the congress member success raises the executive's reelection prospects then the congress member is more eager to perform well. However, in the case of divided government, the negatively aligned incumbents' preferences lead to the different optimal reelection rules. Indeed, each incumbent will perform better if her success decreases the reelection chances of the incumbent counterpart affiliated with the rival political party.

Timing This is a sequential game between politicians and a representative voter. The timing of events is as follows. First, the incumbents are drawn randomly, and a state $\Gamma \in \{U, D\}$ is realized. Second, in the case of unified government, $\Gamma = U$, the executive E imposes a level of party discipline ϑ_E in the congress. In the case of divided government, $\Gamma = D$, it's a leader of the opposition O who imposes a level of party discipline ϑ_O in the congress. Next, the voter commits to the retrospective voting rules determined by scalars λ_E (for E 's reelection) and λ_C (for C 's reelection). The incumbents exert efforts e_E and e_C then. Finally, politicians' abilities a_E and a_C are realized, and policy outcomes p_E and p_C are observed. The presidential and congressional elections are held simultaneously and the voter applies the chosen retrospective voting rules to reward (reelect) or punish (dismiss) the incumbents.

I analyze the game backwards to solve for a subgame perfect equilibrium. The incumbents' efforts e_E^Γ and e_C^Γ in each state $\Gamma \in \{U, D\}$ under linear rules λ_E and λ_C will be found first. Next, I solve for the scalars λ_E^Γ and λ_C^Γ that determine the voter's retrospective voting rules in each state Γ . Finally, I examine the executive's choice of ϑ_E (if $\Gamma = U$) and the opposition leader's choice of ϑ_O (if $\Gamma = D$) of imposing party discipline to their partisan congress members.

¹²The formal proof of this is available upon request.

Intuition Intuitively, the party leaders' objective of controlling the two branches of government implies the alignment of the incumbents' preferences. The voter conditions the reelection of the congress member on the performances of the two incumbents in order to provide right incentives to the executive. Imposing party discipline in the congress leads to even further alignment of the incumbents' preferences, which is used by the voter to increase the accountability. Under party discipline, the voter will condition the reelection of each incumbent on the performances of the two of them. In other words, party discipline in the congress serves as an extra incentive device for the congress member. The party leaders' will choose to enforce a certain level of party discipline that will allow them to "delegate" to their partisan congress member the implementation of a task of controlling the two branches of government.

3. Analysis

Consider the incumbents' decision on efforts e_E^Γ and e_C^Γ under linear rules λ_E and λ_C when the executive has chosen ϑ_E in the case of unified government and the opposition leader has chosen ϑ_O in the case of divided government. The executive's net objective of controlling the two branches of government is given by

$$\begin{aligned}\Psi_E^U(e_E, e_C) &= Pr(\{p_E + \lambda_E p_C \geq e'_E + \lambda_E e'_C\} \cap \{p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E\}) - \frac{e_E^2}{2} - \frac{k\vartheta_E^2}{2}, \\ \Psi_E^D(e_E, e_C) &= Pr(\{p_E + \lambda_E p_C \geq e'_E + \lambda_E e'_C\} \cap \{p_C + \lambda_C p_E < e'_C + \lambda_C e'_E\}) - \frac{e_E^2}{2},\end{aligned}$$

where $p_E = e_E + a_E$ and $p_C = e_C + a_C$. The congress member's net objective depends on the level of party discipline and is given by

$$\begin{aligned}\Psi_C^U(e_E, e_C) &= \vartheta_E Pr(\{p_E + \lambda_E p_C \geq e'_E + \lambda_E e'_C\} \cap \{p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E\}) \\ &\quad + Pr(p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E) - \frac{e_C^2}{2}, \\ \Psi_C^D(e_E, e_C) &= \vartheta_O Pr(\{p_E + \lambda_E p_C < e'_E + \lambda_E e'_C\} \cap \{p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E\}) \\ &\quad + Pr(p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E) - \frac{e_C^2}{2}.\end{aligned}$$

The incumbents make efforts e_E and e_C before knowing the realization of their abilities a_E and a_C , and take the voter's expectations e'_E and e'_C as given. The following proposition establishes the results on the incumbents' efforts e_E^Γ and e_C^Γ under linear rules λ_E and λ_C . (The proof can be found in the Appendix.)

