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Three Essays on the Effect of Voter Turnout on the Subsequent Performance of Elected Official

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ABSTRACT

Dong-Hee Joe: Three Essays on the Effect of Voter Turnout
on the Subsequent Performance of Elected Official
(Under the direction of Karine Van der Straeten)

This dissertation analyzes the effect of voter turnout on the subsequent performance of the elected official. By shedding light on this new topic, it contributes to the 'political agency' literature which studies various ways to improve the functioning of elected offices.

Chapter 2 estimates the effect of turnout in the 18th National Assembly of South Korea (2008 ~ 2012), the country's legislature. The data consists of a cross-section of legislator-constituency pairs. To overcome the endogeneity of turnout, it utilizes the variation in turnout caused by the unusual rainfall on election day and the number of polling places per voter. It finds positive effects on legislative performance. Then it proposes a theoretical explanation for the findings, in which turnout signals the share of voters who will learn the incumbent's performance. The theory has a negative implication for compulsory voting, because it will reduce the signaling role of turnout.

Chapter 3 extends this empirical framework in the 13th National Assembly of France (2007 ~ 2012). An important difference from the South Korean counterpart is its limited capacity to initiate legislation, which makes it an ideal environment to test the generality of the relation discovered in South Korea. It finds positive effects on attendance and participation in debates, but not on formal legislation or government monitoring. Possible explanations for this difference are discussed.

Finally, Chapter 4 presents a game-theoretic explanation for the empirical findings, in a two-period model of political agency. An election is held at the beginning of each period to delegate a policy decision to a politician, whose policy preferences are private information. A representative voter decides, in each election, whether to vote for a politician or abstain. Voting incurs an opportunity cost, which is her private information; and politicians are identical ex-ante. Despite the sub-optimality of turning out in the first election, she may still do so, to signal her willingness-low cost-to punish wrong policy in the following election. The model has a positive implication for having more polling places and a negative one for making election day a public holiday, which follow from their impacts on the distribution of voting cost.

RÉSUMÉ

M. Dong-Hee Joe: Trois Essais sur l'Effet du Taux de Participation
sur la Performance Subséquente de l'Élu
(Sous la direction de Mme. Karine Van der Straeten)

Cette thèse analyse l'effet du taux de participation sur la performance subséquente de l'élu. En mettant en lumière ce nouveau sujet, elle contribue à la littérature de «l'agence politique» qui étudie divers moyens d'améliorer le fonctionnement des postes élus.

Chapitre 2 estime l'effet du taux de participation dans la 18ème Assemblée nationale sud-coréenne (2008 ~ 2012), la législature du pays. Les données se composent de paires législateur-circonscription. Pour surmonter l'endogénéité du taux de participation, il utilise la pluviométrie inhabituelle le jour du scrutin et le nombre de bureaux de vote par électeur. Grâce à ces instruments, il trouve des effets positifs sur la performance législative. Ensuite, il propose une explication théorique pour les résultats, dans lesquels le taux de participation signale de la fraction des électeurs qui apprendront la performance du titulaire. La théorie a une implication négative sur le vote obligatoire, car il permettra de réduire le rôle de signalisation du taux de participation.

Chapitre 3 étend ce cadre empirique dans la 13ème Assemblée nationale française (2007 ~ 2012). Une différence importante de l'homologue sud-coréenne est sa capacité limitée d'initiative législative, ce qui en fait un environnement idéal pour tester la généralité de la relation trouvée en Corée du Sud. Les estimations révèlent des effets positifs sur la présence et la participation aux débats, mais pas sur la législation formelle ou la surveillance du gouvernement. Les explications possibles de cette différence sont discutées.

Enfin, le chapitre 4 présente une explication inspirée de la théorie des jeux pour les résultats empiriques, dans un modèle d'agence politique à deux périodes. Une élection a lieu au début de chaque période afin de déléguer une décision politique à un homme politique, dont les préférences politiques sont des informations privées. Un électeur représentatif décide, à chaque élection, de voter pour un candidat ou s'abstenir. Le vote a un coût d'opportunité, qui est son information privée; et les candidats sont identiques ex ante. Malgré la sous-optimalité statique de voter dans la première élection, l'électeur peut choisir de le faire, pour signaler sa volonté-faible coût-pour punir une mauvaise politique à l'élection suivante. Le modèle a une implication positive pour avoir plus de bureaux de vote et une implication négative pour faire le jour du scrutin un jour férié, qui découlent de leurs impacts sur la distribution des coûts de vote.

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Chapter 1

Overview

Citizen's participation will determine the quality of democracy.

- The 9th President Moo-hyun Roh of South Korea, at the 20th anniversary (June 10, 2007) of the June Democratic Uprising[1]

1.1 Motivation

A defining characteristic of democracy is the delegation of important public tasks to elected officials. A voter can participate in that process at various stages, from standing up as a candidate herself or contributing to the campaign of a candidate, to turning out in elections. The last decision-whether to turn out in an election or not-draws much scholarly attention, exemplified by being the topic of the American Political Science Association's Presidential Address (Lijphart, 1997), and featuring in the American Economic Association's outlet for the general interest press (Feddersen, 2004). Most existing works focus on explaining turnout decision itself (reviewed in Blais (2000) and Feddersen (2004)) or the impact of voter turnout on the representation of conflicting preferences among voters (reviewed in Lijphart (1997)). The general conclusion of the latter category of works is that conflicting interests are represented in proportion to their presence in ballots cast.

Unlike in those 'ideological' dimensions, most voters would agree to have the elected official to exert more effort and represent their interest as opposed to the official's private agenda. Little is known, however, about the effect of voter turnout in these dimensions. This dissertation consists of three papers that try to shed some light on this area; that is, if turnout induces effort or performance from the elected official. By improving our understanding on the role of turnout in this dimension, it

[1] Presidential Archives (`http://www.pa.go.kr/research/contents/speech/index.jsp`; last accessed on May 9, 2016).

also aims at contributing to the design of institutions that affect turnout, such as compulsory voting, the number of polling stations or making election day a public holiday.[2]

1.2 Empirical Analysis

The first two chapters present estimation results of the effect of voter turnout in an election on the subsequent behavior of the elected official, in two different institutional environments: South Korea and France.

A substantial shortcoming of the existing works with a similar goal is their choice of outcome variables for which no elected office is individually accountable, such as the income distribution of a country (Mueller and Stratmann, 2003) or the size of local public finance (Aggeborn, 2016). Many of them also have a technical shortcoming: the reliance on the OLS without a careful treatment of the potential endogenity of turnout (e.g., the OLS estimation of its impact on the New Deal aid the U.S. counties received (Fleck, 1999) or on corruption in Russian regions (Dininio and Orttung, 2005). The empirical works in this dissertation overcomes these problems by considering environments with a clearer accountability, and by using variations in turnout caused by certain sources that are likely to be exogenous in the regression.

1.2.1 South Korea

First, Chapter 2 presents the empirical analysis using the data from the 18th National Assembly of South Korea (2008 $\sim$ 2012), the country's legislature. The data consists of a cross-section of legislator-constituency pairs, and includes essential measures of individual-level effort or performance, such as attendance and bill proposal. Each legislator is clearly accountable for these outcomes. To overcome the endogeneity of turnout, it uses the variation in turnout caused by the unusual rainfall on election day. Because the particular election day (April 9, 2008) was the first major election day in the current Republic (1987 $\sim$) with a significant rainfall across the country, that variation in turnout is likely to be exogenous in the regression. To support the validity of its results, it also uses the variation in turnout caused by the difference in the number of polling places per voter.

With these instruments, it finds substantial effects on legislation: A one standard deviation increase in turnout is predicted to increase the number of bills proposed by 1.2 standard deviations, with an equivalent increase in the number of those bills approved. On the other hand, turnout appears to have no significant effect on attendance. This difference can be explained by the fact that bill proposal and passage are significantly correlated with the legislator's reelection perspective, while

[2] The relevance of these institutions are discussed at appropriate points in following chapters.

attendance is not. This suggests that legislators react to turnout, but only in activities that affect their reelection. Also, those relations are hidden in the OLS, exemplifying the importance of taking the endogeneity problem into consideration.

1.2.2 France (with Sylvain Chareyron and Benjamin Monnery)

Chapter 3 extends the empirical framework of Chapter 2 in the 13th National Assembly of France ($2007 \sim 2012$), the directly elected body of the country's bicameral legislature. Among the important differences between the French and the South Korean Assemblies is the legislative capacity: Most bills are proposed by the Assembly in South Korea, while in France, the government has a much bigger control on the Assembly's agenda. This difference makes the French Assembly an ideal environment to test the generality of the relation found in South Korea, as well as to gain additional insights on the effect of turnout.

It uses analogous data, with more measures of individual-level activities: attendance, participation in debates, legislation and government monitoring. Using the number of polling places per voter as the instrument for turnout, it reveals positive effects of turnout on attendance and participation in debates, but not on formal legislation or government monitoring. It suggests the possibility that participating in debates is more visible than formal legislation or government monitoring, and the deputy reacts to turnout only in the more visible dimension.

1.3 Potential Mechanisms Behind

The last part of Chaper 2 proposes a 'decision-theoretic' explanation for the empirical results, based on the existing evidence that better informed voters are more likely to vote. In that case, the previous turnout updates the elected official's belief on the fraction of the electorate who will learn her performance, in a monotonic way; that is, the higher the previous turnout, the larger she believes that fraction to be. Since that fraction of voters are the ones who may take her current performance into consideration in their next vote choices, her incentive to work increases with the previous turnout. The main argument is that it is not turnout per se; rather, it is the incumbent's updating on the degree of public monitoring, through turnout.

This theory has a negative implication for compulsory voting: By exogenously increasing the probability of voting regardless of the voter's knowledge on the incumbent's performance, it is likely to reduce that signaling role of turnout, decreasing the expected performance level.

Chapter 4 presents another, game-theoretic explanation in which the voter makes a strategic decision on turnout, in a two-period model of political agency. Unlike in the model presented in Chapter 2, turnout per se has an impact on the subsequent performance of the elected official. The

key argument is that by making the costly turnout in one election, the voter signals her willingness to punish wrong policy in the following election. To show this incentive clearly, an environment is built with ex-ante identical politicians whose policy preferences are private information; and a representative voter with purely instrumental motive whose voting cost is private information. An election is held at the beginning of each period to delegate a policy decision, and the voter decides whether to vote for a politician or abstain. Even though turning out in the first election is statically not optimal, the voter may do so, to signal her willingness to punish wrong policy in the following election. And the elected official may react accordingly; that is, choose the right policy if and only if the voter turned out. Focusing on the role of voting cost is apt for explaining the empirical findings, because of its crucial role in the identification strategies there.

This model belongs to a family of theories (reviewed in Besley (2007)) that deal with the disciplinary role of various factors, in the presence of asymmetric information between the electorate (principal) and the elected official (agent). It contributes to this literature by considering the effect of turnout, which has yet to be analyzed. Also related are the theories of repeated elections in which voters have an incentive to signal their ideology by voting or abstaining; e.g., Hummel (2011). But no theory in this group considers discipline, and this model complements the existing ones.

The model also predicts that, in most cases, increasing the number of polling places will improve discipline, while the opposite is true for making election day a public holiday. These implications follow from their impact on the distribution of voting cost.

1.4 Concluding Remarks

This dissertation presents three papers analyzing the effect of voter turnout on the subsequent behavior of the elected official. The first two succeed in establishing empirical evidence in two different institutional environments: the South Korean legislature and its counterpart in France. The first and the last papers also provide theoretical models in which random elements determine turnout, which in turn determines discipline.

One promising explanation for the empirical results that is not modeled here is the one suggested by the empirical literature on 'voting habit' (reviewed in Coppock and Green (2015) and Fujiwara, Meng and Vogl (2016)): The mere act of voting makes the voter more likely to vote in the following election. This can be modeled by assuming a fixed cost of voting, due, for instance, to registration requirement, or learning where and how to vote. In that case, an exogenous increase in turnout in one election implies a larger set of voters who will turn out in the following election, and hence whose votes the incumbent can try to attract by performance.

This dissertation stops short of falsifying potential mechanisms behind the empirical findings, in particular the two theories it proposes and the one on voting habit. Since their implications

for policies that affect turnout can be different, concrete evidence on the likelihoods of different mechanisms will be a prerequisite for making definite policy recommendations. One way to test the theory in Chapter 2-that turnout 'increases' the elected official's belief on the fraction of 'informed voters'-is to look at the impact of exogenous variations in the relevant information available to voters, as in Gentzkow (2006), on voter turnout and the subsequent performance of the elected official. Similarly, the voting habit theory can be tested by analyzing the effect of exogenous inducement to vote on turnout, as in Braconnier, Dormagen and Pons (2014), and the subsequent performance of the elected official.

I hope to complete this crucial last step in the future.

1.5 Note for the Reader

Each of the following chapters contains a standalone paper; thus, it refers to itself a 'paper', rather than a chapter.

Chapter 2

Does Voter Turnout Induce Performance from Elected Officials?

This paper considers the possibility that voter turnout in an election induces performance from the elected official who seeks reelection. First, I estimate the effect of the previous turnout on current performance, using the data from the 18th National Assembly of South Korea (2008-2012), a cross-section of legislator-constituency pairs. To overcome the potential endogeneity of turnout, I use the variation in turnout caused by the unusual rainfall on election day. Because the particular election day was the first major election day in recent history with a significant rainfall across the country, that variation in turnout is likely to be exogenous in the regression. I also use the variation in turnout caused by the difference in the number of polling places per voter. With these instruments, I find substantial effects: A one standard deviation increase in turnout is predicted to increase both the number of bills proposed by the legislator and the number of those bills approved by 1.2 standard deviations. Then, I propose a simple model to demonstrate a potential channel behind this finding, in which turnout serves as a noisy signal of the degree of monitoring by the electorate. Finally, implications for institutions designed to boost turnout, such as compulsory voting, are discussed.*

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2.1 Introduction

In a representative democracy, many important public tasks are delegated to elected officials, such as legislation. Once they are in office, however, voters do not have a direct means to discipline elected officials. This can naturally lead to shirking, as in the 2004 scandal in the European Parliament: Some members of the Parliament were filmed signing in for sessions that did not exist, which would still allow them to collect the daily allowances, only to leave immediately after ("Hans and the cookie jar," *The Guardian*, April 8, 2004). The public outrage following this revelation shows that it was not what most voters want their representatives to do. To prevent such shirking and public discontent, as well as for the functioning of representative democracy in general, it is important to know how to discipline elected officials.

This paper considers the possibility that voter turnout in an election induces performance from the elected official who seeks reelection. This channel has not been considered in the related literature (reviewed below). I estimate the effect of the previous turnout on current performance, and build a simple model to explain the relation. The model allows to draw implications for institutions designed to boost turnout, such as compulsory voting.[1]

Why would turnout matter? One can draw several possibilities from existing studies. First, the mere act of voting can increase one's interest in politics, as Braconnier, Dormagen and Pons (2014) find in their field experiment. In that case, turnout increases the degree of interest among the electorate, which can in turn force the incumbent to adjust performance accordingly. Or the mere act of voting can increase the probability of voting in the next election of the same type.[2] In that case, turnout increases the fraction of the electorate who will turn out in the next election, and hence whose next vote choice the incumbent can try to influence by performance. Moreover, the elected official may feel more legitimate for her job when elected with high turnout (Birch, 2009, Chapter 4). If legitimacy is a factor improving performance, this is another reason why turnout matters.

The theoretical model presented in this paper proposes yet another possibility: Turnout signals the degree of monitoring by the electorate. Various studies (reviewed below) find that better informed voters are more likely to vote. If there is such a correlation between political information or interest and the probability of voting, turnout can signal the degree of monitoring by the electorate; and for the reelection-motivated incumbent, it would be rational to react to that signal when deciding the level of costly performance.

[1] Such institutions are prevalent, and even compulsory voting is not rare: At least 29 countries are currently known to put sanctions on abstention in major elections (Birch, 2009).

[2] Empirical evidence on this 'habit forming' effect of voting is abundant, especially for the U.S., such as Green and Shachar (2000), Gerber, Green and Shachar (2003), Dinas (2012), Coppock and Green (2015) and Fujiwara, Meng and Vogl (2016). Denny and Doyle (2009) report the evidence in the U.K. Coppock and Green (2015) and Fujiwara, Meng and Vogl (2016) offer a thorough review of the literature.

The empirical analysis of this paper uses the cross-sectional data from the 18th National Assembly of South Korea (2008 $\sim$ 2012), the country's legislature. The sample consists of legislator-constituency pairs. Given the essential function of the Assembly, legislative performance is measured by the number of bills proposed by the legislator, and the number of those bills approved. These are common measures in the related literature, and evidence supports their relevance in the South Korean context. To overcome the potential endogeneity of turnout, I utilize the fact that the particular election day (April 9, 2008) was the first major election day in the current Republic (1987 $\sim$) with a significant rainfall across the country. I also use the variation in turnout caused by the difference in the number of polling places per voter. With these instruments, I find substantial effects: A one standard deviation increase in turnout increases the number of bills proposed by 1.2 standard deviations, with an equivalent increase in the number of those bills approved. I also find evidence suggesting that the effect of rainfall on turnout depends on institutional details; in particular, whether election day is a public holiday.

The theoretical model for a potential mechanism assumes that a fixed fraction (α) of the electorate get informed of current performance at the end of each term (*informed voters*). These voters are the ones who may take current performance into account in their vote choice in the next election. Thus, α determines the sensitivity of the incumbent's vote share in the next election to current performance, and hence the incentive to perform. The elected official does not know α, but has a belief about it, which she updates before choosing the level of costly performance. Assuming that informed voters are more likely to vote, her posterior belief "increases" with the previous turnout. This way, turnout increases performance.

The main contribution of this paper is to document evidence of a channel that has not received much attention in the literature on the discipline of elected officials.

Related Literature: Mechanisms to Induce Performance from Elected Officials

Existing studies estimate the effect of wage, selection rule and term length/limit on the performance of the elected official. For instance, Gagliarducci and Nannicini (2013) find that better paid mayors in Italy perform better by certain measures (e.g., efficiency in public finance). Ferraz and Finan (2009) find similar results for local legislators in Brazil, while Hoffman and Lyons (2013) only find negligible effects for the U.S. governors and state legislators, and Fisman et al. (2015) find mixed to insignificant results in the European Parliament.

Gagliarducci, Nannicini and Naticchioni (2011) compare the behavior of those members of the Italian House of Representatives whose type of representation (constituency or PR) was determined in a reasonably random manner. They find that constituency members were more active in pork barrel legislation and participated more in the electronic votes. Lim (2013) carefully compares the degree of congruence in sentencing behavior of elected judges and nominated ones.

Dal Bó and Rossi (2011) look at the random assignments of term length in the Argentine legislature (in 1983 and 2001), and find that longer term induces effort, measured by participation in various parliamentary activities, as well as the number of bills proposed or approved. Besley and Case (1995) find empirical supports for the political agency model: U.S. governors' policy choices are affected by whether they are bound by a term limit, resulting in a decrease in state income when the term limit binds. In the same vein, the counterfactual exercise in Aruoba, Drazen and Vlaicu (2015) shows that voters' welfare is higher when the incumbent is allowed to run again.

Related Literature: Voter Turnout and Economic Outcome

Some studies relate voter turnout to economic outcome. For instance, the cross-country study in Mueller and Stratmann (2003) shows that a country's tendency to vote in legislative elections is negatively correlated with economic inequality. Fleck (1999) finds a positive correlation between a U.S. county's tendency to vote and the federal aid it received from the New Deal. Kim (2010) reports a similar correlation in South Korea regarding the transfer from the central to local governments, and Aggeborn (2016) shows that turnout increases the size of local public finance in Sweden. On the other hand, Dininio and Orttung (2005) fail to find a significant correlation between turnout in gubernatorial elections and the reported amounts of corruption in Russia.

Although these studies relate voter turnout to important outcomes, no elected official in their studies is directly accountable for those variables. For instance, the transfer from the central to local governments used in Kim (2010) is known to be in the discretion of the president (Horiuchi and Lee, 2008). Moreover, other actors, such as the mayor and neighboring legislators, are also involved in that transfer. More importantly, turnout can be endogenous in those regressions, making the causal inference dubious, except in Aggeborn (2016). For instance, the positive results in Fleck (1999) can be due simply to omitted characteristics of the county, such as the economic condition before receiving the aid or the population structure (age or gender), which are likely to be important factors in that relation. Similarly, the negative correlation in Mueller and Stratmann (2003) can be driven by the population structure or the degree of social integration. I focus on measures with clearer accountability, and consistently estimate the effect of turnout.

Existing Evidence: Information and Turnout Decision

The theoretical part is motivated by the previous findings that better informed voters are more likely to vote. For instance, the 'rational voter' theory of Matsusaka (1995), and the Swing Voter's Curse (Feddersen and Pesendorfer, 1996) both predict the probability of voting to increase with how well informed the voter is. This prediction is supported empirically in different settings-Ashenfelter and Kelley (1975), Palfrey and Poole (1987) and Gentzkow (2006) in the U.S., Larcinese (2007) in the U.K. and Lassen (2005) in Denmark, for instance-as well as in laboratory experiments (Battaglini, Morton and Palfrey, 2010). Also, the official voter surveys in the very election this

paper investigates supports the relation.[3]

The remainder of this paper starts by describing the context and variables of interest in Section 2.2. Section 2.3 discusses the endogeneity problem and the instrument. Section 2.4 reports the estimation results and argues for their validity. Section 2.5 presents the model for a potential mechanism and draws implications for institutions designed to boost turnout. Further discussions and conclusion are contained in Section 2.6.

2.2 Data, Context and Variables

My goal is to estimate the coefficient of *Turnout* in the linear regression of

$$Performance_i \text{ on } Turnout_i \text{ and } Controls_i, \tag{2.1}$$

where i indexes the legislator-constituency pair. *Performance* is a measure of legislative performance in the current parliament, and *Turnout* is the percentage of voters in the constituency who voted in the election for the current parliament. I use the data from the 18th National Assembly of South Korea (May 30, 2008 ~ May 29, 2012; elections on Wednesday, April 9, 2008).[4]

2.2.1 Brief Institutional Background

South Korea has a presidential system of government. The president heads the executive body and is directly elected for a single, 5-year term. The National Assembly (henceforth, the Assembly) is the unicameral legislature consisting of 299 members. Each member is directly elected for a 4-year term, with no term limit. 245 members are elected in single-member constituencies, in single-round, first-past-the-post elections. The rest are elected in a national, closed party list election.[5] Voter registration is automatic, and election day is a weekday and a public holiday.

Members elected in party list are accountable to the whole country, and hence only one turnout rate. Because this does not fit the framework, I exclude them from the sample.

[3] Conducted by the National Election Commission; downloadable at `http://nec.go.kr/portal/cmm/fms/FileDown.do?atchFileId=FILE_000000000061978&fileSn=1` (last accessed on October 27, 2015)

[4] Unless otherwise noted, the institutional details are for the 18th National Assembly, and from the Constitution, the National Assembly Act, the Government Organization Act, and the Public Official Election Act of South Korea, available in English at `http://elaw.klri.re.kr/eng_service/main.do` (last accessed on October 22 2015).

[5] Each voter is therefore given two ballots: one for the constituency seat and one for the list.

2.2.2 Measures of Legislative Performance

The Assembly declares that its "most essential power [...] is to enact, amend, and abolish laws."[6] During the 4-year mandate of the 18th Assembly, 11,191 bills were proposed by members of the Assembly (> 80% of all bills proposed), and each such bill is registered with exactly one main proposer. Figure 2.1 outlines the legislative process of such bills.

[Figure 2.1 about here]

For each legislator, let *BillsProposed* denote the number of bills she proposed, and *BillsApproved* the number of those bills approved, including those approved after modification or in an alternative. Given the Assembly's essential function, I use these two variables as measures of legislative performance. Similar variables are commonly used in related studies (Ferraz and Finan, 2009; Dal Bó and Rossi, 2011; Rossi and Tommasi, 2012; Hoffman and Lyons, 2013; Titiunik, 2016).[7]

Among the 245 winners of constituency seats, 26 did not stay for full mandate, for reasons such as illegal campaign, to run for another office or to work for the executive.[8] To hold the duration of mandate constant in the sample, I drop these legislators, leaving the final sample of 219 observations. As long as (potential) performance has no causal effect on the length of mandate, this stratification is unlikely to cause a selection bias.

2.2.2.1 Relevance of Performance Measures

In a survey of South Korean voters, Yoon (2002) reports the importance of the legislator's constituency service in voters' evaluation. Since I do not employ any direct measure of constituency service, that survey may seem to warn that an important element of legislative performance is missing. However, an obvious and effective way of constituency service is the passage of bills that will benefit the constituency (Jeon, 2014). In fact, Gagliarducci, Nannicini and Naticchioni (2011) and Jeon (2014) find that constituency members are more active in proposing pork-barrel bills, with clear and geographically concentrated benefits, which is interpreted as a form of constituency service. Furthermore, as Hwang (2008) observes, requests from constituency are important sources of legislation in South Korea. Thus, the two measures defined above are expected to capture an important part of constituency service as well.[9]

[6] `http://korea.assembly.go.kr/int/act01.jsp` (last accessed on October 22, 2015)

[7] A legislator may write a small number of high-quality bills, which may be considered as a better performance than writing many low-quality bills. Also, more important bills may tend to be more controversial, and hence more difficult to get approved. These two cases show the weakness of the two measures defined. One way to overcome this is to look also at the content of each bill, which is left for future research.

[8] From the summaries of parliamentary activities, available at `http://www.assembly.go.kr/assm/assemact/council/council04/assmReport/reportUserList.do` (last accessed on October 22, 2015).

[9] An alternative measure might use the number of bills that have a clear benefit for the constituency, as in Gagliarducci, Nannicini and Naticchioni (2011). Constructing such a variable is left for future research. One might suggest

Participating in parliamentary sessions, especially when bills are voted on, is another important task of legislators. Measures of such activity are also commonly used as legislative performance in related studies (Dal Bó and Rossi, 2011; Gagliarducci, Nannicini and Naticchioni, 2011; Hoffman and Lyons, 2013; Fisman et al., 2015). This type of activities, however, require the legislator's physical presence in the Assembly building, and hence less time spent in her constituency. At the same time, they are less visible to voters than the number of bills proposed or approved (Fisman et al., 2015). Given the importance of constituency service, measures of such activity are unlikely to fit my framework.

To see if the data agree with the preceding discussion, I regress the indicators of being renominated for and being reelected in the election for the next (19th) Assembly on the two measures defined (the *Bills*), as well as on two other common, participatory measures: the percentage of bills the legislator voted on (*PercParticipated*, 20~99, mean=68 and standard deviation=18); and the number of illegitimate absences (*NAbsences*, 0~19, mean=3 and standard deviation=4). As discussed above, the latter two are expected to be less good measures in South Korea. To control for the legislator's standing in the last election, I include own vote share and the margin of victory in the last election.

[Table 2.1 about here]

As reported in Table 2.1, the two probabilities are positively and significantly correlated with both the number of bills proposed (columns (1) and (2)), and the number of those bills approved (columns (5) and (6)), but not with either of the other measures. This also supports my choice of performance measures.[10]

2.2.3 Factors Controlled For

Table 2.2 lists the control variables.

[Table 2.2 about here]

Legislator-specific controls are deduced from the context, and include the indicator for incumbents, number of previous Assemblies served and party affiliation. Constituency-specific controls are borrowed from the literature on the determinants of turnout (e.g., age distribution, education and income levels, and ideological leaning). Election-specific variables known to be important determinants of turnout are also included: margin of victory, size of the electorate, winner's vote share and campaign expenditure. See Appendix 2.C for details.

using the transfer from the central government to the local government. This transfer in South Korea is, however, known to be in the discretion of the president (Horiuchi and Lee, 2008), and other actors such as the mayor and legislators in neighboring constituencies are also involved in that transfer, making accountability unclear.

[10] As reported in Appendix 2.A, turnout is not significant for the latter two measures in any specification.

Table 2.3 lists summary statistics.

[Table 2.3 about here]

2.3 Endogeneity of Turnout and Its Instruments

Because of unobserved factors, turnout is still likely to be endogenous in the regression of legislator's performance. For instance, some legislators may have a better network in the constituency. The legislator's local network is likely to be important for mobilizing supporters on election day, and thus correlated with turnout. But, if the legislator can mobilize supporters more easily on the next election day, she would have less incentive to perform. This suggests a downward bias in the OLS.[11] Similarly, if the constituency is a candidate for a public project or a landfill, it will be a top issue in election and boost turnout; but the legislator will have to concentrate on that particular issue, doing less on general legislation. This is another source of downward bias in the OLS.

This endogeneity problem is overcome by instrumental variables (IV) estimation.

2.3.1 Instrument for Turnout

Motivated by previous studies, meteorological information on election day is used to build the instrument for turnout (c.f., Hansford and Gomez (2010), Lind (2015) and Fujiwara, Meng and Vogl (2016)). The basic data are on precipitation in mm, recorded at more than 500 weather stations (WS) throughout South Korea. For $N = 1, 3, 5$, *RainN* denotes the demeaned precipitation in the constituency on election day, interpolated from the N nearest WS (inverse distance weighting). It is demeaned, in the sense that the average precipitation on April 9 of the 10 preceding years ($1998 \sim 2007$) is subtracted from that of the year 2008 (the election day). Results are virtually the same for $N = 1, 3, 5$, and only $N = 5$ are reported (the rest available upon request).[12]

Notice from Table 2.3 that the election day was exceptionally rainy: The demeaned rainfall ranges from -2mm to 41mm. Figure 2.2 shows the geographical distribution of turnout and its instrument, and Figure 2.3 does the analogous for the two performance measures.

[Figures 2.2 and 2.3 about here]

[11] Likewise, any unobserved characteristic of the legislator positively correlated with her productivity in mobilization would reduce her incentive to perform, resulting in a downward bias.

[12] One might suggest using turnout in another major election as the instrument for turnout. Unfortunately, no presidential election was held during that period. More importantly, the legislator may react directly to this turnout, making it endogenous in the main regression; see Section 2.5.

2.3.2 Effect of Rainfall on Turnout

Election day rainfall is known to decrease turnout in the U.S. (Gomez, Hansford and Krause, 2007; Hansford and Gomez, 2010; Fujiwara, Meng and Vogl, 2016). A natural explanation is that it increases the *cost of voting per se*, such as the cost of traveling to the polling place, which is known to be an important determinant of turnout (Gibson et al., 2013). But the *opportunity cost of voting* must also take into account of the *utility of the best alternative*:

$$\begin{aligned}&\text{Opportunity cost of voting (C)}\\&= \text{Cost of voting per se (A)} + \text{Utility of the best alternative (B)}.\end{aligned} \tag{2.2}$$

(Lind (2015) also makes a similar argument.)

Election day rainfall is likely to increase the cost of voting per se in all cases (A $\uparrow$). On the other hand, its effect on the utility of the best alternative is likely to depend on whether election day is a public holiday or not. If working day (as in the U.S.),[13] the best alternative for most voters would be working or being at home; rainfall is unlikely to affect its utility much ($\overline{\text{B}}$), and its net effect is likely to increase the opportunity cost of voting (A $\uparrow$ $+\overline{\text{B}}$ = C $\uparrow$), and hence decrease turnout. If public holiday (as in South Korea), on the other hand, the best alternative for many voters would be leisure activities;[14] rainfall is likely to *decrease* the utility of such activities (B $\downarrow$). With its effect on the two components operating in opposite directions (A $\uparrow$ +B $\downarrow$= C?), its net effect can go either way.

2.4 Estimation Results and Validity

Column (1) of Table 2.4 reports the first-stage regression results.

[Table 2.4 about here]

The large F-statistic of *Rain5* suggests that its explanatory power is sufficient.[15] After partialling out the effect of control variables, turnout is *increasing* in rainfall. As discussed in Section 2.3.2, however, this can be explained by the opposite effects of rainfall on the two factors that constitute

[13] In the U.S., a bill to make federal election day a public holiday has been introduced but not enacted (as of August 5, 2015; `https://www.govtrack.us/congress/bills/113/s2918/text`).

[14] The survey results by the National Election Commission supports this hypothesis: Among the 745 nonvoters surveyed, the majority (27%) named 'being busy doing other things' as the main reason for abstention; this pattern of response is uniform across various characteristics (e.g., age and region). Full results downloadable at `http://nec.go.kr/portal/cmm/fms/FileDown.do?atchFileId=FILE_000000000061978&fileSn=1` (last accessed on October 18, 2015).

[15] The big R^2 ($\geq$ .75) is an indication that relevant factors are well controlled for. For instance, the constituency-specific controls-known to be important determinants of turnout (see Appendix 2.C)-alone explain nearly 60% of variation in turnout.

the opportunity cost of voting, when election day is a public holiday. Lind (2015) also finds a similar result in Norway.

Panel (a) of Figure 2.4 plots the residuals from the regression of turnout on controls, against its instrument (*Rain5*).

[Figure 2.4 about here]

It reveals an outlier in terms of precipitation, a constituency in the southernmost part of the country (Jeju island). Without the outlier (panel (b)), the fitted line remains virtually the same; and the F-statistic of the excluded instrument (see Column (2) of Table 2.4) is still well above the rule-of-thumb value of 10. The rest of the paper therefore retains the full sample. There is no meaningful difference when the outlier is excluded (available upon request).

Table 2.5 reports the results of the second-stage IV estimation, as well as the OLS.

[Table 2.5 about here]

The IV estimates show substantial effects of turnout. In particular (sd for standard deviation, henceforth), a 1 % point increase in turnout (1/6 of sd) is predicted to induce the legislator to propose 6.8 more bills (1/5 sd, significant at the 1% level) and get 2 more bills approved (1/5 sd, significant at 5%), during the 4-year mandate. This relation is hidden in the OLS,[16] and the direction of the difference between the IV and the OLS is in line with the discussion in Section 2.3 on the downward bias in OLS.

The results are virtually the same when the *level* of rainfall-without subtracting its historical mean-is used as the instrument for turnout; see Table 2.6.[17]

[Table 2.6 about here]

2.4.1 Validity of Results

In this subsection, I argue for the exclusion restriction of *Rain5* in the regression. To further support the results, I also propose an additional instrument.

2.4.1.1 Exclusion Restriction of *Rain5*

There are two ways that *Rain5* can be correlated with the error term of regression (2.1): The legislator conditions her performance on factors other than *Rain5* that are omitted *and* correlated with *Rain5* (indirect correlation); or she conditions her performance on *Rain5* itself (direct correlation).

[16] The null hypothesis that turnout is exogenous is rejected by statistical tests at the 5% level; see the bottom rows.

[17] The coefficient on rainfall (*Rain5uc*) in the 1st-stage is smaller than that of the demeaned rainfall (*Rain5*) in Table 2.4. This is natural, because the effect of rainfall is likely to depend on how wet the constituency usually is on that day. Demeaned rainfall controls for it, while rainfall itself does not.

Indirect correlation is unlikely, because *Rain5* is the unexpected-demeaned-rainfall, and many relevant characteristics are controlled for. Also, given the large payoff difference between a success and failure in reelection, direct correlation is unlikely if the legislator is not sufficiently confident about how rainfall affects the behavior of (different) voters. There is a strong reason to believe this last condition to be true in the current context.

[Table 2.7 about here]

Precipitation on a major election day almost never happened before the 18th Assembly election! The current-6th-Republic began in 1987 (the last direct presidential election before the 6th Republic held in 1971). In the current republic, 5 presidential elections and 5 Assembly elections preceded the 18th Assembly election. Among all meteorological observations for those 10 election days, only 3 recorded a positive precipitation, as reported in Table 2.7. Even these 3 cases were about small fractions ($< 7\%$) of atypical constituencies (an island and the highest point above the sea level), and recorded low levels of precipitation (< 5.5㎜; c.f., the average of 16.4㎜ on the 18th Assembly election day).

Given this lack of precedent, the legislator would not have been confident about the effect of rainfall on voters' behavior, and hence would not have conditioned her performance on it. This supports the absence of a direct correlation.

2.4.1.2 Additional Instrument for Turnout

To further support the empirical finding, I employ another instrument for turnout: the number of polling places per 100,000 voters, denoted by *NPollPlaces* ($22 \sim 96$, mean=37 and standard deviation=14).

For each election, the local election commission of each constituency decides the set of polling places in the constituency. The commission is an independent body, and thus independent of the legislator of the constituency, making the decision based on local conditions, such as population and geography. When population density is added in the regression, such factors are likely to be well controlled for; and the variation in turnout caused by the remaining variation in the number of polling places is likely to be exogenous in regression (2.1).

[Tables 2.8, 2.9 and 2.10 about here]

As reported in Tables 2.8, 2.9 and 2.10, results are very similar for the three sets of instruments: rainfall only, polling places per voter only, and both together. Also, the null hypothesis that the instruments are exogenous cannot be rejected at any conventional level (see the last rows).

2.4.2 Rate of Approval

The estimated effect of turnout is of a similar magnitude (in standard deviations) for the number of bills proposed and the number of those bills approved. One might wonder if the rate at which bills are approved is constant. In that case, the use of the number of bills approved would be redundant. More importantly, the legislator would not have much incentive to persuade other members to get her bills approved. This may imply a malfunctioning of legislative process, because persuading other legislators and reflecting their opinions can be an important part of democracy in parliament.

[Table 2.11 about here]

Table 2.11 reports the results of the analogous estimation for the percentage of bills approved ($0 \sim 100$, mean=37.5 and standard deviation=17.5). Turnout is significant at the 5% level when the number of polling places per voter is included as an instrument.[18] In those two specifications, turnout substantially increases the rate of approval: A one percentage point increase in turnout is predicted to increase the rate of approval by 4.4 percentage point when instrumented by the number of polling places per voter alone, and by 2.5 when both instruments are used. This suggests that turnout also induces the legislator to work to persuade other legislators and take their opinions into account.

2.5 Simple Model for a Potential Mechanism

How can we explain the positive effect of turnout on performance? Previous studies hint at some possibilities. For instance, the elected official may feel more legitimate for her job when elected with high turnout (Birch, 2009, Chapter 4). If, in addition, (self-)legitimacy is a factor improving performance, this can be a reason behind the effect. Or the mere act of voting may increase one's interest in politics (Braconnier, Dormagen and Pons, 2014). In this case, turnout in the previous election increases the degree of interest among the electorate, and the reelection-motivated incumbent may adjust her performance accordingly. Both of these explanations suggest a positive effect of institutions designed to boost turnout.

This section builds a simple model to propose yet another explanation, in which the degree of monitoring by the electorate is constant over time, and turnout simply serves as a noisy signal of it. The signal is noisy in the sense that the degree of monitoring is one of the many unobserved factors that are correlated with turnout. As mentioned in Section 2.1, it is motivated by the existing evidence that better informed voters are more likely to vote. This explanation may sound similar to the second one mentioned above-in which the mere act of voting increases one's interest in

[18] Turnout is not significant when instrumented by rainfall alone.

politics-because both focus on the relation between voters' characteristics and turnout. Unlike that explanation, however, it does not require the voter's characteristics to change according to whether she voted in the previous election. The positive effect results from the elected official's inference of the degree of monitoring by the electorate, through the previous turnout. As will be shown, this difference leads to different implications for institutions designed to boost turnout.

Appendix 2.D contains omitted details of this section.

2.5.1 Setting

Let us consider a country with a parliament. Each parliamentary constituency is composed of a continuum of voters of measure 1 and is represented by exactly one legislator. The main task of the legislator is legislation (e.g., participating in parliamentary sessions, proposing bills and trying to get them approved). At the end of the current (first) parliament, an election is held to select the members of the next (second) parliament. We consider an arbitrary constituency of this country.

2.5.1.1 Legislator's Preferences

The legislator's decisions in the current parliament are summarized as choosing a number $\ell_1 \in [\underline{\ell}, \overline{\ell}]$. Higher ℓ_1 corresponds to harder-working and better legislative performance. Let s_2 denote her vote share in the next election. Her preferences on all she cares about in her career are represented by the utility function v on (ℓ_1, s_2), such that

$$v(\ell_1, s_2) = s_2 - c(\ell_1), \tag{2.3}$$

where $c(\cdot)$ is twice-differentiable with $c'(\underline{\ell}) = 0$ and $c'' > 0$. She will work only if it increases her (expected) vote share in the next election. Figure 2.5 summarizes the timing in the model.

[Figure 2.5 about here]

2.5.1.2 Voters

As for voters, we simply assume their voting behavior as following. On election day, each voter has three options: vote for the incumbent, vote for a challenger, or abstain. On election day, a voter may or may not know the incumbent's performance in the current parliament. A voter is said to be *informed* if she knows it, and *uninformed* otherwise. Let $\alpha \in (0, 1)$ denote the share of informed voters. This share is constant between elections and unaffected by legislative performance.

Turnout

In the nth election ($n = 1, 2$), each informed voter votes with probability $p_n^I := P^I(x_n)$, and each uninformed voter with $p_n^U := P^U(x_n)$, for some continuous functions P^I and P^U with $0 < P^U < P^I < 1$. x_n is the realization of a random variable $\widetilde{x}_n$ on election day. It reflects variations in all factors that may affect the probability of voting but are otherwise unrelated to the election, including (but not limited to) the traffic/weather condition and the mood of the town. For each n, $\widetilde{x}_n$ is independently and identically distributed over $[\underline{x}, \overline{x}]$, with distribution function $F_{\widetilde{x}}$. It is also independent of all other variables (including the legislator's belief on α defined below), except for the ones defined as a function of itself. By the law of large numbers (Uhlig, 1996, Theorem 2), turnout rate among informed voters is p_n^I, and that of the uninformed p_n^U. The total turnout is $\pi_n := \alpha p_n^I + (1 - \alpha) p_n^U$.

Vote Choice

If an uninformed voter votes in the next election, her vote choice does not depend on ℓ_1. In terms of the theory of Matsusaka (1995) mentioned in Section 2.1, she may not know ℓ_1 or may lack an understanding of how/why it matters to her. Let q^U denote the share of the uninformed who, conditional on turning out in the next election, would vote for the incumbent. The analogous share of informed voters, however, does depend on ℓ_1. In particular, letting $q^I(\ell_1)$ denote this share, the function q^I is strictly increasing. For simplicity, q^I is twice-differentiable with $q^{I\prime\prime} \leq 0 < q^{I\prime}$ and $q^{I\prime}(\overline{\ell}) \leq c'(\overline{\ell})$.

Incumbent's Vote Share in the Next Election

Now, the incumbent's vote share in the next election is

$$s_2 = \frac{\alpha p_2^I q^I(\ell_1) + (1 - \alpha) p_2^U q^U}{\pi_2} = \beta_2 q^I(\ell_1) + (1 - \beta_2) q^U \tag{2.4}$$

where

$$\beta_2 := \frac{\alpha p_2^I}{\pi_2} \tag{2.5}$$

is the share of informed votes among all votes cast in the next election. Plugging (2.4) into (2.3), the incumbent's utility can be expressed as

$$v(\ell_1, s_2) = \beta_2 q^I(\ell_1) + (1 - \beta_2) q^U - c(\ell_1). \tag{2.6}$$

2.5.1.3 Legislator's Information

The legislator does not know the fraction of informed voters (α) but has a belief about it. Let $\widetilde{\alpha}$ denote the random variable distributed according to her belief *before* knowing the turnout in the first election; that is, her prior (at $n = 0$ in Figure 2.5). Let $[\underline{\alpha}, \overline{\alpha}] \subseteq [0, 1]$ and $F_{\widetilde{\alpha}}$ denote its support

and distribution function, respectively.[19]

For turnout-related factors, the legislator knows $P^I(\cdot)$, $P^U(\cdot)$, and the joint distribution of $\widetilde{x}_1$ and $\widetilde{x}_2$, but not their realizations. When choosing ℓ_1, she knows the previous turnout π_1, as well as the supports from informed voters ($q^I(\cdot)$) and uninformed voters (q^U).[20]

For every element of the model that is a function of α and/or x_n, we put a tilde above to denote the random variable obtained by replacing α with $\widetilde{\alpha}$, and x_n with $\widetilde{x}_n$. For example,

$$\widetilde{p}_n^I := P^I(\widetilde{x}_n), \quad \widetilde{p}_n^U := P^U(\widetilde{x}_n), \quad \widetilde{\pi}_n := \widetilde{\alpha}\widetilde{p}_n^I + (1-\widetilde{\alpha})\widetilde{p}_n^U, \quad \widetilde{\beta}_2 := \frac{\widetilde{\alpha}\widetilde{p}_2^I}{\widetilde{\pi}_2}. \tag{2.7}$$

The legislator considers the previous turnout as a realization of $\widetilde{\pi}_1$. Notice the two sources of variation in $\widetilde{\pi}_1$: the incomplete information on the share of informed voters ($\widetilde{\alpha}$), and the stochastic component of turnout ($\widetilde{x}_1$). As we will see, the inability to perfectly distinguish these two sources makes the legislator's posterior on α to react to the previous turnout.