Proposition 1. Under linear retrospective voting rules λ_E and λ_C , $\lambda_E \lambda_C \leq 1$, the incumbents exert efforts e_E^Γ and e_C^Γ equal to

$$e_E^U = \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_E^2}} + \frac{\lambda_C}{\sqrt{1+\lambda_C^2}} \right),$$

$$e_C^U = \frac{\vartheta_E}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_C^2}} + \frac{\lambda_E}{\sqrt{1+\lambda_E^2}} \right) + \frac{1}{\sqrt{2\pi}\sigma\sqrt{1+\lambda_C^2}}$$

in the case of unified government, $\Gamma = U$, and

$$e_E^D = \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_E^2}} - \frac{\lambda_C}{\sqrt{1+\lambda_C^2}} \right),$$

$$e_C^D = \frac{\vartheta_O}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_C^2}} - \frac{\lambda_E}{\sqrt{1+\lambda_E^2}} \right) + \frac{1}{\sqrt{2\pi}\sigma\sqrt{1+\lambda_C^2}}$$

in the case of divided government, $\Gamma = D$.

Turn now to the voter's choice of linear retrospective voting rules determined by scalars λ_E and λ_C . Maximizing $e_E^\Gamma + e_C^\Gamma$ with respect to λ_E and λ_C yields an equilibrium in retrospective voting strategies. The results are summarized in the following proposition (the proof is straightforward).

Proposition 2. The optimal linear retrospective voting rules the voter uses for the incumbents' reelection are determined by scalars λ_E^Γ and λ_C^Γ such that

$$\lambda_E^U = \vartheta_E \text{ and } \lambda_C^U = \frac{1}{2 + \vartheta_E}$$

in the case of unified government, $\Gamma = U$, and

$$\lambda_E^D = -\vartheta_O \text{ and } \lambda_C^D = -\frac{1}{2 + \vartheta_O}$$

in the case of divided government, $\Gamma = D$. Under these optimal rules, the politicians' efforts are equal to

$$e_E^U = \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\vartheta_E^2}} + \frac{1}{\sqrt{5+4\vartheta_E+\vartheta_E^2}} \right),$$

$$e_C^U = \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{\vartheta_E^2}{\sqrt{1+\vartheta_E^2}} + \frac{(2+\vartheta_E)^2}{\sqrt{5+4\vartheta_E+\vartheta_E^2}} \right)$$

in the case of unified government, $\Gamma = U$, and

$$\begin{aligned} e_E^D &= \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1 + \vartheta_O^2}} + \frac{1}{\sqrt{5 + 4\vartheta_O + \vartheta_O^2}} \right), \\ e_C^D &= \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{\vartheta_O^2}{\sqrt{1 + \vartheta_O^2}} + \frac{(2 + \vartheta_O)^2}{\sqrt{5 + 4\vartheta_O + \vartheta_O^2}} \right). \end{aligned}$$

in the case of divided government, $\Gamma = D$.

As expected, in the case of unified government, $\Gamma = U$, the reelection of one incumbent is positively correlated with the performance of the other incumbent. Thus, the success of one incumbent props up the reelection of the other incumbent. So the positively aligned incumbents' preferences imply positively correlated reelection outcomes under unified government. In the case of divided government, $\Gamma = D$, the reelection of one incumbent is negatively correlated with the performance of the other incumbent. Therefore, the success of one incumbent drags down the reelection of the other incumbent. Thus, under divided government the negatively aligned incumbents' preferences lead to negatively correlated reelection outcomes. In fact, two-sided coattail effects arise. On the one hand, the executive's performance affects the congress member's reelection, which implies a presidential coattail effect. On the other hand, the executive's reelection depends on the congress member's performance, which results in a reverse coattail effect.¹³

Moreover, in the absence of party discipline, $\vartheta_j = 0$, $j \in \{E, O\}$, the voter uses joint retrospective voting rule only to reward the congress member C . The optimal rule for reappointing executive E is a simple cutoff rule such that E is reelected if her performance p_E exceeds the equilibrium level of effort e'_E (where e'_E denotes the voter's perception of e_E). Intuitively, in the absence of party discipline, the congress member cares only about his own reelection, that is why there is no way to incentivize him by conditioning the executive's reelection on C 's performance. If the party discipline is enforced in the congress, $\vartheta_j \neq 0$, the congress member will share his party leader's goal of controlling the two branches of government. So the congress member will care about the executive's reelection prospects, and the voter can incentivize him by conditioning E 's reelection on the congress member's performance. Moreover, the stronger the party discipline in the congress, ϑ_j , the more correlated (positively if $\Gamma = U$ and negatively if $\Gamma = D$) E 's reelection with C 's performance. Indeed, the more the congress member shares the party leadership's objective of controlling the two branches of

¹³See Zudenkova (2011) for a formal model of coattail voting.

government, the more incentives he has to perform better. The voter just provides him with an optimal incentive scheme by making the executive's reelection more dependent (positively if $\Gamma = U$ and negatively if $\Gamma = D$) on the congress member's performance. However, the stronger the party discipline in the congress, ϑ_j , the less correlated (positively if $\Gamma = U$ and negatively if $\Gamma = D$) C 's reelection with E 's performance. The reason is that stronger party discipline implies more incentives for the congress member but at the same time less incentives for the executive, who can now partly "delegate" the goal of controlling the two branches of government to the congress member and "free-ride" on C 's effort. The voter thus adapts the optimal voting rule for C 's reelection which is less dependent on E 's performance the stronger is the party discipline.

Consider now the equilibrium levels of efforts e_E^Γ and e_C^Γ , which have the same functional form between the states and differ only in the level of party discipline in the congress, ϑ_j . The reason is that the politicians' preferences are symmetric between the states, which implies the symmetry of the optimal retrospective voting rules. Note moreover that the executive's effort e_E^Γ decreases, while the congress member's effort e_C^Γ increases, with the level of party discipline in the congress, ϑ_j : $\frac{de_E^\Gamma}{d\vartheta_j} < 0$ and $\frac{de_C^\Gamma}{d\vartheta_j} > 0$. As mentioned above, the stronger party discipline leads to extra incentives for the congress member and less incentives for the executive. Under the optimal retrospective voting rules, the congress member will be incentivized to exert higher effort to implement the party's leadership goal of controlling the two branches of government. The executive meanwhile will exert less effort as she can free-ride on the performance of the disciplined congress member. It is important to stress that the sum of the incumbents' performances $e_E^\Gamma + e_C^\Gamma$ increases with the level of party discipline in the congress, ϑ_j : $\frac{d(e_E^\Gamma + e_C^\Gamma)}{d\vartheta_j} > 0$. So the stronger the party discipline, the better off the representative voter is. Note moreover that the equilibrium levels of efforts e_E^Γ and e_C^Γ decrease with the politicians' ability variance σ^2 (since more randomness in the incumbents' performances makes the reelection probabilities less sensitive to effort and thus reduces the incumbents' incentives).

Party Discipline Consider now the problem of a party leader $j \in \{E, O\}$ who decides on the level of party discipline ϑ_j to impose on her partisan congress member. The leader of the governing party, i.e. the executive E , can control the legislature only in the case of unified government since under divided government a congress member is affiliated with the opposite party. In reverse, the leader of the opposition O can impose party discipline only under divided government. The party leaders' net objective functions can be found by plugging e_E^Γ , e_C^Γ , λ_E^Γ and λ_C^Γ into $\Psi_E^U(e_E, e_C)$ and $\Psi_O^D(e_E, e_C)$ (the detailed derivation can

be found in the Appendix). This yields

$$\begin{aligned}\Psi_E^U(e_E^U, e_C^U) &= \frac{1}{4} + \frac{1}{2\pi} \left(\arctan \vartheta_E + \arctan \frac{1}{2 + \vartheta_E} \right) - \frac{k\vartheta_E^2}{2} \\ &\quad - \frac{1}{16\pi\sigma^2} \left(\frac{1}{\sqrt{1 + \vartheta_E^2}} + \frac{1}{\sqrt{5 + 4\vartheta_E + \vartheta_E^2}} \right)^2, \\ \Psi_O^D(e_E^D, e_C^D) &= \frac{1}{4} + \frac{1}{2\pi} \left(\arctan \vartheta_O + \arctan \frac{1}{2 + \vartheta_O} \right) - \frac{k\vartheta_O^2}{2},\end{aligned}$$