2.5.2 Legislator's Expected Utility Maximization

Now, the legislator chooses ℓ_1 to maximize

$$\mathbb{E}[v(\ell_1, \widetilde{s}_2)|\pi_1] = \underbrace{\mathbb{E}(\widetilde{\beta}_2|\pi_1)q^I(\ell_1)}_{\text{(Expected) Benefit from } \ell_1} + [1-\mathbb{E}(\widetilde{\beta}_2|\pi_1)]q^U - \underbrace{c(\ell_1).}_{\text{Total cost of } \ell_1} \tag{2.8}$$

Taking the partial derivative with respect to ℓ_1,

$$\frac{\partial \mathbb{E}[v(\ell_1, \widetilde{s}_2)|\pi_1]}{\partial \ell_1} = \underbrace{\mathbb{E}(\widetilde{\beta}_2|\pi_1)q^{I\prime}(\ell_1)}_{\text{Marginal benefit at } \ell_1} - \underbrace{c'(\ell_1).}_{\text{Marginal cost at } \ell} \tag{2.9}$$

The marginal benefit of performance at given level is strictly increasing with $\mathbb{E}(\widetilde{\beta}_2|\pi_1)$, the expected share of informed votes among all votes cast in the next election. This is because those voters are the ones who will take current performance into account in their vote choice in the next election. The larger that subset is, the more sensitive the incumbent's vote share in the next election will be to current performance. This is the channel through which the previous turnout may affect current performance.

Lemma 2.1. *The level of current legislative performance is strictly increasing with the expected share of informed votes among all votes cast in the next election.*

[19] For the random variables to be in the appropriate range with probability 1, we assume that $\overline{\alpha} \leq [1 - \max P^U(x_n)]/[\max P^I(x_n) - \max P^U(x_n)]$.

[20] In fact, all that is needed is that $(\widetilde{q}^U, \widetilde{q}^I(\ell_1))$, the random vector distributed according to her belief on $(q^U, q^I(\ell_1))$, is independent of $\widetilde{\alpha}$ for every ℓ_1. This has some empirical support: Ashenfelter and Kelley (1975) find that the reported candidate preference-a strong predictor of actual vote choice-has no significant impact on the likelihood of voting.

Thus, we are led to analyze the conditional expectation $\mathbb{E}(\widetilde{\beta}_2|\pi_1)$, a function of the previous turnout. By definition,

$$\widetilde{\beta}_2 = \frac{\widetilde{\alpha}\widetilde{p}_2^I}{\widetilde{\pi}_2} = \frac{\widetilde{\alpha}P^I(\widetilde{x}_2)}{\widetilde{\alpha}P^I(\widetilde{x}_2) + (1-\widetilde{\alpha})P^U(\widetilde{x}_2)}. \tag{2.10}$$

Since $\widetilde{x}_2$ is independent of both $\widetilde{\alpha}$ and $\widetilde{x}_1$, it is independent of $\widetilde{\pi}_1$ (because the latter is a function of only $\widetilde{\alpha}$ and $\widetilde{x}_1$). Putting $b(a) := \mathbb{E}(\widetilde{\beta}_2|\widetilde{\alpha} = a)$ for $a \in [\underline{\alpha}, \overline{\alpha}]$,

$$\mathbb{E}(\widetilde{\beta}_2|\widetilde{\pi}_1) = \mathbb{E}[\mathbb{E}(\widetilde{\beta}_2|\widetilde{\alpha}, \widetilde{\pi}_1)|\widetilde{\pi}_1] = \mathbb{E}[\mathbb{E}(\widetilde{\beta}_2|\widetilde{\alpha})|\widetilde{\pi}_1] = \mathbb{E}[b(\widetilde{\alpha})|\widetilde{\pi}_1] \tag{2.11}$$

by the law of iterated expectations. This equation simplifies the derivation of the main result, because the function b has the following properties:

Lemma 2.2. *The function b is strictly increasing and strictly concave.*

2.5.3 Main Result

Current performance is strictly increasing with the expected share of informed votes among all votes cast in the next election (Lemma 2.1). By (2.11), this last expectation is equal to the conditional expectation of $b(\widetilde{\alpha})$ given the previous turnout, and the function b is strictly increasing and strictly concave (Lemma 2.2). If the legislator's posterior on α "increases" (in the appropriate sense) with the previous turnout, which is only natural, it will follow that the previous turnout increases current performance.

Proposition 2.1. *Suppose, for any two levels of the previous turnout $\pi_1 < \pi_1'$, the legislator's posterior belief on the share of informed voters given π_1' second-order stochastically dominates that given π_1. Then, the level of current legislative performance is strictly increasing with the previous turnout.*

Proof. This is a direct application of Bawa (1975, Theorem 2). □

Example 1. As an illustration, Appendix 2.D.2 considers the simple case where $P^I(x_n) := p^I + x_n$ and $P^U(x_n) := p^U + x_n$ for some fixed numbers p^I and p^U with $\max\{0, -\underline{x}\} < p^U < p^I < \min\{1, 1 - \overline{x}\}$, and $F_{\widetilde{x}}$ and $F_{\widetilde{\alpha}}$ are uniform.

2.5.4 Effect of Institutions Designed to Boost Turnout

An important motivation for building the model is to consider the impact of institutions designed to boost turnout, such as compulsory voting, in the current framework. Given the estimated effect

of voter turnout on performance, it is worthwhile to investigate the effect of such institutions on performance.[21]

The *introduction* of compulsory voting, automatic voter registration or longer polling time is likely to cause a jump in turnout. A naive interpretation of the empirical results of this paper would suggest an analogous jump in the performance of elected officials. However, at the heart of the mechanism proposed above is the inference of the fraction of informed voters from the previous turnout. The legislator does not observe the variation in turnout caused by exogenous factors ($\widetilde{x}_n$ in the model), and considers a high (low) turnout as an indication of a large (small) share of informed voters. On the contrary, she is likely to observe the introduction of such measures and anticipate the subsequent jump in turnout. Unless they alter the share of informed voters as well, their effect on performance through the jump in turnout is likely to be limited and short-lived, if anything.

On the other hand, the model suggests a more significant, *negative* impact of such institutions. Since informed voters already have a higher tendency to vote, the difference in turnout probability between informed voters and uninformed voters is likely to diminish when such institutions are put in place. In that case, the share of informed voters among all voters who turnout (i.e., β_2) will be smaller; performance will be less important for reelection, because a larger fraction of votes in the next election will be independent of it. Essentially, this is a manifestation of the "danger of a low grade of intelligence [...] in the popular opinion which controls [the representative body]" (Mill, 1861, p.131).

To demonstrate these effects clearly, institutions designed to boost turnout are now introduced into the model.[22] Let $\delta \geq 0$ be a measure of the strength of such institutions in place (*penalty*, henceforth). Larger fine on abstention corresponds to higher δ, for instance. It is constant between the two elections ($n = 1, 2$), and the legislator knows its value. The baseline case studied above corresponds to no penalty ($\delta = 0$). To emphasize its dependence on δ, every variable, random or nonrandom, is written as a function of δ, except when $\delta = 0$.

2.5.4.1 Institutions in the Model

For $\delta > 0$, let $\widetilde{p}_n^I(\delta)$ denote the random variable whose value is the probability that each informed voter will vote in the nth election, and $\widetilde{p}_n^U(\delta)$ the analogous random variable for uninformed voters. We consider the institutions that increase turnout probability equally for informed voters and uninformed voters:[23]

$$\widetilde{p}_n^I(\delta) - \widetilde{p}_n^I = \gamma(\delta) = \widetilde{p}_n^U(\delta) - \widetilde{p}_n^U \tag{2.12}$$

[21] A major argument for such institutions is to improve the equality of representation among different voters (Lijphart, 1997).

[22] This extension is built on the same probability space as in the baseline case.

[23] The same conclusion can be obtained for the institutions that decrease the probability of abstention in equal proportion for both types of voters.

with probability 1, for some continuously differentiable function γ with $0 < \gamma < 1 - \max P^I(x_n)$ and $\gamma' > 0$.

In reality, the difference in turnout probability between informed voters and uninformed voters is likely to diminish with penalty, as discussed above. Thus, we are taking a conservative approach to the negative effect we would like to show. Let $p_n^I(\delta)$ and $p_n^U(\delta)$ denote arbitrary realizations of the corresponding random variables.

2.5.4.2 Higher Turnout but Smaller Share of Informed Votes

Under this form of institutions, turnout in the nth election is

$$\pi_n(\delta) := \alpha p_n^I(\delta) + (1-\alpha)p_n^U(\delta) = \underbrace{\pi_n}_{\substack{\text{Turnout in} \\ \text{the baseline case}}} + \underbrace{\gamma(\delta).}_{\substack{\text{Additional turnout} \\ \text{induced by the institutions}}} \tag{2.13}$$

Let $\widetilde{\pi}_n(\delta) := \widetilde{\alpha}\widetilde{p}_n^I(\delta) + (1-\widetilde{\alpha})\widetilde{p}_n^U(\delta)$. As in the baseline case, the legislator considers turnout as a realization of this random variable. Importantly, as penalty increases from δ to δ', she considers turnout under the larger penalty as a realization of $\widetilde{\pi}_n(\delta')$. She expects turnout to be higher under δ', and the jump in turnout following the increase in penalty will have no positive effect on her performance, as discussed above.

Let $\beta_2(\delta)$ denote the share of informed votes among all votes cast in the second election. It is decreasing with penalty under this form of institutions:

$$\beta_2'(\delta) = \frac{\alpha\gamma'(\delta)[\pi_2(\delta) - p_2^I(\delta)]}{\pi_2(\delta)^2} < 0. \tag{2.14}$$

Performance will be less important for reelection under higher penalty, because larger fraction of votes in the next election will be independent of current performance. This form of institutions will therefore result in a lower level of performance. The next proposition formally establishes this.

Proposition 2.2. *The expected level of current performance is strictly decreasing with the strength of the institutions that increase turnout probability equally for informed voters and uninformed voters.*

2.6 Conclusion

In this paper, I show that voter turnout can induce performance from elected officials. This possibility has not received much attention in the related literature. Specifically, I estimate the effect turnout on relevant measures of legislative performance, in the 18th National Assembly of South Korea. With

turnout instrumented by the exceptional rainfall on election day, the estimation reveals substantial effects: A 1 standard deviation increase in turnout induces a 1.2 standard deviations increase in both the number of bills proposed and the number of those bills approved. I also find evidence that the effect of election day rainfall on turnout depends on institutional details.

An important weakness of the performance measures used is that they are only quantitative; for instance, writing many low-quality/easy-to-pass bills is considered as good performance. Taking into account of the content of each bill-for instance, its substantiality or whether it is pork-barrel or public good-will be a useful extension of the current framework. Also, extending the sample dynamically or applying the framework to different contexts can be valuable for testing the relation more generally.

The theoretical framework for a potential mechanism behind the empirical finding highlights the signaling role of turnout. It warns of a negative effect of institutions designed to boost turnout, because such institutions can reduce the sensitivity of the reelection probability to current performance. This prediction relies crucially on the assumptions that better informed voters are more likely to vote, and that the level of information of each voter is fixed over time. This suggests further research on the relation between information and turnout decision.

Appendices

2.A Results for Participatory Measures

Table 2.12 reports the second-stage results for the percentage of bills the legislator voted on, and the number of unjustified absences.

[Table 2.12 about here]

As discussed in Section 2.2.2.1, these are commonly used as measures of legislative performance but expected to fit poorly to the current context. As expected, turnout has no significance for them, and there is no meaningful difference between the IV and the OLS estimates. This suggests exogeneity of turnout, and statistical tests support it: The null hypothesis that it is the case cannot be rejected at any conventional level; see the bottom rows of the table.

2.B Figures and Tables

Figure 2.1: The legislative process of member-initiated bills in the Assembly

(1) Proposer ⇒ **(2) Speaker**

writes a proposal to the speaker of the Assembly (with at least 10 seconding members).

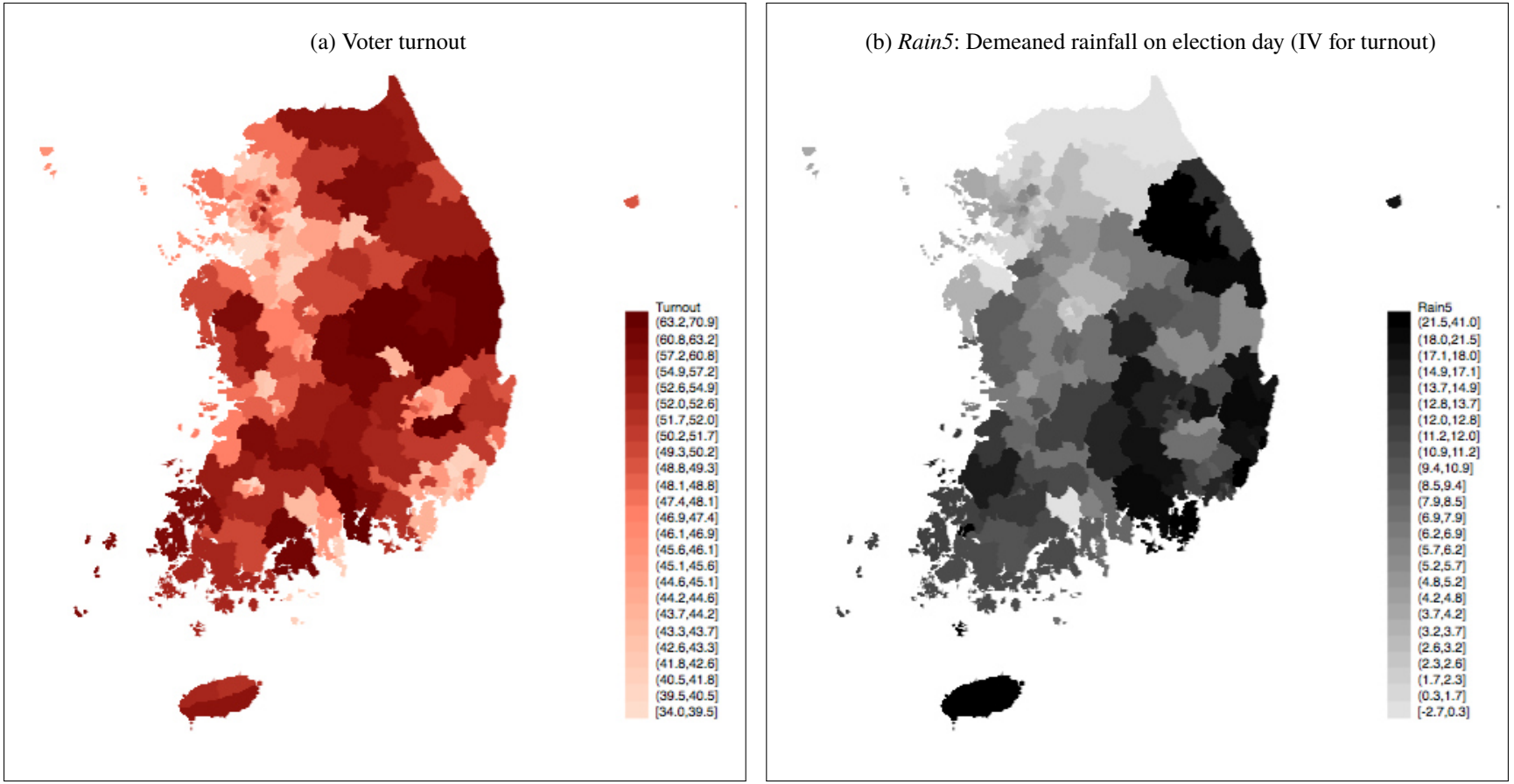
makes the proposal available to all members and assigns it to the corresponding committee.

⇒ **(3) Committee** ⇒ **(4) Plenary Session**

decides whether to (modify or combine in an alternative, and) refer it to the plenary session.

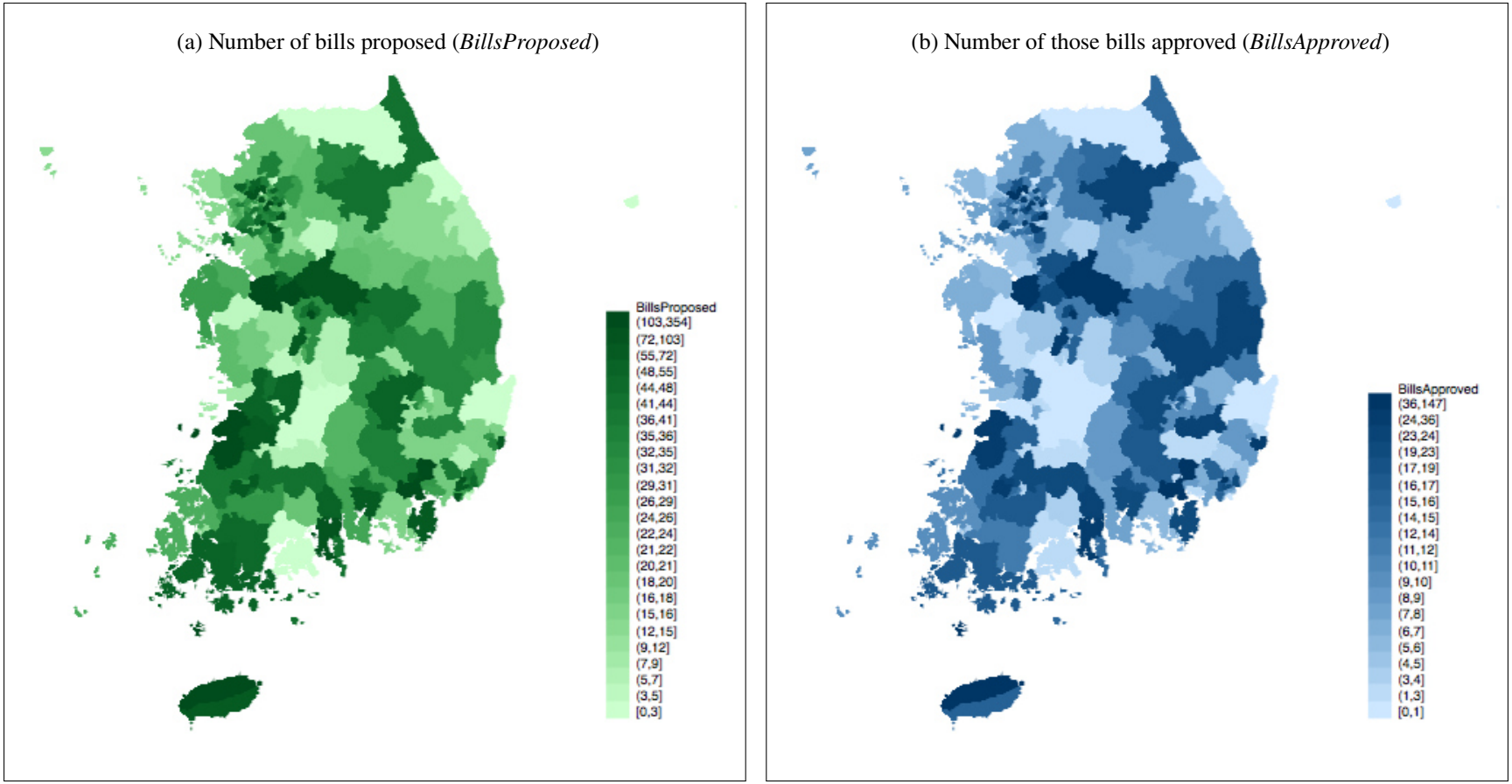
- The speaker announces the bill to be voted on, and members discuss and vote.
- If approved, the speaker sends it to the executive.

Figure 2.2: Projection of voter turnout and its instrument on a map



The maps are drawn on Stata, using the command `spmap` (Pisati (2007)).

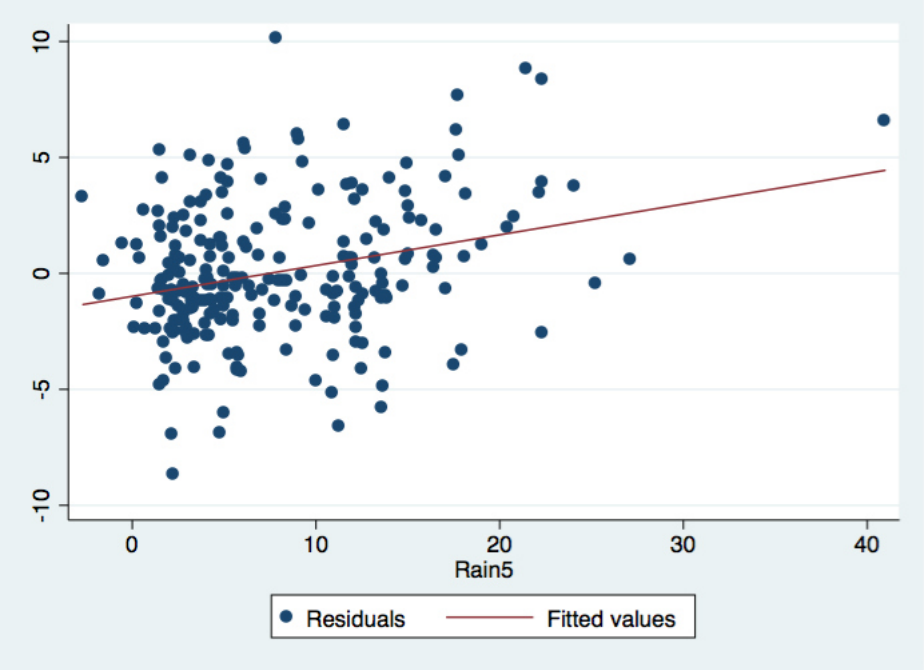
Figure 2.3: Projection of performance measures on a map



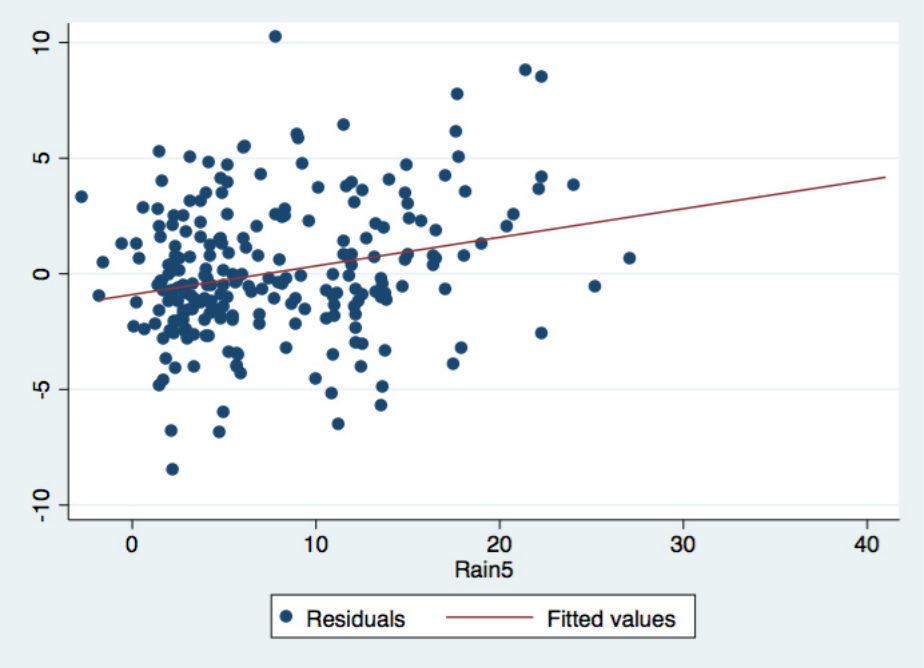
The maps are drawn on Stata, using the command `spmap` (Pisati (2007)).