where $\arctan(\cdot)$ is the arctangent function. Note that a stronger party discipline, ϑ_j , increases the probability of the party controlling the two branches of government. Indeed, in the case of unified government, $\Gamma = U$, a stronger party discipline implies the more positively aligned incumbents' preferences, so that the voter uses more positively correlated retrospective voting rules. Under these rules, the incumbents are more likely to be reelected together than they are to receive the opposite rewards. Thus, the probability of both incumbents to be reelected increases with the level of party discipline ϑ_E the executive imposes under unified government. In the case of divided government, $\Gamma = D$, a stronger party discipline leads to the more negatively aligned incumbents' preferences. The voter then applies more negatively correlated voting rules. Thus, it is more likely that one incumbent will be dismissed while the other is reelected. So the probability that the congress member is reelected while the executive is thrown out of office increases with the level of party discipline ϑ_O the opposition leader imposes under divided government.

Owing to the symmetry of the party leaders' preferences, the voter uses symmetric linear retrospective voting rules between the states. So the probability of controlling the two branches of government has the same functional form between the states. The only difference is that under unified government, $\Gamma = U$, it depends on the level of party discipline ϑ_E that the leader of the governing party (i.e. executive) enforces in the congress. Under divided government, $\Gamma = D$, it depends on the level of party discipline ϑ_O that the opposition leader enforces to her partisan congress member. However, the net objective functions of the party leaders differ between the states such that $\Psi_E^U(e_E^U, e_C^U) < \Psi_O^D(e_E^D, e_C^D)$ for any $\vartheta_E = \vartheta_O \in [0, 1]$. The reason is that under unified government the executive takes into account the effect of imposing party discipline on her own performance in the office. E 's choice of party discipline, ϑ_E , modifies her effort of policy implementation, e_E , and the cost of this effort, $\frac{e_E^2}{2}$, that is included in E 's objective function Ψ_E^U . The following proposition specifies the optimal party leaders' choices of the levels party discipline in the congress. (The proof is straightforward.)

Proposition 3. *Under unified government, $\Gamma = U$, the executive imposes a level of party discipline ϑ_E^* , which is a decreasing function of the cost parameter k , defined implicitly by the first-order condition*

$$\frac{d}{d\vartheta_E} \Psi_E^U(e_E^U, e_C^U) = 0 \text{ if } k \geq \frac{7 + 2\sqrt{5} + 40\sigma^2}{200\pi\sigma^2}$$

and

$$\vartheta_E^* = 1 \text{ if } k < \frac{7 + 2\sqrt{5} + 40\sigma^2}{200\pi\sigma^2}.$$

Under divided government, $\Gamma = D$, the opposition leader imposes a level of party discipline ϑ_O^ , which is a decreasing function of the cost parameter k , defined implicitly by the first-order condition*

$$\frac{d}{d\vartheta_O} \Psi_O^D(e_E^D, e_C^D) = 0 \text{ if } k \geq \frac{1}{5\pi}$$

and

$$\vartheta_O^* = 1 \text{ if } k < \frac{1}{5\pi}.$$

Moreover, the executive always enforces stronger party discipline in the congress than the opposition leader does, i.e., $\vartheta_E^* \geq \vartheta_O^*$ for any cost parameter $k \geq 0$.

Note that the executive E will impose more party discipline than the opposition leader O , $\vartheta_E^* \geq \vartheta_O^*$. The reason is that E 's effort for policy implementation, e_E , is decreasing with ϑ_E , so is the corresponding effort cost $\frac{e_E^2}{2}$. The executive therefore is more eager than the opposition leader to impose party discipline since that would lead to less policy work for her. Indeed, stronger party discipline implies higher congress member's effort on policy implementation e_C and allows the executive to "free-ride" on her partisan congress member's performance.

The level of party discipline that the executive imposes under unified government approaches that of the opposition leader under divided government as the politicians' ability variance σ^2 increases: $\lim_{\sigma \rightarrow \infty} \vartheta_E^*(\sigma^2) = \vartheta_O^*$. Larger variance σ^2 implies more randomness in the politicians' performance and makes reelection probabilities less sensitive to effort. The executive exerts therefore less effort e_E , and her incentives of imposing party discipline approach those of the opposition leader. It is important to stress that all the above results hold only for the values of σ different from zero. In particular, I consider $\sigma > 0.36$ for the politicians' individual rationality (i.e., participation) constraints to be satisfied.

It is important to mention that ensuring party discipline in the congress improves not only the gross utility of the party leaders but also the utility of the representative voter. In fact, if party discipline were cheap to impose, there would be no conflict of interests between

the voter and the party leaders who would prefer the highest possible level of party discipline in the congress. Since party discipline is costly to introduce, the party leaders choose a moderate level of party discipline that maximizes their net utility. However, imposing party discipline has an ambiguous effect on the congress member's utility. For large values of the politicians' ability variance σ^2 the disciplined congress member is strictly better off than undisciplined one. A lower variance σ^2 increases the congress member effort such that his net utility decreases with stronger party discipline.

Discussion My results emphasize the role of party discipline as an incentive device to motivate the congress member to perform in the interests of his party leadership. Party discipline is modeled as a party leader's control over her partisan congress member. In fact, the party leader makes the congress member to share the party objective of controlling the two branches of government. Through imposing party discipline in the congress party leaders can somewhat delegate their goal to the partisan congress member and free-ride on his effort. Note that my analysis ignores the ideological component. Indeed, one might suggest that imposing party discipline means promoting party ideological position among the congress members. This might be an alternative way of modeling the things. Let me stress, however, that I assume office-motivated party leaders that simply care about controlling the two branches of government. That is why in my framework it is reasonable to assume that imposing party discipline means promoting office-seeking goal of party leadership among the congress members.

4. Conclusion

This paper has studied party discipline under assumption of office-motivated politicians. In a political agency model with moral hazard, party discipline serves as an incentive device to motivate legislators to perform in line with the party leaders' objective of controlling both the executive and legislative branches of government.

The party leaders choose to impose party discipline to somewhat "delegate" the party line of controlling the two branches of government to their partisan congress member. A stronger party discipline implies more aligned incumbents' preferences. As a result, the voter adopts more correlated retrospective voting rules conditioned on the government being unified or divided. In the case of unified government, the reelection outcomes for the incumbents will be positively correlated to incentivize the congress member who wants his partisan executive to be reelected. Under divided government, the reelection outcomes will be negatively correlated to motivate the congress member who wants the executive to be thrown out of office and

his partisan ally to win the presidential election. The congress member therefore performs better, for the sake of his party as well as for himself. So the executive can free-ride on the congress member's performance, which decreases the executive's effort. However, the aggregate performance of the incumbents' goes up with a stronger party discipline, so the representative voter is getting better off.

The probability of controlling the two branches of government is strictly increasing with party discipline. Indeed, in the case of unified government the reelection outcomes are positively correlated, so the executive and the congress member are more likely to be reelected together. Under divided government, the reelection outcomes are negatively correlated, and it is more likely that the congress member is reelected while the executive is thrown out of office. I show that the leader of governing party (i.e., the executive) imposes stronger party discipline under unified government than the opposition leader does under divided government. The reason is that the executive takes into the account the impact of party discipline on her own policy effort and on the associated cost of this effort, which are strictly decreasing with party discipline.

Even though the model is very stylized, it yields a number of empirically testable predictions. First, according to my results, a stronger party discipline in the congress is expected to increase the probability that the same party will control the two branches of government, i.e., the probability of unified government. Second, my predictions indicate that the leader of governing party (i.e., the executive) imposes stronger party discipline over her partisan congress members under unified government than the opposition leader does under divided government. Finally, a stronger party discipline is expected to increase the aggregate performance of the incumbents. Testing these predictions implies identifying and measuring party discipline, which might be a hard but still feasible task somewhat addressed by a number of authors (see the references on empirical studies of party discipline in the Introduction).