Figure 2.4: Partial correlation between turnout and its instrument

(a) All constituencies ($N = 219$)



(b) Excluding the outlier ($N = 218$)



Note: The vertical axis measures the residual from the regression of turnout on the controls.

Figure 2.5: Timing in the model

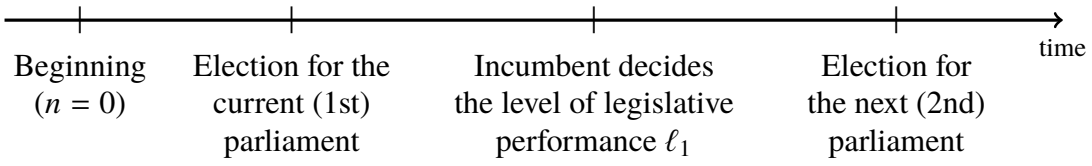
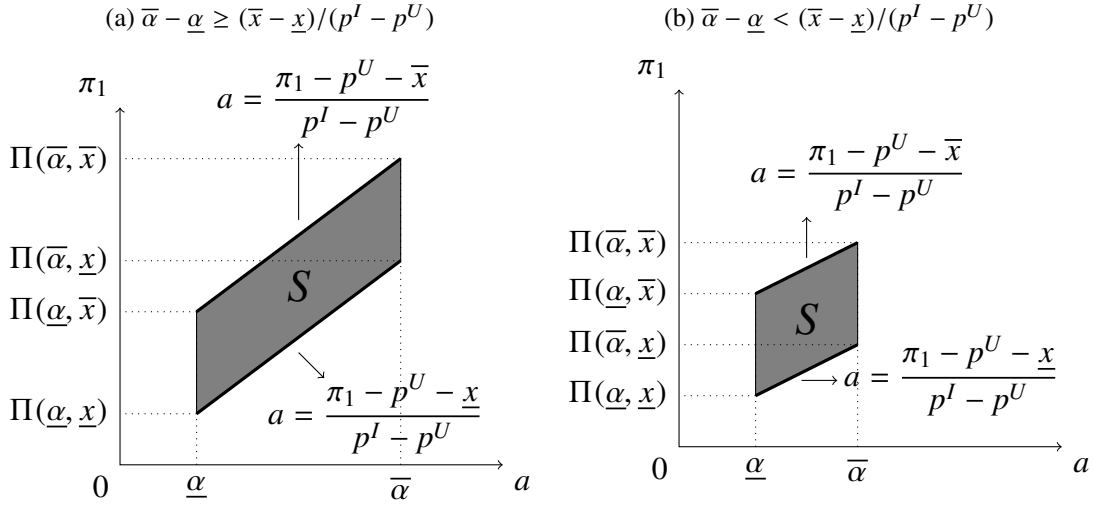


Figure 2.6: The support of the joint density of $\widetilde{\pi}_1$ and $\widetilde{\alpha}$



Note: See Example 1 in Appendix 2.D.2. The gray surface of the parallelogram is the support of the joint density of $\widetilde{\pi}_1$ and $\widetilde{\alpha}$, in (2.29). Panel (a) is for $\overline{\alpha} - \underline{\alpha} \geq (\overline{x} - \underline{x})/(p^I - p^U)$, and panel (b) is for $\overline{\alpha} - \underline{\alpha} < (\overline{x} - \underline{x})/(p^I - p^U)$.

Table 2.1: Linear probability models of renomination and reelection

	=1 if renominated				=1 if reelected			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BillsProposed	0.165***				0.139***			
BillsApproved		0.145**				0.117**		
PercParticipated			0.060				0.084	
NAbsences				-0.088				-0.052
Margin	-0.126	-0.123	-0.082	-0.106	0.115	0.122	0.169	0.140
VShareOwn	0.147	0.146	0.100	0.134	0.106	0.101	0.045	0.082
N	219	219	219	219	144	144	144	144
R^2	0.0290	0.0230	0.0057	0.0097	0.0648	0.0593	0.0528	0.0484

Standardized beta coefficients (with robust standard errors); * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

VShareOwn and *Margin*: own vote share and the margin, respectively, in the 18th Assembly election

Table 2.2: List of control variables

Variable	Definition
Legislator-specific factors	
Incumbent	= 1 if represented the same constituency in the previous Assembly
NPrevAssemblies	Number of Assemblies (≤16th) served
CommitteeChair	= 1 if the chairperson of a standing committee
GNP, DP	Indicators for the corresponding party affiliation[b]
Constituency-specific factors	
PercOver65	Percentage of residents who are 65 years old or older
AverageAge	Average age of the residents
PercUniversity	Percentage of citizens who had been registered to a 4-year university
ResidentTax	Collected resident tax per capita in 2007[a]
VSharePresident	Vote share of the incumbent (17th) president[c]
Election-specific factors	
VShareOwn	Own vote share
Margin	Own vote share - the second largest vote share
NVotersK	Number of voters, in thousands[a]
CampSpendM	Total campaign spending of all candidates, in millions of KRW[a, d]

See Appendix 2.C for details, and Table 2.13 for data sources.

a) Included in logarithm

b) GNP was the major conservative party, and DP was the major opposition; see Table 2.3.

c) The incumbent president was from GNP. The election was held on December 19, 2007.

d) The USD-KRW (Korean Won) exchange rate is 1,124.86 (as of October 23, 2015, Bloomberg).

Table 2.3: Summary statistics

(a) Summary statistics

	mean	sd	min	max
BillsProposed	36	36	1	354
BillsApproved	13	13	0	147
PercParticipated	68	18	20	99
NAbsences	3	4	0	19
Turnout	47	6	34	71
Rain5	8	6	-2	41
Incumbent	52%	-	-	-
NPrevAssemblies	1	1	0	5
CommitteeChair	13%	-	-	-
PercOver65	11	5	4	29
AverageAge	36	4	30	50
PercUniversity	26	11	6	63
ResidentTax	133	152	29	1492
VSharePresident	48	17	6	84
Margin	21	19	0	81
VShareOwn	54	11	28	89
NVotersK	153	36	86	243
CampSpendM	467	146	217	1282
N	219			

(b) Distribution of party affiliation

	Number of legislators
DP	60
GNP	139
DLP	2
LFP	13
Ind	5
N	219

Note: The variables in panel (a) are defined in Table 2.2 and Section 2.3. Numbers are rounded up to integer, except for *Incumbent* and *CommitteeChair*. In panel (b), the full names are (in the order of appearance) Democratic Party, Grand National Party, Democratic Labor Party and Liberty Forward Party. *Ind* indicates no affiliation (i.e., independent).

Table 2.4: The first-stage regressions: Turnout on the instruments

	All constituencies (1)	Excluding the outlier (2)
Rain5	0.173***	0.168***
	(0.035)	(0.040)
Incumbent	-0.062	-0.068
	(0.443)	(0.442)
NPrevAssemblies	0.591**	0.592**
	(0.262)	(0.262)
CommitteeChair	-0.045	-0.033
	(0.603)	(0.603)
GNP	-1.331*	-1.339*
	(0.758)	(0.759)
DP	-1.727**	-1.751**
	(0.730)	(0.736)
PercOver65	1.159***	1.159***
	(0.207)	(0.207)
AverageAge	-0.545**	-0.545**
	(0.254)	(0.255)
PercUniversity	0.155***	0.154***
	(0.024)	(0.024)
logResidentTax	-0.341	-0.350
	(0.368)	(0.370)
VSharePresident	0.070***	0.070***
	(0.018)	(0.018)
Margin	-0.252***	-0.251***
	(0.029)	(0.030)
VShareOwn	0.360***	0.360***
	(0.062)	(0.062)
logNVotersK	-6.833***	-6.824***
	(1.045)	(1.045)
logCampSpendM	6.887***	6.876***
	(1.261)	(1.260)
N	219	218
F-statistic: Rain5	25.09	17.26
R^2	0.7719	0.7687
Adjusted R^2	0.7550	0.7516

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.5: The second-stage estimation and the OLS estimation

	BillsProposed		BillsApproved	
	IV	OLS	IV	OLS
Turnout	6.807***	1.080	2.077**	0.306
	(2.624)	(0.885)	(0.828)	(0.282)
Incumbent	-2.366	-2.041	-1.301	-1.200
	(6.428)	(5.996)	(2.448)	(2.402)
NPrevAssemblies	-12.478***	-9.405***	-4.144***	-3.194***
	(2.918)	(1.910)	(0.992)	(0.708)
CommitteeChair	-8.801	-7.823*	-3.361*	-3.058*
	(5.728)	(4.037)	(1.899)	(1.558)
GNP	-3.836	-12.079	-1.644	-4.193
	(19.364)	(19.049)	(7.695)	(7.835)
DP	8.083	-2.097	-0.297	-3.445
	(17.045)	(16.757)	(6.548)	(6.709)
PercOver65	-4.096	2.526	-0.646	1.401
	(3.712)	(2.577)	(1.258)	(1.008)
AverageAge	-2.178	-5.227	-1.554	-2.497*
	(3.706)	(3.532)	(1.330)	(1.338)
PercUniversity	-0.924*	-0.133	-0.300*	-0.055
	(0.507)	(0.271)	(0.176)	(0.112)
logResidentTax	7.705	4.114	3.658	2.548
	(6.393)	(5.531)	(2.504)	(2.301)
VSharePresident	-0.615**	-0.154	-0.158*	-0.015
	(0.284)	(0.189)	(0.095)	(0.074)
Margin	1.793***	0.486	0.544**	0.140
	(0.693)	(0.466)	(0.224)	(0.162)
VShareOwn	-2.690**	-0.720	-0.779*	-0.170
	(1.235)	(1.038)	(0.409)	(0.372)
logNVotersK	50.544**	9.998	14.466*	1.927
	(22.722)	(12.925)	(7.826)	(4.816)
logCampSpendM	-50.510**	-11.376	-13.102*	-1.000
	(21.804)	(16.612)	(7.306)	(5.962)
N	219	219	219	219
p-value of the test of H_0: Turnout is exogenous				
Robust score χ^2	.0115		.0136	
Robust regression F	.0113		.0202	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.6: Level of rainfall (*Rain5uc*) as the instrument for turnout

(a) The first-stage

	Turnout
Rain5uc	0.165***
	(0.030)
Incumbent	-0.095
	(0.444)
NPrevAssemblies	0.609**
	(0.261)
CommitteeChair	-0.055
	(0.602)
GNP	-1.413*
	(0.772)
DP	-1.796**
	(0.744)
PercOver65	1.191***
	(0.210)
AverageAge	-0.586**
	(0.257)
PercUniversity	0.156***
	(0.024)
logResidentTax	-0.475
	(0.363)
VSharePresident	0.079***
	(0.018)
Margin	-0.244***
	(0.030)
VShareOwn	0.355***
	(0.063)
logNVotersK	-6.800***
	(1.046)
logCampSpendM	6.878***
	(1.255)
N	219
F-statistic: Rain5	29.49
R^2	0.7722
Adjusted R^2	0.7554

(b) The second-stage

	BillsProposed	BillsApproved
Turnout	7.301***	2.093**
	(2.594)	(0.845)
Incumbent	-2.394	-1.302
	(6.514)	(2.445)
NPrevAssemblies	-12.743***	-4.152***
	(2.938)	(0.972)
CommitteeChair	-8.885	-3.363*
	(5.905)	(1.895)
GNP	-3.125	-1.621
	(19.906)	(7.871)
DP	8.961	-0.269
	(17.593)	(6.761)
PercOver65	-4.667	-0.665
	(3.874)	(1.342)
AverageAge	-1.915	-1.546
	(3.877)	(1.386)
PercUniversity	-0.992**	-0.302*
	(0.489)	(0.168)
logResidentTax	8.015	3.668
	(6.313)	(2.435)
VSharePresident	-0.654**	-0.159
	(0.293)	(0.098)
Margin	1.906***	0.548**
	(0.698)	(0.234)
VShareOwn	-2.860**	-0.784*
	(1.261)	(0.433)
logNVotersK	54.043**	14.579*
	(21.922)	(7.589)
logCampSpendM	-53.887**	-13.211*
	(22.335)	(7.710)
N	219	219
p-value of the test of H_0: Turnout is exogenous		
Robust score χ^2	.0056	.0095
Robust regression F	.0073	.0270

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.7: The rare cases of wet election day before the 18th Assembly election

Date	1987.12.16	1992.03.24	2002.12.19
Weather Station	Daegwallyeong		Ulleung-do
Precipitation (in mm)	1.9	5.3	5
Number of Voters (V)[a,b]	6,063	4,804	7,502
% of V in the Assembly Constituency[a]	6.47	6.38	3.86
Note	Highest station above sea level (842.52m)		Island

a) As of the corresponding election
b) In the administrative division equivalent of city (*sigungu* in Korean)
Source: Korea Meteorological Administration
(`http://www.kma.go.kr/weather/observation/currentweather.jsp`; last accessed on June 9, 2015) and the National Election Commission (`http://info.nec.go.kr/`; last accessed on June 9, 2015)

Table 2.8: The first-stage regressions with the additional instrument

	IV: Rain5	IV: NPollPlaces	IV: Both
Rain5	0.165***		0.151***
	(0.035)		(0.034)
NPollPlaces		0.128***	0.110***
		(0.040)	(0.036)
Incumbent	-0.121	-0.086	-0.128
	(0.454)	(0.443)	(0.437)
NPrevAssemblies	0.624**	0.599**	0.615**
	(0.265)	(0.260)	(0.250)
CommitteeChair	-0.033	0.054	-0.118
	(0.613)	(0.575)	(0.578)
GNP	-1.122	-0.828	-0.958
	(0.777)	(0.851)	(0.788)
DP	-1.607**	-1.329	-1.428*
	(0.740)	(0.817)	(0.752)
PercOver65	1.019***	0.684**	0.843***
	(0.243)	(0.265)	(0.237)
AverageAge	-0.370	-0.224	-0.391
	(0.304)	(0.319)	(0.291)
PercUniversity	0.164***	0.176***	0.179***
	(0.025)	(0.026)	(0.024)
logResidentTax	-0.443	-1.094***	-0.722**
	(0.365)	(0.367)	(0.365)
VSharePresident	0.066***	0.082***	0.076***
	(0.018)	(0.018)	(0.017)
PopDensity	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Margin	-0.259***	-0.245***	-0.257***
	(0.030)	(0.030)	(0.029)
VShareOwn	0.369***	0.367***	0.372***
	(0.062)	(0.061)	(0.058)
logNVotersK	-6.850***	-6.565***	-6.420***
	(1.041)	(1.128)	(1.081)
logCampSpendM	6.943***	6.794***	6.809***
	(1.244)	(1.214)	(1.194)
N	219	219	219
F-statistic of the IV	22.23	10.22	16.27
Adjusted R^2	0.7551	0.7456	0.7658

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.9: The second-stage: Number of bills proposed with the additional instrument

	IV: Rain5	IV: NPollPlaces	IV: Both	OLS
Turnout	7.229**	4.832*	6.337***	1.043
	(2.885)	(2.853)	(2.381)	(0.883)
Incumbent	-1.832	-2.006	-1.897	-2.281
	(6.139)	(5.793)	(5.991)	(5.639)
NPrevAssemblies	-13.014***	-11.556***	-12.471***	-9.251***
	(3.384)	(2.920)	(3.066)	(2.109)
CommitteeChair	-8.889	-8.471*	-8.733	-7.810*
	(6.013)	(4.912)	(5.575)	(4.028)
GNP	-5.086	-7.504	-5.986	-11.327
	(20.511)	(21.110)	(20.645)	(20.593)
DP	7.770	4.100	6.404	-1.702
	(17.262)	(18.594)	(17.577)	(17.510)
PercOver65	-3.374	-1.274	-2.593	2.045
	(4.095)	(4.500)	(3.984)	(3.582)
AverageAge	-3.473	-3.905	-3.634	-4.588
	(5.010)	(4.946)	(4.961)	(4.889)
PercUniversity	-1.070*	-0.690	-0.928*	-0.090
	(0.649)	(0.503)	(0.539)	(0.340)
logResidentTax	8.728	6.804	8.012	3.762
	(7.513)	(6.127)	(6.878)	(6.269)
VSharePresident	-0.609**	-0.438	-0.546**	-0.168
	(0.288)	(0.320)	(0.277)	(0.209)
PopDensity	0.000	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)
Margin	1.963**	1.375	1.745**	0.445
	(0.771)	(0.867)	(0.714)	(0.456)
VShareOwn	-2.921**	-2.048	-2.596**	-0.670
	(1.278)	(1.518)	(1.252)	(1.014)
logNVotersK	53.581**	36.583	47.257**	9.711
	(25.076)	(23.191)	(21.617)	(13.247)
logCampSpendM	-53.906**	-37.241	-47.706**	-10.897
	(22.756)	(26.664)	(21.641)	(16.534)
N	219	219	219	219
p-value of the test of H_0: The instruments are exogenous				
Robust score χ^2			0.4969	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.10: The second-stage: Number of bills approved with the additional instrument

	IV: Rain5	IV: NPollPlaces	IV: Both	OLS
Turnout	2.265**	1.667*	2.043***	0.305
	(0.928)	(0.959)	(0.758)	(0.278)
Incumbent	-1.063	-1.106	-1.079	-1.205
	(2.306)	(2.257)	(2.284)	(2.259)
NPrevAssemblies	-4.383***	-4.019***	-4.247***	-3.190***
	(1.185)	(0.994)	(1.066)	(0.797)
CommitteeChair	-3.400*	-3.295*	-3.361*	-3.058*
	(2.012)	(1.759)	(1.910)	(1.568)
GNP	-2.201	-2.804	-2.425	-4.178
	(8.198)	(8.616)	(8.333)	(8.468)
DP	-0.436	-1.352	-0.777	-3.437
	(6.661)	(7.398)	(6.891)	(7.030)
PercOver65	-0.325	0.199	-0.130	1.391
	(1.453)	(1.719)	(1.474)	(1.415)
AverageAge	-2.131	-2.239	-2.171	-2.484
	(1.883)	(1.910)	(1.887)	(1.903)
PercUniversity	-0.365	-0.270	-0.330*	-0.054
	(0.235)	(0.179)	(0.196)	(0.143)
logResidentTax	4.114	3.634	3.935	2.541
	(2.939)	(2.482)	(2.737)	(2.596)
VSharePresident	-0.155	-0.113	-0.140	-0.016
	(0.097)	(0.113)	(0.095)	(0.082)
PopDensity	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Margin	0.620**	0.473*	0.566**	0.139
	(0.248)	(0.283)	(0.225)	(0.154)
VShareOwn	-0.882**	-0.664	-0.801**	-0.169
	(0.410)	(0.509)	(0.404)	(0.355)
logNVotersK	15.818*	11.577	14.240*	1.922
	(8.800)	(7.798)	(7.477)	(4.958)
logCampSpendM	-14.614*	-10.457	-13.068*	-0.991
	(7.503)	(8.912)	(7.090)	(5.842)
N	219	219	219	219
p-value of the test of H_0: The instruments are exogenous				
Robust score χ^2			0.6154	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.11: The second-stage: Percentage of bills approved

	IV: Rain5	IV: NPollPlaces	IV: Both	OLS
Turnout	1.402	4.424**	2.526**	0.571
	(1.053)	(2.131)	(1.198)	(0.441)
Incumbent	0.715	0.934	0.797	0.655
	(2.650)	(2.941)	(2.682)	(2.799)
NPrevAssemblies	1.054	-0.784	0.370	1.560
	(1.993)	(2.611)	(2.125)	(2.046)
CommitteeChair	-3.475	-4.002	-3.671	-3.330
	(4.357)	(4.608)	(4.362)	(4.591)
GNP	5.963	9.012	7.097	5.124
	(4.930)	(5.840)	(5.046)	(4.874)
DP	1.206	5.834	2.928	-0.066
	(5.032)	(6.404)	(5.190)	(4.907)
PercOver65	1.103	-1.544	0.118	1.831
	(1.777)	(2.420)	(1.834)	(1.565)
AverageAge	-2.768	-2.223	-2.565	-2.917
	(1.913)	(2.166)	(1.952)	(1.977)
PercUniversity	-0.378*	-0.856**	-0.556**	-0.246
	(0.193)	(0.381)	(0.230)	(0.152)
logResidentTax	3.051	5.477*	3.953	2.384
	(2.448)	(3.197)	(2.570)	(2.427)
VSharePresident	0.130	-0.085	0.050	0.190
	(0.142)	(0.184)	(0.140)	(0.125)
PopDensity	0.000	0.001*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Margin	0.394	1.136*	0.670*	0.190
	(0.315)	(0.586)	(0.359)	(0.238)
VShareOwn	-0.265	-1.365	-0.675	0.037
	(0.513)	(0.894)	(0.567)	(0.397)
logNVotersK	11.922	33.354*	19.896*	6.029
	(9.960)	(17.506)	(11.104)	(8.498)
logCampSpendM	4.611	-16.401	-3.207	10.388
	(9.889)	(16.764)	(10.725)	(7.264)
N	219	219	219	219
p-value of the test of H_0: The instruments are exogenous				
Robust score χ^2			0.1002	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.12: The second-stage and the OLS: Participatory measures