Appendix

A. Proof of Proposition 1

The executive E is reelected if $p_E + \lambda_E p_C \geq e'_E + \lambda_E e'_C$ or $a_E + \lambda_E a_C \geq e'_E - e_E + \lambda_E (e'_C - e_C)$, where $a_E + \lambda_E a_C \sim N(0, (1 + \lambda_E^2) \sigma^2)$. The congress member C is reelected if $p_C + \lambda_C p_E \geq e'_C + \lambda_C e'_E$ or $a_C + \lambda_C a_E \geq e'_C - e_C + \lambda_C (e'_E - e_E)$, where $a_C + \lambda_C a_E \sim N(0, (1 + \lambda_C^2) \sigma^2)$. The density function of a bivariate normal distribution of random variables $a_E + \lambda_E a_C$ and

$a_C + \lambda_C a_E$, denoted by $f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y)$, is

$$f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y) = \frac{1}{2\pi\sigma^2(1 - \lambda_E\lambda_C)} \exp\left\{-\frac{(x - \lambda_E y)^2 + (y - \lambda_C x)^2}{2\sigma^2(1 - \lambda_E\lambda_C)^2}\right\}.$$

The executive's net objective is equal to

$$\begin{aligned}\Psi_E^U(e_E, e_C) &= \int_{e'_E - e_E + \lambda_E(e'_C - e_C)}^{+\infty} \left[\int_{e'_C - e_C + \lambda_C(e'_E - e_E)}^{+\infty} f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y) dy \right] dx - \frac{e_E^2}{2} - \frac{k\vartheta_E^2}{2}, \\ \Psi_E^D(e_E, e_C) &= \int_{e'_E - e_E + \lambda_E(e'_C - e_C)}^{+\infty} \left[\int_{-\infty}^{e'_C - e_C + \lambda_C(e'_E - e_E)} f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y) dy \right] dx - \frac{e_E^2}{2}.\end{aligned}$$

One should carefully take the first-order condition with respect to actual effort e_E , taking e'_E as given. After imposing the equilibrium requirements $e'_E = e_E$ and $e'_C = e_C$, one obtains the executive's equilibrium effort e_E^Γ under linear retrospective voting rules λ_E and λ_C , $\lambda_E\lambda_C \leq 1$:

$$\begin{aligned}e_E^U &= \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1 + \lambda_E^2}} + \frac{\lambda_C}{\sqrt{1 + \lambda_C^2}} \right), \\ e_E^D &= \frac{1}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1 + \lambda_E^2}} - \frac{\lambda_C}{\sqrt{1 + \lambda_C^2}} \right).\end{aligned}$$

It is straightforward to check that the second-order condition holds.

The congress member's net objective is equal to

$$\begin{aligned}\Psi_C^U(e_E, e_C) &= \vartheta_E \int_{e'_E - e_E + \lambda_E(e'_C - e_C)}^{+\infty} \left[\int_{e'_C - e_C + \lambda_C(e'_E - e_E)}^{+\infty} f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y) dy \right] dx \\ &\quad + (1 - F_{a_C + \lambda_C a_E}(e'_C - e_C + \lambda_C(e'_E - e_E))) - \frac{e_C^2}{2}, \\ \Psi_C^D(e_E, e_C) &= \vartheta_O \int_{-\infty}^{e'_E - e_E + \lambda_E(e'_C - e_C)} \left[\int_{e'_C - e_C + \lambda_C(e'_E - e_E)}^{+\infty} f_{a_E + \lambda_E a_C, a_C + \lambda_C a_E}(x, y) dy \right] dx \\ &\quad + (1 - F_{a_C + \lambda_C a_E}(e'_C - e_C + \lambda_C(e'_E - e_E))) - \frac{e_C^2}{2},\end{aligned}$$

where F denotes the normal distribution function. Take the first-order condition with respect to actual effort e_C , taking e'_C as given, and afterwards impose the equilibrium requirements

$e'_E = e_E$ and $e'_C = e_C$. This yields the congress member's equilibrium effort e_C^Γ under linear retrospective voting rules λ_E and λ_C , $\lambda_E \lambda_C \leq 1$:

$$\begin{aligned} e_C^U &= \frac{\vartheta_E}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_C^2}} + \frac{\lambda_E}{\sqrt{1+\lambda_E^2}} \right) + \frac{1}{\sqrt{2\pi}\sigma\sqrt{1+\lambda_C^2}}, \\ e_C^D &= \frac{\vartheta_O}{2\sqrt{2\pi}\sigma} \left(\frac{1}{\sqrt{1+\lambda_C^2}} - \frac{\lambda_E}{\sqrt{1+\lambda_E^2}} \right) + \frac{1}{\sqrt{2\pi}\sigma\sqrt{1+\lambda_C^2}}. \end{aligned}$$

The second-order condition for the congress member's problem holds too.