	PercParticipated		NAbsences	
	IV	OLS	IV	OLS
Turnout	-0.312	0.178	0.083	0.016
	(1.145)	(0.367)	(0.245)	(0.073)
Incumbent	0.442	0.414	0.289	0.293
	(2.502)	(2.592)	(0.458)	(0.477)
NPrevAssemblies	-4.203***	-4.466***	0.191	0.227
	(1.548)	(1.525)	(0.275)	(0.249)
CommitteeChair	3.562	3.478	-0.649	-0.638
	(3.879)	(4.037)	(0.716)	(0.739)
GNP	11.256*	11.962**	-3.022**	-3.118**
	(5.847)	(5.700)	(1.182)	(1.215)
DP	4.131	5.004	-1.246	-1.366
	(5.682)	(5.424)	(1.060)	(1.091)
PercOver65	-1.140	-1.708	0.085	0.163
	(1.603)	(1.171)	(0.351)	(0.265)
AverageAge	1.629	1.891	-0.150	-0.186
	(1.472)	(1.453)	(0.315)	(0.321)
PercUniversity	-0.082	-0.150	-0.004	0.005
	(0.200)	(0.144)	(0.041)	(0.028)
logResidentTax	0.217	0.525	-0.033	-0.075
	(2.153)	(2.105)	(0.394)	(0.374)
VSharePresident	-0.022	-0.061	0.037	0.042*
	(0.148)	(0.112)	(0.029)	(0.024)
Margin	-0.210	-0.098	-0.021	-0.036
	(0.339)	(0.216)	(0.064)	(0.038)
VShareOwn	0.477	0.308	0.085	0.109
	(0.591)	(0.424)	(0.103)	(0.070)
logNVotersK	-10.076	-6.601	1.219	0.743
	(11.365)	(7.597)	(2.097)	(1.486)
logCampSpendM	7.254	3.900	-0.273	0.187
	(11.339)	(7.892)	(2.001)	(1.349)
N	219	219	219	219
p-value of the test of H_0: Turnout is exogenous				
Robust score χ^2	.6475		.7667	
Robust regression F	.6610		.7775	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.13: Data sources

Variable	Source	Access
Election-specific variables	NEC	http://info.nec.go.kr/, and request to the NEC
BillsProposed, BillsApproved	National Assembly	http://likms.assembly.go.kr/bill/jsp/main.jsp
CommitteeChair		http://likms.assembly.go.kr/record/new/getFileDown.jsp?CONFER$_{N}$UM=037112
		http://likms.assembly.go.kr/record/new/getFileDown.jsp?CONFER$_{N}$UM=039545
GNP, DP		http://www.assembly.go.kr/assm/assemact/council/council04/assmReport/reportUserView.do?agendaid=1100014685
PercParticipated, NAbsences	Citizen's Coalition for Economic Justice	http://ccej.or.kr/?module=file&act=procFileDownload&file$_{s}$rl=170090&sid=4422cc32f6ea8bd9366438637fa51c49
Incumbent, NPrevAssemblies	Parliamentarians' Society	http://rokps.or.kr/
PercOver65	Statistics Korea (SK)	http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT$_{1}$B04005&conn$_{p}$ath=I2
AverageAge		http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT$_{1}$IN0503&conn$_{p}$ath=I3
PercUniversity		http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT$_{1}$IN0504&conn$_{p}$ath=I2
PopDensity		http://kosis.kr/statHtml/statHtml.do?orgId=116&tblId=DT$_{M}$LTM$_{2}$300&conn$_{p}$ath=I2
ResidentTax	SK	http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT$_{1}$B040A3&conn$_{p}$ath=I2
	Ministry of Public Administration and Security	http://www.mospa.go.kr/frt/bbs/type001/commonSelectBoardArticle.do?bbsId=BBSMSTR$_{0}$00000000014&nttId=35530
RainN	Korea Meteorological Administration	https://data.kma.go.kr/svc/main.do

Note: See Table 2.2 and Appendix 2.C for definitions. All URLs last accessed on October 23, 2015

2.C Control Variables

This appendix explains why certain variables are included in the regression. See Table 2.2 and Section 2.4.1.2 for definitions, and Table 2.13 for data sources.

Legislator-Specific Factors

Incumbent: The legislator who represented the same constituency in the previous Assembly may have ongoing projects, which would make it easier to mobilize supporters on election day (and hence likely to be correlated with turnout). Since those plans were already initiated, proposing related bills, and passing them into legislation, would be easier.

NPrevAssemblies: The opportunity cost of legislative activity may change with seniority. Seniority is also likely to affect popularity among voters (e.g., name recognition), and hence mobilizing supporters on election day. Both of these are likely to affect the incentive to perform. *NPrevAssemblies* is included to control for seniority.

CommitteeChair: Each of the 16 standing committees of the 18th Assembly is chaired by a chairperson, who performs various administrative tasks during the mandate of two years, which can interfere with performance. Although it is unclear how this can be correlated with turnout, *CommitteeChair* is still included.

GNP, DP: Party affiliation of the legislator is likely to be correlated with both legislative activity and turnout. Because 199 legislators in the sample (of 219) are from GNP or DP (see Table 2.3), only the two indicators are included. Among the 26 members in the sample who ran as an independent or a coalition candidate, 21 returned to their "original" party within the first 3 months of the mandate, and this was expected by voters (Yun and Joo, 2010). Thus, the value three months into the term is used.

Constituency-Specific Factors

PercOver65, *AverageAge*, *PercUniversity*, *ResidentTax*: Existing studies find that age, education and income are strong predictors of the probability of voting; e.g., Wolfinger and Rosenstone (1980), Filer, Kenny and Morton (1993) and Gomez, Hansford and Krause (2007) for the U.S., Blais (2000) for 9 other countries, and the studies reviewed in Lijphart (1997). Braconnier, Dormagen and Pons (2014) find similar differences between those who have registered to vote and those who have not. These characteristics may also be correlated with how a voter reacts to the legislator's performance.

For age, *PercOver65* is commonly used (Filer, Kenny and Morton, 1993; Horiuchi and Lee, 2008; Yun and Joo, 2010). The value for the end of 2007 is used. *AverageAge* is included to better control for the age distribution, and the value for 2005 is used (the last census before the 18th Assembly election).

PercUniversity controls for education (from the same census as *AverageAge*).

Income data for the whole country is only available at a much larger level than constituency (*sigungu* in Korean). Following Yun and Joo (2010), *ResidentTax* is used as a proxy for income. This tax is collected by the local governments closest to constituencies. The denominator is the number of residents (end of 2007). When the constituency does not coincide with a local government collecting the tax, the smallest number of local governments and the smallest number of constituencies such that the union of the former coincides with that of the latter and contains the constituency are taken. Then, the number for the union is computed and applied to every constituency contained in the union. The analogous adjustments are made for *PercOver65*, *AverageAge*, *PerUniversity* and *PopDensity*.

VSharePresident: Yun and Joo (2010) find the ideological leaning to be correlated with turnout in the 18th Assembly elections. Braconnier, Dormagen and Pons (2014) also report that those who are not registered to vote have a different ideological leaning than the median registered. Since the expected support for the incumbent is likely to affect her performance, *VSharePresident* controls for this.

PopDensity:= population data used for *PercOver65*/land area at the beginning of 2008

Election-Specific Factors

VShareOwn, Margin: The 'rational choice' theory of voting predicts that turnout is the higher the closer the election is (Blais, 2000). Closeness in the previous election is likely to be correlated with the expected support for the legislator in the next election, which is likely to affect her performance. It may also reflect unobserved legislative productivity. *Maring* controls for the closeness. When *Margin* is controlled for, the legislator with a larger vote share would have a smaller incentive to perform. Thus, *VShareOwn* is also included.

NVotersK: When the closeness is controlled for, another key determinant of turnout in the rational choice theory is the size of the electorate. Although unclear how the size would affect legislative performance, *NVotersK* is still included.

CampSpendM: Yun and Joo (2010) report a positive correlation between campaign expenditure and turnout. The legislator's behavior in the parliament may depend on how costly the campaign was, due to the need for financing and catering to donors, for instance.

2.D Omitted Details of the Model

2.D.1 Proofs

Proof of Lemma 2.1. Under the assumptions, $\widetilde{\pi}_1 \in (0,1)$ with probability 1, and $\mathbb{E}(\widetilde{\beta}_2|\pi_1) \in (0,1)$ for $\pi_1 \in (0,1)$. Fix $\pi_1 \in (0,1)$, and for this π_1, let $V(\ell_1) := \mathbb{E}[v(\ell_1, \widetilde{s}_2)|\pi_1]$ for $\ell_1 \in [\underline{\ell}, \overline{\ell}]$. The function V is differentiable and strictly concave on $[\underline{\ell}, \overline{\ell}]$, with $V'(\underline{\ell}) > 0 > V'(\overline{\ell})$ (see (2.8)). Thus, it is uniquely maximized at $\ell_1^* \in (\underline{\ell}, \overline{\ell})$, characterized by $V'(\ell_1^*) = 0$, or equivalently

$$\frac{c'(\ell_1^*)}{q^{I\prime}(\ell_1^*)} = \mathbb{E}(\widetilde{\beta}_2|\pi_1). \tag{2.15}$$

Let $r(\ell_1) := c'(\ell_1)/q^{I\prime}(\ell_1)$ for $\ell_1 \in [\underline{\ell}, \overline{\ell}]$ (the quotient function that appears on the left side of (2.15)). Under the assumptions on $c(\cdot)$ and $q^I(\cdot)$, $r' > 0$, and the result follows. □

Proof of Lemma 2.2. Since $\widetilde{x}_2$ is independent of $\widetilde{\alpha}$,

$$b(a) = \int_{\underline{x}}^{\overline{x}} \frac{aP^I(x)}{aP^I(x) + (1-a)P^U(x)} \mathrm{d}F_{\widetilde{x}}(x) \qquad (\underline{\alpha} \le a \le \overline{\alpha}) \tag{2.16}$$

by definition. Let $\varphi(x, a)$ denote the integrand. Its partial derivative with respect to the second variable is continuous and positive on the polygon $[\underline{x}, \overline{x}] \times [\underline{\alpha}, \overline{\alpha}]$. Thus,

$$b'(a) = \int_{\underline{x}}^{\overline{x}} \frac{\partial \varphi(x, a)}{\partial a} \mathrm{d}F_{\widetilde{x}}(x) > 0 \tag{2.17}$$

for $a \in (\underline{\alpha}, \overline{\alpha})$ (see Rudin (1976, Theorem 9.42)). The strict concavity follows by applying the same argument once more. □

Proof of Proposition 2.2. Let $\widetilde{\beta}_2(\delta)$ denote the random variable obtained from $\beta_2(\delta)$ by replacing α with $\widetilde{\alpha}$, and x_2 with $\widetilde{x}_2$. Lemma 2.1 is still applicable, and let $\ell_1^*(\pi_1, \delta)$ denote the unique level of current performance that maximizes the legislator's expected utility given the previous turnout π_1. Our goal is to show that the expected current performance computed before the election for the current term (i.e., at $n = 0$ in Figure 2.5), $\mathbb{E}[\ell_1^*(\widetilde{\pi}_1(\delta), \delta)]$, is strictly decreasing with δ. Let $F_{\widetilde{\pi}_1(\delta)}$ and $F_{\widetilde{\pi}_1}$ denote the distribution functions of $\widetilde{\pi}_1(\delta)$ and $\widetilde{\pi}_1$, respectively. Also, let $\underline{\pi}_1$ and $\overline{\pi}_1$ denote, respectively, the left and the right end points of the support of $\widetilde{\pi}_1$.

Since

$$\widetilde{\pi}_1(\delta) = \widetilde{\pi}_1 + \gamma(\delta) \tag{2.18}$$

with probability 1, we have

$$F_{\widetilde{\pi}_1(\delta)}(\pi_1) = \Pr\{\widetilde{\pi}_1(\delta) \leq \pi_1\} = \Pr\{\widetilde{\pi}_1 \leq \pi_1 - \gamma(\delta)\} = F_{\widetilde{\pi}_1}(\pi_1 - \gamma(\delta)). \tag{2.19}$$

Thus, changing the variable of integration,

$$\mathbb{E}[\ell_1^*(\widetilde{\pi}_1(\delta), \delta)] = \int_{\underline{\pi}_1+\gamma(\delta)}^{\overline{\pi}_1+\gamma(\delta)} \ell_1^*(\pi_1, \delta) \mathrm{d}F_{\widetilde{\pi}_1(\delta)}(\pi_1) = \int_{\underline{\pi}_1}^{\overline{\pi}_1} \ell_1^*(\pi_1 + \gamma(\delta), \delta) \mathrm{d}F_{\widetilde{\pi}_1}(\pi_1). \tag{2.20}$$

Let r^{-1} denote the inverse function of r in the proof of Lemma 2.1 above. It exists, and is differentiable with ${r^{-1}}' > 0$, because $r' > 0$. We have, by Lemma 2.1,

$$\ell_1^*(\pi_1 + \gamma(\delta), \delta) = r^{-1}\{\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\pi}_1(\delta) = \pi_1 + \gamma(\delta)]\} = r^{-1}\{\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\pi}_1 = \pi_1]\}, \tag{2.21}$$

where the second equality follows by (2.18). Thus,

$$\mathbb{E}[\ell_1^*(\widetilde{\pi}_1(\delta), \delta)] = \int_{\underline{\pi}_1}^{\overline{\pi}_1} r^{-1}\{\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\pi}_1 = \pi_1]\} \mathrm{d}F_{\widetilde{\pi}_1}(\pi_1). \tag{2.22}$$

Since ${r^{-1}}' > 0$, the proof will be completed if we show that the conditional expectation inside r^{-1} in (2.22) is a differentiable and strictly decreasing function of δ. This is be done below, by the same argument as in (2.11) and the proof of Lemma 2.2 above.

Let $b(a, \delta) := \mathbb{E}[\widetilde{\beta}(\delta)|\widetilde{\alpha} = a]$ for $a \in [\underline{\alpha}, \overline{\alpha}]$, and let $F_{\widetilde{\alpha}|\pi_1}$ denote the conditional distribution function of $\widetilde{\alpha}$ given $\widetilde{\pi}_1 = \pi_1$. As in (2.11),

$$\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\pi}_1 = \pi_1] = \mathbb{E}\{\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\alpha}, \widetilde{\pi}_1]|\pi_1\} = \mathbb{E}\{\mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\alpha}]|\pi_1\} = \mathbb{E}[b(\widetilde{\alpha}, \delta)|\pi_1] \tag{2.23}$$

$$= \int_{\underline{\alpha}}^{\overline{\alpha}} b(a, \delta) \mathrm{d}F_{\widetilde{\alpha}|\pi_1}(a). \tag{2.24}$$

By definition,

$$b(a, \delta) = \int_{\underline{x}}^{\overline{x}} \frac{a[P^I(x) + \gamma(\delta)]}{aP^I(x) + (1-a)P^U(x) + \gamma(\delta)} \mathrm{d}F_{\widetilde{x}}(x). \tag{2.25}$$

Let $\varphi(x, a, \delta)$ denote the integrand. Its partial derivative with respect to the third variable is continuous and negative on the polyhedron $[\underline{x}, \overline{x}] \times [\underline{\alpha}, \overline{\alpha}] \times [0, \overline{\delta}]$ for any $\overline{\delta} > 0$. Thus,

$$\frac{\partial b(a, \delta)}{\partial \delta} = \int_{\underline{x}}^{\overline{x}} \frac{\partial \varphi(x, a, \delta)}{\partial \delta} \mathrm{d}F_{\widetilde{x}}(x) < 0, \tag{2.26}$$

and applying the same argument once more,

$$\frac{\partial \mathbb{E}[\widetilde{\beta}_2(\delta)|\widetilde{\pi}_1 = \pi_1]}{\partial \delta} = \int_{\underline{\alpha}}^{\overline{\alpha}} \frac{\partial b(a,\delta)}{\partial \delta} \mathrm{d}F_{\widetilde{\alpha}|\pi_1}(a) < 0. \tag{2.27}$$

□

2.D.2 Example 1

In this case, we can explicitly derive the legislator's posterior belief (a conditional distribution of $\widetilde{\alpha}$ given $\widetilde{\pi}_1$) by the Bayes' rule, from a conditional distribution of $\widetilde{\pi}_1$ given $\widetilde{\alpha}$.

Since $\widetilde{\pi}_1 = \widetilde{\alpha}p^I + (1-\widetilde{\alpha})p^U + \widetilde{x}_1$, it has a conditional density given $\widetilde{\alpha}$: If $\underline{\alpha} \le a \le \overline{\alpha}$ and $ap^I + (1-a)p^U + \underline{x} \le \pi_1 \le ap^I + (1-a)p^U + \overline{x}$, then $f_{\widetilde{\pi}_1|\widetilde{\alpha}}(\pi_1|a) = (\overline{x} - \underline{x})^{-1}$; and 0 otherwise. Then, $\widetilde{\pi}_1$ and $\widetilde{\alpha}$ have a joint density (Ash, 2008, Section 4.3):

$$f_{\widetilde{\pi}_1,\widetilde{\alpha}}(\pi_1, a) = f_{\widetilde{\alpha}}(a) f_{\widetilde{\pi}_1|\widetilde{\alpha}}(\pi_1|a) = \left(\frac{1}{\overline{\alpha} - \underline{\alpha}}\right)\left(\frac{1}{\overline{x} - \underline{x}}\right) \quad \text{if} \quad (a, \pi_1) \in S, \tag{2.28}$$

and 0 otherwise, where

$$S := \{(a, \pi_1) : \underline{\alpha} \le a \le \overline{\alpha},\ ap^I + (1-a)p^U + \underline{x} \le \pi_1 \le ap^I + (1-a)p^U + \overline{x}\}. \tag{2.29}$$

That is, $(\widetilde{\pi}_1, \widetilde{\alpha})$ is uniformly distributed over S. Figure 2.6 depicts S, where $\Pi(a, x) := ap^I + (1-a)p^U + x$. For $\pi_1 \in [\Pi(\underline{\alpha}, \underline{x}), \Pi(\overline{\alpha}, \overline{x})]$, let $\underline{A(\pi_1)}$ and $\overline{A(\pi_1)}$ denote, respectively, the left and right end points of the horizontal line segment of S at π_1 in the figure; that is,

$$\underline{A(\pi_1)} := \max\left\{\underline{\alpha}, \frac{\pi_1 - p^U - \overline{x}}{p^I - p^U}\right\} \quad \text{and} \quad \overline{A(\pi_1)} := \min\left\{\overline{\alpha}, \frac{\pi_1 - p^U - \underline{x}}{p^I - p^U}\right\}. \tag{2.30}$$

Now, we obtain an unconditional density of $\widetilde{\pi}_1$ by integrating $f_{\widetilde{\pi}_1,\widetilde{\alpha}}$ over $\widetilde{\alpha}$:

$$f_{\widetilde{\pi}_1}(\pi_1) = \int_{\underline{\alpha}}^{\overline{\alpha}} f_{\widetilde{\pi}_1,\widetilde{\alpha}}(\pi_1, a)\mathrm{d}a = \int_{\underline{A(\pi_1)}}^{\overline{A(\pi_1)}} f_{\widetilde{\pi}_1,\widetilde{\alpha}}(\pi_1, a)\mathrm{d}a = \frac{\overline{A(\pi_1)} - \underline{A(\pi_1)}}{(\overline{\alpha} - \underline{\alpha})(\overline{x} - \underline{x})} \tag{2.31}$$

if $\Pi(\underline{\alpha}, \underline{x}) \le \pi_1 \le \Pi(\overline{\alpha}, \overline{x})$; and 0 otherwise. Then, a conditional density of $\widetilde{\alpha}$ given $\widetilde{\pi}_1$ is

$$f_{\widetilde{\alpha}|\widetilde{\pi}_1}(a|\pi_1) = \frac{f_{\widetilde{\pi}_1,\widetilde{\alpha}}(\pi_1, a)}{f_{\widetilde{\pi}_1}(\pi_1)} = \frac{1}{\overline{A(\pi_1)} - \underline{A(\pi_1)}} \tag{2.32}$$

if $\Pi(\underline{\alpha}, \underline{x}) \le \pi_1 \le \Pi(\overline{\alpha}, \overline{x})$ and $\underline{A(\pi_1)} \le a \le \overline{A(\pi_1)}$; and 0 otherwise. Since the end points $\underline{A(\pi_1)}$ and $\overline{A(\pi_1)}$ do not depend on a, this is nothing but the uniform density between them.

Figure 2.6 shows that the support of the conditional distribution of $\widetilde{\alpha}$ given $\widetilde{\pi}_1 = \pi_1$ (which is uniform) shifts to the right as π_1 increases, which implies the first-order (and hence the second-order) stochastic dominance, except for some intermediate values of π_1 when $\overline{\alpha} - \underline{\alpha} < (\overline{x} - \underline{x})/(p^I - p^U)$ (Panel (b)). In this last case, the support, and hence the level of current legislative performance, remains constant for $\Pi(\overline{\alpha}, \underline{x}) \leq \pi_1 \leq \Pi(\underline{\alpha}, \overline{x})$.[24]

Thus, unless (*i*) the legislator's prior belief is very narrow, or (*ii*) the range of the common shock in turnout probability is very wide, or (*iii*) the difference in turnout probability between the informed and the uninformed voters is very small, the level of current legislative performance is strictly increasing with the previous turnout. Even when any of (*i*)-(*iii*) is true, it is strictly increasing except for some intermediate values of turnout, where it is constant. It follows that the average partial effect of the previous turnout, where the average is over the distribution of those parameters, will be positive unless all legislators have a very narrow prior, and all turnout rates are intermediate. The empirical analysis of this paper can be seen as estimating that average partial effect.

[24] This is because the amount of variation in $\widetilde{\pi}_1$ coming from $\widetilde{\alpha}$ is smaller than what results from $\widetilde{x}_n$ in that case. That is, the legislator considers mild variation in the previous turnout as resulting from the exogenous factors, rather than as an indication to narrow her belief even more.

Chapter 3

The Effect of Voter Turnout in the French National Assembly

WITH SYLVAIN CHAREYRON AND BENJAMIN MONNERY *

This paper estimates the impact of voter turnout in an election on the subsequent activities of the elected official. We use the data from the 13th National Assembly of France (2007 $\sim$ 2012), a cross-section of deputy-constituency pairs. To overcome the potential endogeneity of turnout in the regression of deputy's activities, we use the variation in turnout caused by the difference in the number of polling places per voter. With this instrument, we find significant impacts on deputy's attendance and participation in debates, but not on formal legislation or government monitoring. This implies a positive but limited value of voter's participation in election, as a means to improve the functioning of the elected office. †

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3.1 Introduction

Voter turnout receives much scholarly attention, as reviewed in Lijphart (1997), Blais (2000), Feddersen (2004) and Birch (2009), for instance. Among the empirical regularities found is that the act of voting per se has an impact on voter; in particular, it is shown to increase her political information and interest (Braconnier, Dormagen and Pons, 2014), and the probability of voting in the following election (Coppock and Green, 2015; Fujiwara, Meng and Vogl, 2016). In that case, an exogenous increase in voter turnout in one election implies a larger subset of the electorate who are more likely to vote in the next election, with higher interest and better information. This can make the elected official's reputation more sensitive to her behavior in the current term, thereby giving a larger incentive to do a good job.

This paper tests this idea by estimating the effect of voter turnout on the subsequent activities of the elected official. We use the data from the 13th National Assembly of France (2007 ~ 2012), a cross-section of deputy-constituency pairs. We overcome the potential endogeneity of turnout using the number of polling places per voter as an instrument. Holding fixed relevant factors, the variation in turnout caused by the difference in the number of polling places per voter is likely to be exogenous in the regression of deputy's activities. We estimate the impact on four categories of activities that are commonly used in related studies as measures of effort or performance: attendance, participation in debates, legislation and government monitoring.

Our results show that turnout induces the deputy to put more effort, measured by attendance variables, and to participate more in debates. These relations are hidden in the OLS, which supports our use of the IV. We fail to find, however, any significant impact on formal legislation or government monitoring. This suggests a positive but limited value of voter's participation in election, as a means to improve the functioning of the elected office. We also discuss possible reasons behind the different impact on different activities.

Related Literature and Main Contribution

Several estimates exist of the effect of voter turnout. For instance, Fleck (1999) finds a positive effect on the New Deal aid U.S. counties received, and Mueller and Stratmann (2003) reports a negative impact on countries' economic growth and a positive impact on income distribution, while Dininio and Orttung (2005) finds no significant effect on corruption in Russian regions. Kim (2010) estimates a positive impact on the transfer from the central to local governments in South Korea, and Aggeborn (2016) finds a positive effect on the size of local public finance in Sweden.

A major shortcoming of these works is that no individual elected official is directly accountable for the outcome variables used.[1] Our setting has a clearer accountability: turnout in a legislative constituency on the effort (or performance) of the representative from that constituency. This sheds

[1] Another shortcoming is that, except for Aggeborn (2016), the endogeneity problem is not properly (if at all) treated.

brighter light on the relation between turnout and the outcome variable. To our knowledge, the only existing work on this direct relation is the South Korean case of Joe (2016). Our main contribution is to extend this rare evidence, by looking at a new context. Our results also differ from the equivalents in Joe (2016), bringing new insights on the impact of turnout.

The remainder is organized as following. We define our main regression and variables in the relevant context in Section 3.2. The endogeneity problem and our solution are described in Section 3.3. Estimation results are presented and discussed in Section 3.4, and Section 3.5 concludes. Data sources are listed in Appendix 3.B.

3.2 Context and Variables

We estimate the linear regression of

$$Activity_i \text{ on } Turnout_i \text{ and } Controls_i, \tag{3.1}$$

where i indexes the elected official-constituency pair. *Activity* is a measure of activities during the current mandate, and *Turnout* is the percentage of voters in the constituency who voted in the election for the current mandate.

We use the data from the 13th National Assembly of France (June 20, 2007 ~ June 19, 2012). The institutional details in this section are from the Constitution, the Election Law, Assemblée Nationale (2014) and various government websites.[2]

The National Assembly of France

The National Assembly (*l'Assemblée Nationale*, hencefore the Assembly) is the directly elected body of the bicameral legislature of France, consisting of 577 deputies (*deputés*).[3] Each deputy is elected for a 5-year term, in a two-round runoff election.[4] In the 13th Assembly, 110 deputies were elected in the first-round (June 10, 2007), and 467 in the second-round (June 17, 2007). Legislative elections are held on Sundays.

We use turnout in the first round (*Turnout*). For the first few results, we also report the analogous using turnout in the second round (*TurnoutR2*) for those who were elected in the second round, to

[2] `https://www.legifrance.gouv.fr/Droit-francais/Constitution`, `http://www.legifrance.gouv.fr/affichCode.do?cidTexte=LEGITEXT000006070239`, `http://www.assemblee-nationale.fr`, `http://www.senat.fr` and `http://www.interieur.gouv.fr`, all last accessed on April 27, 2016.

[3] The other chamber, the Senate (*Sénat*), is indirectly elected by departmental delegates. It is the Assembly which decides in case of a disagreement between the two chambers.

[4] In the first round, if a candidate receives votes that are more than 50% of all votes cast and 25% of all registered voters, she is elected. Otherwise, those with a vote share larger than 12.5% of all registered voters proceed to the second round. If no candidate meets this last condition, the two candidates with the largest vote shares proceed to the second round. The second round is 'first-past-the-post'.

show that results are virtually the same. Figure 3.1 depicts the distribution of turnout in the sample.

[Figure 3.1 about here]

3.2.1 Activities: Attendance, Debate, Legislation and Monitoring

We use four categories of activities that are commonly used to measure effort or performance in related studies.

Attendance

Since the Assembly is where deputy's formal work is carried out, being present in the Assembly during sessions is already an important activity. Attendance variables are commonly used in related studies to measure legislator's effort or (inversely) rent (Dal Bó and Rossi, 2011; Gagliarducci, Nannicini and Naticchioni, 2011; Hoffman and Lyons, 2013; Mocan and Altindag, 2013; Gehring, Kauffeldt and Vadlamannati, 2015; Fisman et al., 2015).

In this category, we use the number of weeks the deputy was present during sessions in the Assembly, denoted by *WeeksAssem*. Also important is the attendance in the standing committee the deputy is assigned to, since the standing committees are "the essential working bodies of the National Assembly" (Assemblée Nationale, 2014, p. 161). We use the number of standing committee meetings the deputy attended (*CommAttends*).

Participation in Debates

A common way of contributing to the decision making in any parliament is to participate in debates. In the French legislature, this takes the form of giving speeches, in the plenary session or in committees. Speeches in the plenary session are also divided into short speeches are long speeches. We use the numbers of short speeches and long speeches in the plenary session (*ShortSpeeches* and *LongSpeeches*, respectively), as well as in the standing committee (*CommSpeeches*), the deputy gave. Similar measures are considered in the related literature as legislator's performance (Dal Bó and Rossi, 2011; Mocan and Altindag, 2013; Gehring, Kauffeldt and Vadlamannati, 2015).

Formal Legislation

Although the previous two categories capture important activities, they miss an essential role of deputies: to initiate legislation. The most common means of initiating legislation by deputies is making amendments to bills already submitted. This is due to the rules on agenda setting: For each working month of the Assembly, 2 weeks are devoted to handling government-initiated bills, while only 1 week is allocated for deputy-initiated bills. Each amendment carries the names of deputies who (co-)initiated it. We use the number of amendments that carry the deputy's name (*AmendsSigned*).

Although less common than amendments, deputy-initiated bills are becoming more frequent in recent years and count for about 30% of all bills passed (Assemblée Nationale, 2014, pp. 235-236). Thus we also use the number of bills the deputy (co-)initiated (*BillsWritten*).

Given the importance of these activities, it is not surprising that they are commonly used to measure legislative performance in related studies (Ferraz and Finan, 2009; Dal Bó and Rossi, 2011; Rossi and Tommasi, 2012; Hoffman and Lyons, 2013; Joe, 2016; Titiunik, 2016).

Government Monitoring

Another essential function of a parliament is to monitor the (executive) government. In the French legislature, this takes the formality of asking questions (oral or written) to the government, and 1 week for each working month is devoted to this. We use the numbers of oral questions (*OralQs*) and written questions (*WrittenQs*) in this category. Some studies use similar variables as performance measures (Mocan and Altindag, 2013; Gehring, Kauffeldt and Vadlamannati, 2015).

The length of completed mandate is shorter for a non-negligible fraction of deputies, most of whom joined the government at some point. We consider, for each variable, its monthly average during completed mandate (with *M* added at the end of its name), as well as the aggregate over the whole mandate. For the latter, we restrict to those who completed the full mandate. We exclude those deputies whose completed mandate is shorter than 3 months (most of whom stayed in the government).

Figures 3.2 and 3.3 depict the distribution of the monthly average of each activity in the sample.

[Figures 3.2 and 3.3 about here]

3.2.2 Controls

We control for factors that are likely to be correlated with both turnout and activity.

Constituency-Specific Factors

Previous studies found age, education and income to be strong predictors of the voter's participation probability (Wolfinger and Rosenstone, 1980; Filer, Kenny and Morton, 1993; Blais, 2000; Gomez, Hansford and Krause, 2007; Braconnier, Dormagen and Pons, 2014). These characteristics are also likely to affect how the voter reacts to her deputy's activity. To control for them, we include the percentages of population of age 65 or older (*PercOver65*) and high-school graduates (*PercHSchool*), as well as the declared income divided by population (*IncomPerC*).

Braconnier, Dormagen and Pons (2014) report evidence in France that the probability of participating in election is correlated with the voter's ideological leaning, which may also affect her reaction to deputy's activity. As a proxy for ideological leaning, we include the vote share of the

then-President Nicolas Sarkozy, in the second round of the 2007 presidential election (May 6, 2007), denoted by *VSarkozy*.

Deputy-Specific Factors

Certain characteristics of deputy are likely to affect how she reacts to turnout. These include gender (*Female*), previous political experience (*Entrant*), administrative duties in the Assembly (*AssemAdmin*) and in standing committees (*CommPres*), as well as party affiliation (as of June 27, 2007).

Election-Specific Factors

The 'rational choice' theory of voting predicts turnout to be correlated with the closeness of the election, as well as the size of the electorate (Blais, 2000). To control for them, we include the margin of victory (*Margin* or *MarginR2*, depending on the round of election) and the number of registered voters (*NVoters*).

Candidates make significant expenses during campaign (e.g., €131,947 per constituency in our sample). Campaign spending is likely to be correlated with both turnout and activity, the latter due to the need for attracting contributions. Thus we include the sum of campaign expenditures of all candidates (*CampSpend*).

Table 3.1 presents summary statistics of the variables defined thus far. Due to data availability, we exclude those overseas constituencies that do not have a departmental status as of January 1, 2007.

[Table 3.1 about here]

3.3 Endogeneity of Turnout and its Instrument

If turnout has an impact on deputy's effort or performance, it is likely to be endogenous in our regression due to unobserved factors. For instance, some deputies may be better at mobilizing supporters than do others. In that case, they will have a smaller incentive to impress their electorate by effort or performance, because they can easily mobilize their supporters in the following election again. This will bias the OLS downward. Also, voters may observe deputy's productivity, which may attract them to the polling place. This will bias the OLS upward.

To overcome this problem, we use the number of polling places per 1,000 voters (*PollsPerK*) as an instrument for turnout. Joe (2016) uses the analogous strategy in his study of the South Korean legislature.[5]

[5] Joe (2016) also uses election day rainfall as an instrument for turnout. This is not possible in the current case, because the particular election day was dry in most constituencies.

For each city (*commune*) and for each election, a prefectoral decree decides the set of polling places in the city. The decision is based on local conditions such as population, and the recommended range of the number of voters assigned to each polling place is $800 \sim 1,000$.[6][7] Since population density is likely to be a key determinant of the number of polling places, we also control for it (*Density*); see Table 3.1 for summary statistics.

The number of polling places per voter is likely to decrease the average voting cost, and hence increase turnout. At the same time, that number is unlikely to be correlated with the error term in our regression, because we control for relevant characteristics of the constituency. We thus expect the variation in turnout caused by the difference in the number of polling places per voter to be exogenous in our regression of deputy's effort or performance.

3.4 Results

Figure 3.4 plots the residuals from the regression of turnout on controls, against the number of polling places per voter.

[Figure 3.4 about here]

The figure suggests a positive and diminishing effect of the number of polling places per voter on the variation in turnout unexplained by controlled factors. Thus we use a quadratic function of it as our instrument for turnout. Nothing significant changes when we use a linear function instead (available upon request).

Table 3.2 reports the first-stage estimation: turnout on instruments.

[Table 3.2 about here]

As expected, the number of polling places per voter is positively and significantly correlated with turnout (see the second-bottom row for the F statistic). The negative and significant coefficient on its square also supports that its effect is diminishing.

The other coefficients are in line with previous findings and common sense, except that education level (*PercHSchool*), campaign expenditures (*CampSpendK*) and the size of electorate (*NVotersK*) appear to have little to do with turnout.[8] Some existing studies also find education insignificant in explaining turnout; e.g., Milligan, Moretti and Oreopoulos (2004) in the U.K., Pelkonen (2012) in

[6] Article R40 of *Code électoral*, and *Circulaire* n° NOR/INT/A/06/00092C of October 16, 2006, *Ministre de l'intérieur et de l'aménagement du territoire*.

[7] The number of polling places in a constituency changes between elections. In our dataset, for instance, it changed in more than 490 constituencies between the 12th and the 13th Assembly elections, with a mean absolute change of 4.

[8] Although the latter two are statistically significant, they are practically ignorable. For instance, to reduce (increase) turnout by 1% point, it is predicted to take an additional €62,000 (17,000 voters), which is far beyond the current rules on those variables.

Norway and Gibson et al. (2013) in New Zealand. The negligible coefficient on campaign spending (which is shown to increase turnout, in Joe (2016) for instance) may be due to the offsetting by reverse causality: Candidates try harder to mobilize when they expect a low turnout. The negligible coefficient on the size of electorate contradicts the 'rational choice' theory of voting (Blais, 2000), which predicts the size to reduce the probability of being 'pivotal', and hence turnout. It may be an indication that larger constituencies are politically more active, even after controlling for various characteristics.

3.4.1 Impact on Attendance

Table 3.3 reports the second-stage estimation for the monthly average of the attendance variables.

[Table 3.3 about here]

Turnout is estimated to increase deputy's attendance both in the Assembly in general and the committee meetings she belongs to. For instance (*sd* for standard deviation), a 1 sd (= 5.5% point) increase in turnout is predicted to induce the deputy to spend 0.5 sd (= 0.4) more weeks per month in the Assembly, and attend 0.4 sd (= 0.8) more committee meetings per month. The results are significantly different from the OLS (see the bottom rows), suggesting endogeneity of turnout in those regressions (especially a downward bias).[9]

Similar results are obtained if we use aggregate variables, instead of monthly averages, for those who stayed for the full mandate (Table 3.4), or use turnout in the second round for those who were elected in the second round (Table 3.5).

[Tables 3.4 and 3.5 about here]

For the aggregate variables, a 1% point increase in turnout is predicted to induce the deputy to spend 1 more month in the Assembly, and attend 8 more committee meetings.

These variables are commonly interpreted as measuring deputy's effort (Dal Bó and Rossi, 2011; Gagliarducci, Nannicini and Naticchioni, 2011; Mocan and Altindag, 2013; Hoffman and Lyons, 2013; Gehring, Kauffeldt and Vadlamannati, 2015; Fisman et al., 2015). In that case, our finding supports a positive effect of voter's participation in election on the subsequent effort exerted by the elected official.

3.4.2 Impact on Participation in Debates

Tables 3.6 and 3.7 report the second-stage results for the formal speech variables.

[9] Joe (2016) also reports evidence of a downward bias in the OLS in analogous regressions in the South Korean legislature.

[Tables 3.6 and 3.7 about here]

Similarly to attendance, turnout is estimated to induce the deputy to participate more in debates, both in the plenary session and in the committee she belongs to. In particular, a 1 sd (= 5.5% point) increase in turnout is predicted to induce the deputy to make 0.3 sd (= 11) more short speeches and 0.4 sd (= 5) more long speeches per month in the plenary session, as well as 0.3 sd (= 2) more speeches per month in the committee. Again, these relations are hidden in the OLS.

Since participating in debates to represent one's constituency is an important performance of any member of parliament, this result supports a positive value of voter's participation in election.

3.4.3 Impact on Formal Legislation

Does the positive implication from our results so far continue for more formal types of performance? Tables 3.8 and 3.9 report the second-stage estimation for the formal legislation variables.

[Tables 3.8 and 3.9 about here]

Unlike for previous categories, turnout appears to have no significant impact on formal legislation.[10]

We showed previously that turnout induces effort, measured by attendance. Regarding performance, we showed that it induces participation in debates but not formal legislation. Among the possible reasons behind this difference are (*i*) formal legislation is less visible to voters than giving speeches, and the deputy reacts to turnout only in the more visible dimension; or (*ii*) formal legislation is considered less important than giving speeches, because the government is given much more capacity for that. One way to get some sense on the validity of the second possibility is to look at government monitoring activities, because the Assembly's capacity in those activities is not shared with the government.

3.4.4 Impact on Government Monitoring

Tables 3.10 and 3.11 report the second-stage estimation for government monitoring activities.

[Tables 3.10 and 3.11 about here]

Similarly to legislation, turnout appears to have no impact on government monitoring.

Unlike initiating legislation, in which the government has more capacity, the Assembly is in charge of government monitoring. Thus, the second possibility we mentioned above-that it is considered not important-does not apply. Although not definite, the following subsection presents further suggestive evidence for the first possibility-that the difference in the impact of turnout on different types of performance is due to the difference in visibility.

[10] This difference between attendance and formal legislation is the opposite of what Joe (2016) finds in the South Korean legislature.

3.4.5 Performance and Reelection Perspective

A clear objective of a deputy is reelection perspective, even if she is policy-motivated (Calvert, 1985). As we discussed above, one possibility for the different impact of turnout on different types of performance is that giving speeches is more visible than formal legislation or government monitoring. In that case, the latter two activities will not improve the deputy's reelection perspective, while the first activity may. To check this idea with data, we regress, for those deputies who ran in the following election (for the 14th Assembly), her vote share in the 14th election (*VShare14th*) on each of the performance measures. To control for her general reelection perspective, we include the margin of victory in the previous (13th) election (*Margin13th*), the number of candidates in the 14th election (*NCands14th*), and party affiliation. Table 3.12 reports the standardized (beta) coefficients of this regression.

[Tables 3.12 about here]

In line with our previous results, debate participation variables are all positively and significantly correlated with the vote share in the following election, while the other performance measures are insignificant or even negatively correlated. Although we cannot claim anything structural from this result, it is still suggestive of the possibility that the different impacts of turnout on different types of performance is due to their difference in visibility.

3.5 Conclusion

This paper estimates the impact of voter turnout on elected official's effort or performance, using the cross-sectional data from the 13th National Assembly of France. To overcome the potential endogeneity of turnout, we instrument it by the number of polling places per voter. Given the variety of deputy's task, we consider four categories of activities: attendance, participation in debates, formal legislation and government monitoring.

We find that turnout induces the deputy to be present in the Assembly more often, as well as to attend more committee meetings. Given the nature of these activities, we interpret this result as turnout inducing effort. It is also estimated to induce the deputy to participate more in debates. These relations are hidden in the OLS, which supports our use of the IV. We fail to find, however, any significant impact of turnout on formal legislation or government monitoring.

Our interpretation of the difference in the impact of turnout on different types of performances is that giving speeches is more visible than formal legislation or government monitoring, and the deputy reacts to the increased pressure from the electorate only in the more visible dimension. The estimated relation between performance and reelection perspective supports this interpretation.

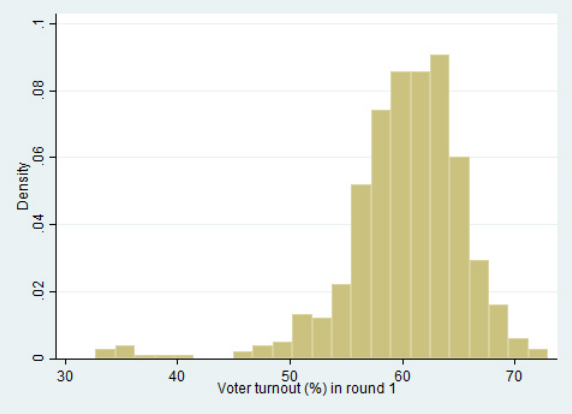
Our results suggest for future research to (a) identify the mechanism behind the relation between turnout and activity, and (b) collect evidence on possible reasons for the different impacts of turnout on different activities. In particular, one way to test our interpretation is to compare the media coverage of different types of activities; and whether a high expected media coverage induces deputies to give more speeches. Advancements in those directions will allow us to evaluate policies that are likely to affect turnout, such as registration requirements or the number of polling places. Also, covering more Assemblies (other than the 13th) will test the generality of the relation we find in this paper.