B. Derivation of the party leaders' objective functions $\Psi_E^U(e_E^U, e_C^U)$ and $\Psi_O^D(e_E^D, e_C^D)$

Under unified government, $\Gamma = U$, the voter applies the linear retrospective voting rules determined by scalars λ_E^U and λ_C^U , and the incumbents exert efforts e_E^U and e_C^U . E 's objective function is thus equal to

$$\Psi_E^U(e_E^U, e_C^U) = \int_{e'_E - e_E^U + \lambda_E^U(e'_C - e_C^U)}^{+\infty} \left[\int_{e'_C - e_C^U + \lambda_C^U(e'_E - e_E^U)}^{+\infty} f_{a_E + \lambda_E^U a_C, a_C + \lambda_C^U a_E}(x, y) dy \right] dx - \frac{e_E^{U2}}{2} - \frac{k\vartheta_E^2}{2}.$$

Imposing the equilibrium requirements $e'_E = e_E^U$ and $e'_C = e_C^U$ and plugging in the equilibrium values of e_E^U , e_C^U , λ_E^U and λ_C^U yields

$$\begin{aligned} \Psi_E^U(e_E^U, e_C^U) &= \int_0^{+\infty} \left[\int_0^{+\infty} f_{a_E + \vartheta_E a_C, a_C + \frac{1}{2+\vartheta_E} a_E}(x, y) dy \right] dx - \frac{k\vartheta_E^2}{2} \\ &\quad - \frac{1}{16\pi\sigma^2} \left(\frac{1}{\sqrt{1+\vartheta_E^2}} + \frac{1}{\sqrt{5+4\vartheta_E+\vartheta_E^2}} \right)^2 = \\ &\quad \frac{1}{4} + \frac{1}{2\pi} \left(\arctan \vartheta_E + \arctan \frac{1}{2+\vartheta_E} \right) - \frac{k\vartheta_E^2}{2} \\ &\quad - \frac{1}{16\pi\sigma^2} \left(\frac{1}{\sqrt{1+\vartheta_E^2}} + \frac{1}{\sqrt{5+4\vartheta_E+\vartheta_E^2}} \right)^2, \end{aligned}$$

where $\arctan(\cdot)$ is the arctangent function.

Under divided government, $\Gamma = D$, the voter uses the linear retrospective voting rules determined by scalars λ_E^D and λ_C^D , and the incumbents exert efforts e_E^D and e_C^D . The objective

function of the opposition leader O is

$$\Psi_O^D(e_E^D, e_C^D) = \int_{-\infty}^{e'_E - e_E^D + \lambda_E^D(e'_C - e_C^D)} \left[\int_{e'_C - e_C^D + \lambda_C^D(e'_E - e_E^D)}^{+\infty} f_{a_E + \lambda_E^D a_C, a_C + \lambda_C^D a_E}(x, y) dy \right] dx - \frac{k\vartheta_O^2}{2}.$$

After imposing the equilibrium requirements $e'_E = e_E^U$ and $e'_C = e_C^U$ and plugging in the equilibrium values of e_E^U , e_C^U , λ_E^U and λ_C^U , O 's objective function becomes

$$\begin{aligned} \Psi_O^D(e_E^D, e_C^D) &= \int_{-\infty}^0 \left[\int_0^{+\infty} f_{a_E - \vartheta_O a_C, a_C - \frac{1}{2 + \vartheta_O} a_E}(x, y) dy \right] dx - \frac{k\vartheta_O^2}{2} = \\ &\quad \frac{1}{4} + \frac{1}{2\pi} \left(\arctan \vartheta_O + \arctan \frac{1}{2 + \vartheta_O} \right) - \frac{k\vartheta_O^2}{2}. \end{aligned}$$

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