Appendices

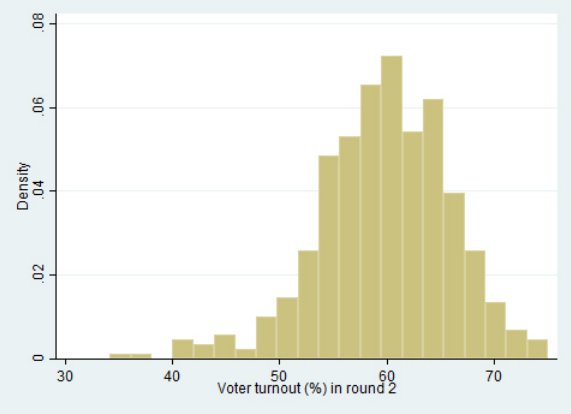
3.A Figures and Tables

Figure 3.1: Sample distribution of turnout

(a) First-round turnout



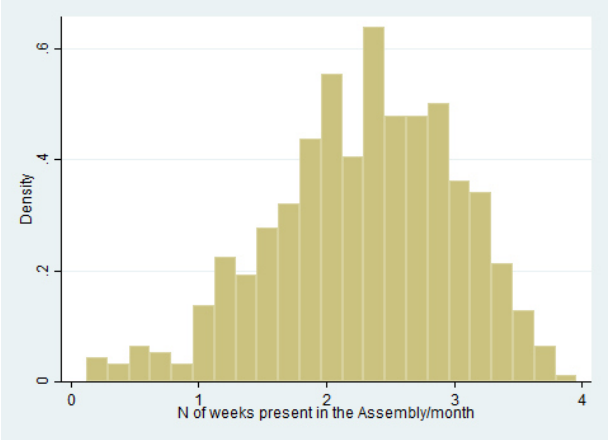
(b) Second-round turnout

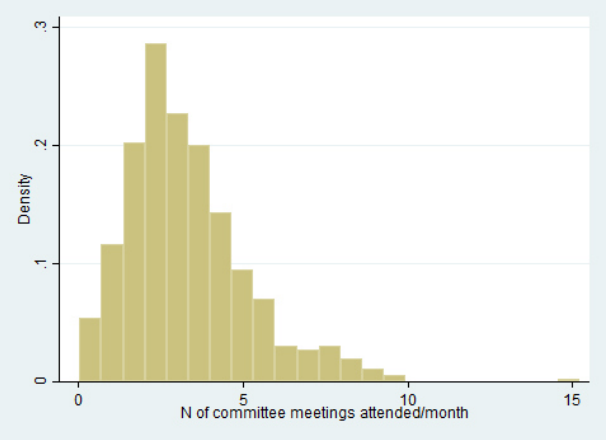


Note: The vertical axis measures the density of each subinterval in the sample.

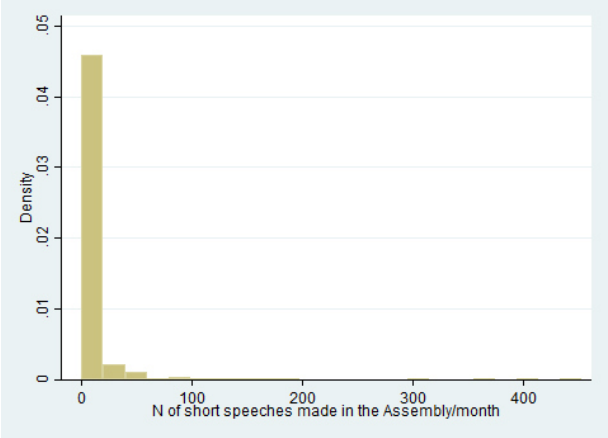
Figure 3.2: Sample distribution of monthly activities: Attendance and Participation in debates

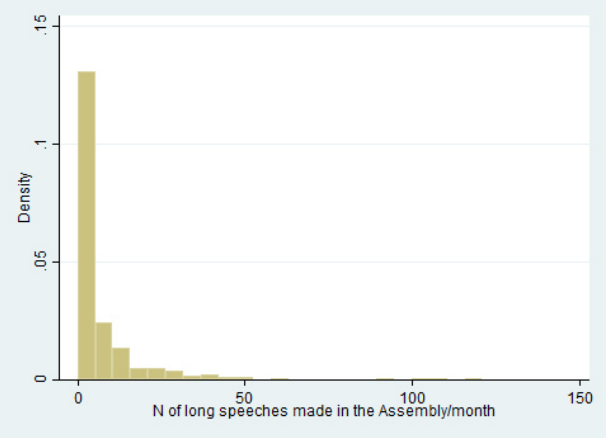
(a) Attendance

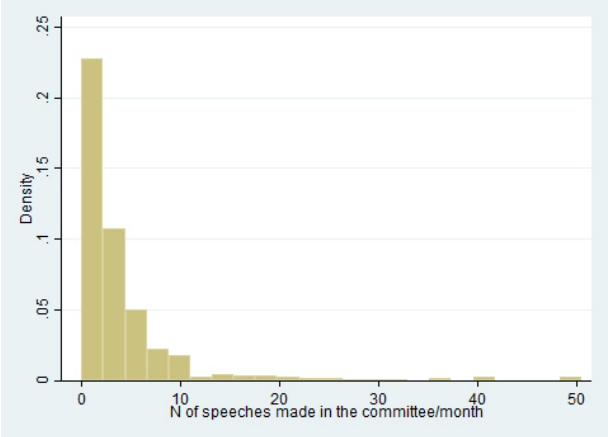




(b) Participation in debates



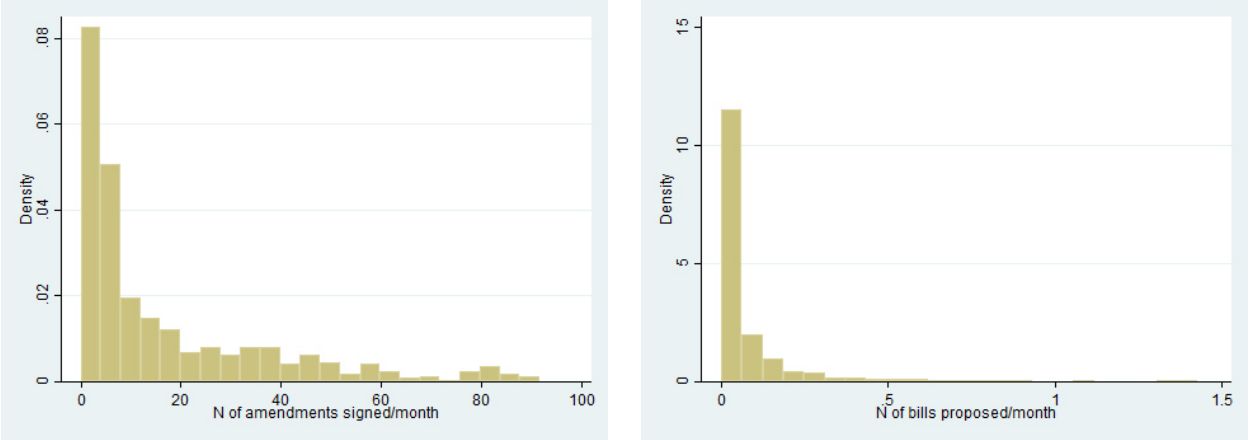




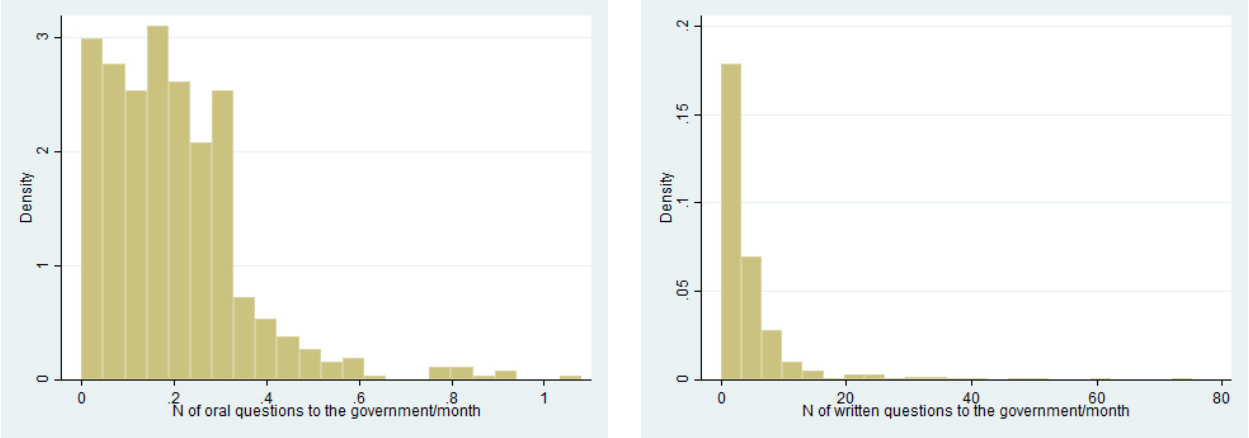
Note: The vertical axis measures the density of each subinterval in the sample.

Figure 3.3: Sample distribution of monthly activities: Legislation and Government monitoring

(a) Legislation



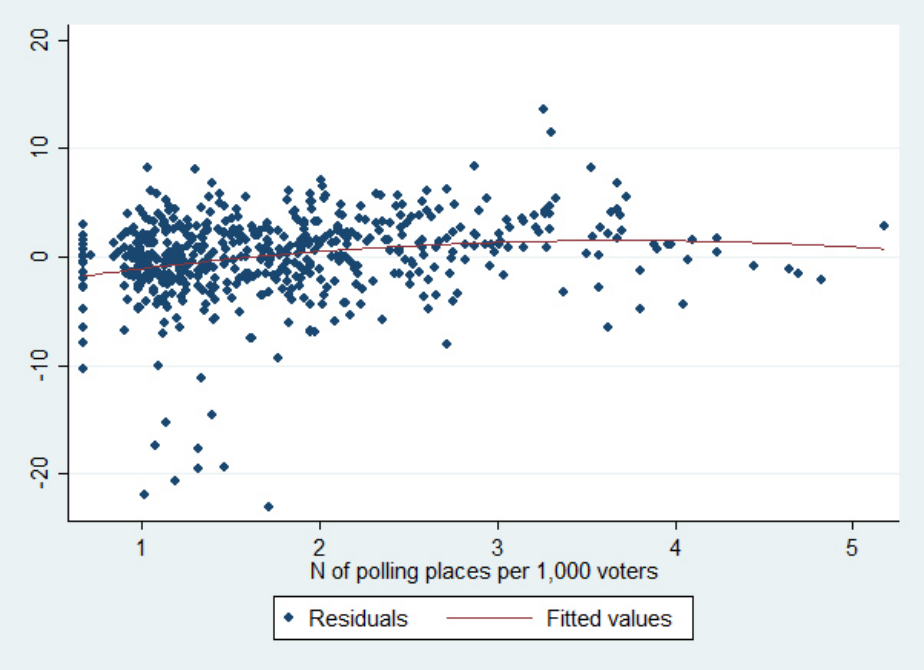
(b) Government monitoring



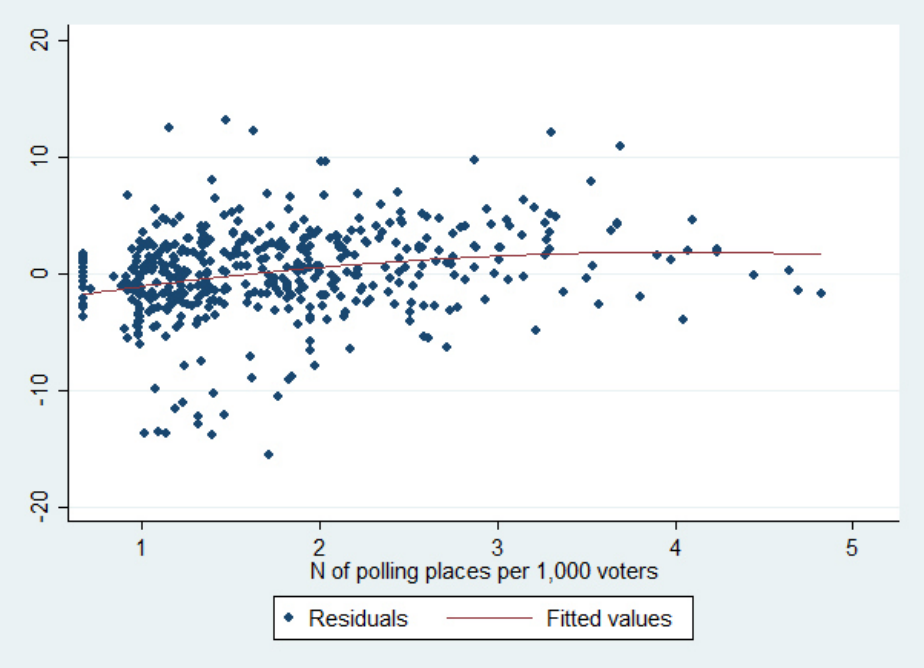
Note: The vertical axis measures the density of each subinterval in the sample.

Figure 3.4: Partial correlation between turnout and its instrument

(a) First-round turnout



(b) Second-round turnout



Note: Each point corresponds to an observation. The vertical axis measures the value of the residual from the regression of turnout on control variables. The curve represents the fitted values from the regression of the residuals on the number of polling places per voter and its square.

Table 3.1: Summary statistics

(a) Activities: Monthly average

	mean	sd	min	max	*N*
WeeksAssemM	2.3	0.7	0	4	562
CommAttendsM	3.3	1.9	0	15	562
ShortSpeechesM	10.9	37.6	0	453	562
LongSpeechesM	7.2	13.5	0	121	562
CommSpeechesM	4.1	6.5	0	51	562
AmendsSignedM	17.0	20.7	0	92	562
BillsWrittenM	0.1	0.2	0	1	562
OralQsM	0.2	0.2	0	1	562
WrittenQsM	4.7	7.4	0	75	562

(b) Activities: Aggregate (full mandate only)

	mean	sd	min	max	*N*
WeeksAssem	115	33	6	183	493
CommAttends	170	87	3	482	493
ShortSpeeches	466	1591	0	20050	493
LongSpeeches	341	625	0	5254	493
CommSpeeches	200	299	0	2422	493
AmendsSigned	887	1029	3	4487	493
BillsWritten	4	8	0	70	493
OralQs	10	8	0	53	493
WrittenQs	243	380	0	3694	493

(c) Characteristics: Election and constituency

	mean	sd	min	max	*N*
Turnout	60.3	5.5	33	73	562
TurnoutR2	59.7	6.3	34	75	456
Margin	17.3	12.1	0	57	562
MarginR2	12.1	9.2	0	76	456
CampSpendK	132.0	37.2	31	377	562
NVotersK	76.2	17.0	22	163	562
PercOver65	16.8	4.1	3	29	562
PercHSchool	44.4	11.0	28	84	562
IncomPerCK	12.2	4.1	5	48	562
VSarkozy	52.7	7.8	32	84	562
DensityK	1.2	2.7	0	23	562
PollsPerK	1.8	0.8	1	5	562

(d) Characteristics: Deputy

	N
FullMandate	493
Female	102
Entrant	127
AssemAdmin	24
CommPres	11
Party_UMP	308
Party_SRC	202
Party_GDR	24
Party_NC	22
Party_NI	6

Note: Variables are defined in Section 3.2. Numbers are rounded up. In panel (c), variables ending with a K are the corresponding variables without K divided by 1,000. In panel (d), NI denotes no affiliation.

Table 3.2: The first-stage regressions: Turnout on the instruments

	Turnout	TurnoutR2
PollsPerK	4.145***	4.012***
	(0.888)	(0.939)
PollsPerKsq	-0.588***	-0.550***
	(0.170)	(0.192)
PercOver65	0.639***	0.706***
	(0.048)	(0.060)
PercHSchool	-0.000	-0.002
	(0.029)	(0.031)
logIncomPerC	12.775***	8.983***
	(2.023)	(1.956)
VSarkozy	-0.153***	-0.226***
	(0.045)	(0.057)
DensityK	-0.084	-0.322***
	(0.063)	(0.099)
Female	-0.877*	-0.741*
	(0.451)	(0.432)
Entrant	-0.046	-0.350
	(0.393)	(0.452)
AssemAdmin	0.752	1.268**
	(0.574)	(0.498)
CommPres	1.918**	1.610**
	(0.810)	(0.714)
Party_UMP	1.286*	-0.134
	(0.735)	(0.730)
Party_SRC	0.230	1.880***
	(0.748)	(0.667)
CampSpendK	-0.016***	-0.009*
	(0.005)	(0.005)
NVotersK	0.059***	0.074***
	(0.011)	(0.013)
Margin	-0.100***	
	(0.027)	
MarginR2		-0.224***
		(0.025)
N	562	456
F-stat: IV for turnout	20.57	21.65
Adjusted R^2	0.5043	0.6291

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.3: The second-stage: Attendance per month

	WeeksAssemM		CommAttendsM	
	OLS	IV	OLS	IV
Turnout	0.006	0.067***	0.009	0.141**
	(0.008)	(0.025)	(0.017)	(0.064)
PercOver65	0.013	-0.034	0.031	-0.070
	(0.011)	(0.021)	(0.026)	(0.056)
PercHSchool	0.002	0.000	-0.000	-0.004
	(0.005)	(0.005)	(0.013)	(0.013)
logIncomPerC	0.570**	0.011	1.169*	-0.033
	(0.244)	(0.344)	(0.652)	(0.895)
VSarkozy	-0.004	0.003	-0.007	0.009
	(0.006)	(0.007)	(0.015)	(0.017)
DensityK	-0.014	-0.007	-0.035	-0.021
	(0.015)	(0.016)	(0.029)	(0.033)
Female	-0.137*	-0.085	-0.314*	-0.201
	(0.073)	(0.080)	(0.177)	(0.190)
Entrant	0.308***	0.310***	0.520***	0.524***
	(0.069)	(0.073)	(0.171)	(0.177)
AssemAdmin	0.588***	0.533***	0.264	0.145
	(0.154)	(0.154)	(0.448)	(0.442)
CommPres	1.075***	0.944***	4.493***	4.211***
	(0.154)	(0.155)	(0.969)	(0.941)
Party_UMP	0.005	-0.067	0.757***	0.603**
	(0.121)	(0.131)	(0.276)	(0.301)
Party_SRC	-0.122	-0.124	0.543**	0.538**
	(0.115)	(0.124)	(0.251)	(0.263)
CampSpendK	-0.002**	-0.001	-0.003	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)
NVotersK	0.001	-0.003	0.006	-0.000
	(0.002)	(0.002)	(0.005)	(0.006)
Margin	-0.006	0.000	-0.008	0.005
	(0.004)	(0.004)	(0.009)	(0.011)
N	562	562	562	562
p-value: robust score χ^2		0.0077		0.0279
p-value: robust regression F		0.0078		0.0299

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.4: The second-stage: Attendance (full mandate only)

	WeeksAssem		CommAttends	
	OLS	IV	OLS	IV
Turnout	0.602	3.923***	1.197	8.125**
	(0.403)	(1.235)	(0.841)	(3.250)
PercOver65	0.180	-2.400**	0.873	-4.510
	(0.568)	(1.077)	(1.394)	(2.862)
PercHSchool	-0.023	-0.146	-0.014	-0.272
	(0.250)	(0.265)	(0.661)	(0.679)
logIncomPerC	31.067***	-0.286	51.384	-14.028
	(11.543)	(17.389)	(32.736)	(47.043)
VSarkozy	-0.364	0.078	-0.728	0.195
	(0.296)	(0.346)	(0.731)	(0.867)
DensityK	-0.563	-0.214	-1.862	-1.135
	(0.769)	(0.881)	(1.501)	(1.717)
Female	-8.791**	-6.080	-18.053**	-12.395
	(3.765)	(4.215)	(9.102)	(9.927)
Entrant	14.456***	14.511***	22.554***	22.668**
	(3.251)	(3.513)	(8.522)	(8.859)
AssemAdmin	28.101***	27.232***	15.975	14.161
	(8.028)	(7.738)	(25.329)	(23.935)
CommPres	43.432***	34.911***	157.900***	140.123***
	(7.596)	(7.655)	(34.649)	(32.555)
Party_UMP	0.550	-3.976	36.936***	27.493*
	(5.933)	(6.517)	(14.148)	(15.522)
Party_SRC	-6.371	-6.257	20.362	20.600
	(5.777)	(6.340)	(12.768)	(13.488)
CampSpendK	-0.083**	-0.025	-0.154	-0.032
	(0.042)	(0.048)	(0.105)	(0.122)
NVotersK	0.006	-0.157	0.291	-0.049
	(0.079)	(0.110)	(0.228)	(0.284)
Margin	-0.102	0.261	0.046	0.804
	(0.181)	(0.221)	(0.466)	(0.589)
N	493	493	493	493
p-value: robust score χ^2		0.0037		0.0225
p-value: robust regression F		0.0037		0.0239

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.5: The second-stage: Attendance per month with the second-round turnout

	WeeksAssemM		CommAttendsM	
	OLS	IV	OLS	IV
TurnoutR2	-0.007	0.078***	-0.032	0.158**
	(0.010)	(0.027)	(0.021)	(0.069)
PercOver65	0.021	-0.051**	0.064**	-0.096
	(0.014)	(0.026)	(0.032)	(0.066)
PercHSchool	-0.001	-0.004	-0.002	-0.009
	(0.006)	(0.006)	(0.014)	(0.015)
logIncomPerC	1.023***	0.588*	1.670**	0.703
	(0.296)	(0.347)	(0.706)	(0.846)
VSarkozy	-0.006	0.010	-0.010	0.026
	(0.007)	(0.010)	(0.016)	(0.024)
DensityK	-0.015	0.014	-0.035	0.028
	(0.019)	(0.025)	(0.037)	(0.051)
Female	-0.081	-0.019	-0.271	-0.132
	(0.074)	(0.086)	(0.182)	(0.206)
Entrant	0.297***	0.328***	0.488***	0.557***
	(0.071)	(0.084)	(0.175)	(0.203)
AssemAdmin	0.499***	0.383**	0.228	-0.029
	(0.179)	(0.182)	(0.500)	(0.516)
CommPres	1.180***	1.027***	5.890***	5.548***
	(0.255)	(0.242)	(1.686)	(1.626)
Party_UMP	-0.113	-0.083	0.624**	0.692**
	(0.132)	(0.149)	(0.285)	(0.321)
Party_SRC	-0.133	-0.278*	0.586**	0.264
	(0.125)	(0.145)	(0.259)	(0.308)
CampSpendK	-0.002**	-0.001	-0.003	-0.001
	(0.001)	(0.001)	(0.002)	(0.003)
NVotersK	0.001	-0.005*	0.009	-0.005
	(0.002)	(0.003)	(0.005)	(0.008)
MarginR2	-0.000	0.019**	-0.013	0.031
	(0.004)	(0.008)	(0.010)	(0.019)
N	456	456	456	456
p-value: robust score χ^2		0.0005		0.0030
p-value: robust regression F		0.0005		0.0034

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6: The second-stage: Speeches per month

	ShortSpeechM		LongSpeechesM		CommSpeechesM	
	OLS	IV	OLS	IV	OLS	IV
Turnout	-0.017	1.862*	-0.051	0.882**	-0.020	0.352*
	(0.209)	(0.959)	(0.086)	(0.396)	(0.039)	(0.190)
PercOver65	0.151	-1.280	0.057	-0.654**	-0.023	-0.307*
	(0.198)	(0.802)	(0.105)	(0.313)	(0.065)	(0.161)
PercHSchool	0.087	0.028	0.016	-0.013	0.002	-0.009
	(0.236)	(0.228)	(0.085)	(0.085)	(0.039)	(0.040)
logIncomPerC	-4.288	-21.348	4.374	-4.092	3.397*	0.019
	(12.353)	(17.647)	(4.343)	(6.274)	(1.843)	(2.526)
VSarkozy	-0.083	0.147	-0.097	0.017	-0.015	0.031
	(0.224)	(0.317)	(0.110)	(0.137)	(0.042)	(0.053)
DensityK	0.082	0.271	0.156	0.250	-0.050	-0.012
	(0.459)	(0.443)	(0.274)	(0.277)	(0.101)	(0.104)
Female	-4.426	-2.825	-2.615**	-1.820	-0.999*	-0.682
	(3.490)	(3.913)	(1.183)	(1.308)	(0.566)	(0.619)
Entrant	2.653	2.719	2.173**	2.205**	0.452	0.465
	(1.856)	(2.060)	(0.905)	(1.009)	(0.439)	(0.462)
AssemAdmin	121.730***	120.041***	36.608***	35.770***	4.388*	4.054*
	(25.977)	(25.399)	(7.364)	(7.225)	(2.324)	(2.313)
CommPres	12.080**	8.080	14.692***	12.707***	25.629***	24.837***
	(5.005)	(5.674)	(3.659)	(3.760)	(3.857)	(3.815)
Party_UMP	-8.382**	-10.571**	-9.470***	-10.557***	-1.305	-1.738
	(4.134)	(4.600)	(2.189)	(2.288)	(1.238)	(1.320)
Party_SRC	-12.731***	-12.795***	-9.178***	-9.209***	-0.527	-0.540
	(4.066)	(4.398)	(2.373)	(2.426)	(0.898)	(0.923)
CampSpendK	-0.050	-0.015	-0.016	0.001	-0.000	0.007
	(0.039)	(0.045)	(0.015)	(0.017)	(0.005)	(0.007)
NVotersK	0.002	-0.092	-0.003	-0.049	0.004	-0.015
	(0.065)	(0.097)	(0.026)	(0.034)	(0.013)	(0.016)
Margin	-0.077	0.113	-0.033	0.061	0.031	0.069*
	(0.097)	(0.152)	(0.047)	(0.070)	(0.031)	(0.040)
N	562	562	562	562	562	562
p: r.score χ^2		0.0417		0.0119		0.0311
p: r.regression F		0.0441		0.0116		0.0327

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.7: The second-stage: Speeches (full mandate only)

	ShortSpeech		LongSpeeches		CommSpeeches	
	OLS	IV	OLS	IV	OLS	IV
Turnout	-4.0	87.8*	-3.1	44.6**	0.6	20.7**
	(9.5)	(51.1)	(4.3)	(20.7)	(2.0)	(9.6)
PercOver65	6.8	-64.5	2.0	-35.1**	-2.2	-17.8**
	(10.7)	(44.8)	(5.8)	(16.8)	(3.5)	(8.2)
PercHSchool	-4.0	-7.4	-1.2	-3.0	0.6	-0.2
	(7.2)	(6.9)	(3.6)	(3.8)	(2.0)	(2.1)
logIncomPerC	221.0	-646.4	360.2*	-89.9	121.3	-68.4
	(379.8)	(772.9)	(191.1)	(310.8)	(92.1)	(132.2)
VSarkozy	-6.6	5.6	-6.2	0.2	-0.9	1.8
	(11.7)	(17.6)	(5.7)	(7.4)	(2.2)	(2.8)
DensityK	15.3	25.0	10.3	15.3	-3.4	-1.3
	(22.0)	(21.5)	(14.1)	(14.3)	(5.0)	(5.3)
Female	-151.4	-76.4	-119.7*	-80.8	-54.1*	-37.7
	(178.0)	(205.6)	(61.4)	(69.1)	(29.5)	(32.6)
Entrant	99.8	101.4	97.1**	97.9*	20.2	20.5
	(86.6)	(96.7)	(45.5)	(51.1)	(22.4)	(23.9)
AssemAdmin	5120.4***	5096.3***	1577.0***	1564.5***	259.0*	253.8*
	(1366.4)	(1340.8)	(405.4)	(399.0)	(138.2)	(134.1)
CommPres	448.8**	213.1	575.3***	453.0**	1033.6***	982.1***
	(223.7)	(272.1)	(181.6)	(182.3)	(163.3)	(157.1)
Party_UMP	-388.3*	-513.5**	-506.9***	-571.9***	-77.5	-104.9
	(205.2)	(236.1)	(117.1)	(121.8)	(69.1)	(72.7)
Party_SRC	-532.6***	-529.5**	-486.6***	-484.9***	-52.5	-51.8
	(199.3)	(218.1)	(127.3)	(130.2)	(48.4)	(49.7)
CampSpendK	-1.3	0.3	-0.6	0.2	-0.1	0.2
	(1.5)	(2.0)	(0.7)	(0.8)	(0.3)	(0.4)
NVotersK	0.6	-3.9	-0.1	-2.4	0.2	-0.8
	(3.3)	(4.9)	(1.4)	(1.7)	(0.7)	(0.8)
Margin	-3.5	6.5	-1.7	3.5	1.9	4.1*
	(5.0)	(7.9)	(2.6)	(3.8)	(1.6)	(2.2)
N	493	493	493	493	493	493
p: r.score χ^2		0.0705		0.0143		0.0175
p: r.regression F		0.0740		0.0142		0.0188

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.8: The second-stage: Formal legislation per month

	AmendsSignedM		BillsWrittenM	
	OLS	IV	OLS	IV
Turnout	-0.436**	0.554	0.001	0.003
	(0.179)	(0.559)	(0.002)	(0.006)
PercOver65	0.545***	-0.208	0.001	-0.000
	(0.207)	(0.438)	(0.002)	(0.005)
PercHSchool	0.014	-0.017	0.003**	0.003**
	(0.108)	(0.111)	(0.001)	(0.001)
logIncomPerC	6.707	-2.272	-0.158**	-0.175**
	(5.150)	(6.917)	(0.073)	(0.082)
VSarkozy	-0.402***	-0.281*	-0.000	-0.000
	(0.146)	(0.159)	(0.001)	(0.001)
DensityK	0.565*	0.664**	-0.002	-0.002
	(0.312)	(0.332)	(0.002)	(0.002)
Female	3.169*	4.011**	0.002	0.004
	(1.734)	(1.829)	(0.018)	(0.019)
Entrant	6.489***	6.524***	0.013	0.014
	(1.756)	(1.817)	(0.016)	(0.016)
AssemAdmin	-0.033	-0.922	0.054	0.052
	(3.582)	(3.372)	(0.040)	(0.041)
CommPres	3.590	1.484	0.058	0.054
	(2.631)	(2.728)	(0.072)	(0.071)
Party_UMP	-28.353***	-29.505***	-0.058**	-0.060**
	(4.442)	(4.576)	(0.023)	(0.024)
Party_SRC	-10.362**	-10.396**	-0.124***	-0.125***
	(4.730)	(4.836)	(0.024)	(0.023)
CampSpendK	0.011	0.030	0.000	0.000
	(0.021)	(0.024)	(0.000)	(0.000)
NVotersK	0.005	-0.045	-0.001	-0.001
	(0.037)	(0.045)	(0.001)	(0.001)
Margin	-0.123	-0.023	0.002*	0.003*
	(0.087)	(0.101)	(0.001)	(0.001)
N	562	562	562	562
p-value: robust score χ^2		0.0559		0.7551
p-value: robust regression F		0.0560		0.7582

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.9: The second-stage: Formal legislation (full mandate only)

	AmendsSigned		BillsWritten	
	OLS	IV	OLS	IV
Turnout	-20.304**	37.593	0.083	0.227
	(9.131)	(29.911)	(0.120)	(0.301)
PercOver65	29.088***	-15.896	0.012	-0.099
	(11.056)	(23.822)	(0.079)	(0.258)
PercHSchool	-1.838	-3.996	0.114*	0.108*
	(5.651)	(5.899)	(0.061)	(0.061)
logIncomPerC	511.032*	-35.679	-7.917**	-9.274**
	(283.027)	(385.402)	(4.020)	(4.371)
VSarkozy	-20.296***	-12.582	-0.033	-0.013
	(7.669)	(8.609)	(0.065)	(0.054)
DensityK	34.698**	40.779**	-0.059	-0.044
	(16.240)	(17.824)	(0.098)	(0.098)
Female	153.726*	201.010**	0.292	0.410
	(90.166)	(96.896)	(0.984)	(0.996)
Entrant	342.710***	343.669***	0.660	0.662
	(87.925)	(92.406)	(0.815)	(0.814)
AssemAdmin	-33.069	-48.228	3.074	3.036
	(196.328)	(181.654)	(2.378)	(2.339)
CommPres	255.718*	107.134	2.930	2.562
	(135.310)	(149.938)	(4.263)	(4.217)
Party_UMP	-1498.536***	-1577.460***	-2.358*	-2.554**
	(238.630)	(246.636)	(1.235)	(1.249)
Party_SRC	-591.440**	-589.455**	-5.901***	-5.896***
	(248.027)	(255.838)	(1.221)	(1.210)
CampSpendK	0.598	1.615	0.010	0.013
	(1.067)	(1.220)	(0.008)	(0.009)
NVotersK	0.270	-2.573	-0.035	-0.042
	(1.931)	(2.328)	(0.033)	(0.033)
Margin	-5.399	0.934	0.138**	0.154**
	(4.752)	(5.613)	(0.067)	(0.078)
N	493	493	493	493
p-value: robust score χ^2		0.0330		0.6419
p-value: robust regression F		0.0324		0.6464

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.10: The second-stage: Government monitoring per month

	OralQsM		WrittenQsM	
	OLS	IV	OLS	IV
Turnout	-0.001	0.004	0.118	0.146
	(0.002)	(0.006)	(0.135)	(0.220)
PercOver65	-0.000	-0.004	0.043	0.021
	(0.002)	(0.005)	(0.096)	(0.182)
PercHSchool	0.000	-0.000	0.079	0.078
	(0.001)	(0.001)	(0.060)	(0.059)
logIncomPerC	0.004	-0.043	-8.771**	-9.023**
	(0.048)	(0.069)	(3.780)	(3.904)
VSarkozy	-0.001	-0.001	0.072	0.075
	(0.001)	(0.001)	(0.051)	(0.058)
DensityK	-0.003	-0.003	-0.143	-0.140
	(0.002)	(0.002)	(0.099)	(0.099)
Female	0.018	0.022	-0.400	-0.376
	(0.014)	(0.015)	(0.762)	(0.789)
Entrant	0.076***	0.077***	0.159	0.160
	(0.014)	(0.014)	(0.718)	(0.710)
AssemAdmin	0.002	-0.002	0.956	0.931
	(0.027)	(0.027)	(2.223)	(2.248)
CommPres	0.032	0.021	-0.340	-0.399
	(0.028)	(0.030)	(2.731)	(2.652)
Party_UMP	-0.244***	-0.250***	-0.330	-0.362
	(0.034)	(0.034)	(0.966)	(0.954)
Party_SRC	-0.206***	-0.206***	0.003	0.002
	(0.033)	(0.033)	(0.823)	(0.811)
CampSpendK	-0.000	-0.000	0.007	0.008
	(0.000)	(0.000)	(0.007)	(0.008)
NVotersK	-0.000	-0.000	-0.040	-0.042
	(0.000)	(0.000)	(0.032)	(0.031)
Margin	0.000	0.001	0.072	0.074
	(0.001)	(0.001)	(0.056)	(0.055)
N	562	562	562	562
p-value: robust score χ^2		0.3843		0.9136
p-value: robust regression F		0.3892		0.9149

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.11: The second-stage: Government monitoring (full mandate only)

	OralQs		WrittenQs	
	OLS	IV	OLS	IV
Turnout	-0.049	0.388	7.012	12.554
	(0.085)	(0.311)	(7.184)	(11.565)
PercOver65	-0.052	-0.391	1.465	-2.840
	(0.102)	(0.254)	(5.216)	(10.085)
PercHSchool	-0.014	-0.030	3.895	3.688
	(0.054)	(0.055)	(3.138)	(3.126)
logIncomPerC	0.852	-3.273	-447.214**	-499.544**
	(2.508)	(3.732)	(207.674)	(210.776)
VSarkozy	-0.069	-0.011	2.861	3.599
	(0.075)	(0.070)	(2.644)	(3.017)
DensityK	-0.144	-0.098	-7.362	-6.780
	(0.101)	(0.110)	(5.126)	(5.041)
Female	0.792	1.149	-19.598	-15.072
	(0.752)	(0.795)	(40.619)	(41.857)
Entrant	3.778***	3.785***	7.029	7.121
	(0.710)	(0.719)	(37.496)	(37.385)
AssemAdmin	0.564	0.449	78.295	76.844
	(1.415)	(1.321)	(132.723)	(130.750)
CommPres	1.506	0.385	-6.140	-20.362
	(1.566)	(1.659)	(159.098)	(155.045)
Party_UMP	-12.936***	-13.531***	-2.257	-9.812
	(1.742)	(1.756)	(53.975)	(52.453)
Party_SRC	-11.069***	-11.054***	-4.548	-4.358
	(1.705)	(1.756)	(44.110)	(43.606)
CampSpendK	-0.007	0.000	0.333	0.430
	(0.010)	(0.012)	(0.367)	(0.417)
NVotersK	-0.003	-0.025	-2.338	-2.611
	(0.019)	(0.023)	(1.651)	(1.590)
Margin	0.036	0.084	4.435	5.041*
	(0.046)	(0.064)	(3.107)	(3.041)
N	493	493	493	493
p-value: robust score χ^2		0.1481		0.6821
p-value: robust regression F		0.1512		0.6868

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.12: Monthly Performance and Reelection Perspective

	VShare14th						
ShortSpeechesM	0.100***						
	(0.008)						
LongSpeechesM		0.129***					
		(0.022)					
CommSpeechesM			0.110***				
			(0.036)				
AmendsSignedM				0.069			
				(0.024)			
BillsWrittenM					-0.002		
					(2.764)		
OralQsM						0.036	
						(3.219)	
WrittenQsM							-0.094*
							(0.048)
Margin13th	0.381***	0.380***	0.364***	0.390***	0.382***	0.384***	0.387***
	(0.042)	(0.042)	(0.043)	(0.041)	(0.041)	(0.042)	(0.041)
NCands14th	-0.137***	-0.150***	-0.140***	-0.137***	-0.132***	-0.134***	-0.131***
	(0.133)	(0.132)	(0.133)	(0.135)	(0.134)	(0.134)	(0.133)
Party_UMP	-0.140	-0.107	-0.157*	-0.114	-0.160*	-0.132	-0.159*
	(1.498)	(1.526)	(1.490)	(1.658)	(1.498)	(1.423)	(1.472)
Party_SRC	0.500***	0.527***	0.480***	0.484***	0.477***	0.499***	0.479***
	(1.653)	(1.663)	(1.649)	(1.654)	(1.690)	(1.518)	(1.627)
N	415	415	415	415	415	415	415
Adjusted R^2	0.2590	0.2645	0.2611	0.2517	0.2491	0.2501	0.2579

Beta coefficients; robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.B Data Sources

All Internet addresses listed below are last accessed on May 6, 2016.

- Election results and information on deputies: data compiled by Sciences Po, available at https://www.data.gouv.fr/en/datasets/elections-legislatives-1958-2012; and the Assembly website, http://www.assemblee-nationale.fr/elections/2007
- Polling places: from the *Ministère de l'Intérieur*, available at https://www.data.gouv.fr/en/datasets/elections-legislatives-2007-resultats-par-bureaux-de-vote
- Campaign expenditures: from the *Commission nationale des comptes de campagne et des financements politiques*, available at http://www.cnccfp.fr/index.php?art=210
- Activities: data compiled by the *Association Regards Citoyens*, downloadable at http://2007-2012.nosdeputes.fr/synthese/data/csv; missing data available at http://2007-2012.nosdeputes.fr/'firstname'-'lastname' (change 'firstname' and 'lastname' accordingly); definitions of variables at https://www.nosdeputes.fr/synthese
- Administrative duties: from the *rapport d'activité* of each year, available at http://www.assemblee-nationale.fr/connaissance/rapactiv'year' (change 'year' for the corresponding four-digit year)
- Correspondence between statistical units (for control variables) and constituencies: from the *Ministère de l'Intérieur*, available at https://www.data.gouv.fr/en/datasets/table-de-correspondance-des-communes-et-des-cantons-avec-les-circonscriptions-legislat-551418, complemented by the Assembly website, http://www.assemblee-nationale.fr/elections/2007/circonscriptions
- Characteristics of constituencies
  - Age: 2006 census data from Insee, available at http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=td-population-06, and

http://www.insee.fr/fr/themes/detail.asp?ref_id=poplegalescom&page=recensement/poplegalescom/com-article-156.htm for *Saint-Barthélemy* and *Saint-Martin*

- Education: 2006 census data from Insee, available at http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-diplomes-formation-06, and at http://www.insee.fr/fr/themes/detail.asp?ref_id=poplegalescom&page=recensement/poplegalescom/com-article-156.htm for *Saint-Barthélemy* and *Saint-Martin*
- Declared income in 2006: from the *Direction générale des finances publiques*, available at http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-irpp-nouv-serie, and at http://www2.impots.gouv.fr/documentation/statistiques/ircom2006/dep/dep.htm for *Saint-Barthélemy* and *Saint-Martin*
- Area: from the *Ministère de l'environnement, de l'énergie et de la mer*, available at http://www.statistiques.developpement-durable.gouv.fr/donnees-ligne/t/donnees.html, and at http://www.outre-mer.gouv.fr/?presentation-saint-barthelemy.html and http://www.outre-mer.gouv.fr/?presentation.html for *Saint-Barthélemy* and *Saint-Martin*

Chapter 4

Discipline by Turnout

Recent empirical evidence shows that voter turnout induces subsequent performance from the elected official. This paper offers a game-theoretic explanation, in a two-period model of political agency. An election is held at the beginning of each period to delegate a policy decision to a politician, whose policy preferences-congruent or dissonant-are private information. A representative voter decides, in each election, whether to vote for a politician or abstain. Voting incurs an opportunity cost, which is her private information; and all politicians are identical ex-ante. Although this implies turning out in the first election is statically not optimal for the voter, she may still do so, to signal her willingness-low cost-to punish wrong policy in the following election. I characterize necessary and sufficient conditions on the distribution of voting cost which determines the dissonant politician's policy choice in perfect Bayesian equilibrium. The model implies that having more polling places is likely to make the dissonant politician choose the right policy, while the opposite is true for making election day a public holiday. *

* I thank Karine Van der Straeten, as well as Alberto Grillo, Ananya Sen and Yves Le Yaouanq, for insightful discussions.

4.1 Introduction

In his commemorative speech at the 20th anniversary of the June Democratic Uprising of South Korea, then-President Moo-hyun Roh claimed that "citizen's participation will determine the quality of democracy".[1] One ordinal dimension of the quality of democracy is whether the elected official (agent) follows the preferences of her constituency (principal), when there is a conflict between hers and her constituency's. On such dimensions, empirical studies provide evidence supporting President Roh's claim; in particular, the positive effect of voter turnout (reviewed below).

This paper provides a game-theoretic explanation for his claim and those empirical findings, in a two-period model of political agency. The key argument is that by making the costly turnout in one election, the voter signals her willingness to punish wrong policy in the following election. To show this incentive clearly, I consider an environment with ex-ante identical politicians, costly voting, and a representative voter with purely instrumental motive. Even though turning out is statically not optimal, the voter may still do so for the aforementioned signaling incentive.

Specifically, an election is held at the beginning of each period, to delegate a binary policy decision to a politician whose policy preferences-for the right policy (congruent) or for the wrong policy (dissonant)-are private information. The representative voter decides, in each election, whether to vote for a politician or abstain; and her voting cost is private information. Observing the wrong policy chosen may reveal that the politician is dissonant. But the voter may find it too costly to vote against her in the following election if voting cost is too high, in which case the dissonant politician would choose the wrong policy. This gives an incentive for the low-cost voter to turn out in the first election to signal her type. The dissonant politician then behaves accordingly in the first period: choose the right policy if and only if the voter turned out.

I characterize necessary and sufficient conditions on the distribution of voting cost which determines the dissonant politician's policy choice in perfect Bayesian equilibrium. Then I draw implications for policy decisions that affect the distribution of voting cost, such as the number of polling places or making election day a public holiday.

Empirical Evidence

The idea that voter turnout affects elected official's behavior is empirically supported. For instance, Joe (2016) shows that turnout induces performance from the South Korean legislators, and Chareyron, Joe and Monnery (2016) find similar results in the French legislature. The current paper offers a game-theoretic explanation for these findings.

Although the link from turnout to the outcome variable is less clear, some studies also report that turnout affects important economic outcomes; for instance, the New Deal aids U.S. counties

[1] June 10, 2007. Available at the Presidential Archives (`http://www.pa.go.kr/research/contents/speech/index04_result.jsp`; last accessed on May 8, 2016).

received (Fleck, 1999), income distribution and grwoth of countries (Mueller and Stratmann, 2003), the transfer from the central to local governments in South Korea (Kim, 2010), and the size of local public finance in Sweden (Aggeborn, 2016).

Main Contribution and Related Literature

This paper contributes to the theoretical literature on political agency, and the one on the signaling incentive of voting in repeated elections.

The political agency literature (reviewed in Besley (2007, Chapter 3) and Ashworth (2012)) covers the impact of various factors on discipline: e.g., wage (Besley, 2004), term limit (Besley and Case, 1995; Smart and Sturm, 2013; Aruoba, Drazen and Vlaicu, 2015), media (Besley and Burgess, 2002; Besley and Prat, 2006; Guriev and Treisman, 2015) and selection rule (Maskin and Tirole, 2004; Lim, 2013). But the impact of voter turnout has yet to be analyzed, and this paper tries to shed some light on it. Although Aldashev (2015) looks at *correlation* between policy announcements during campaign and *subsequent turnout* of voters with purely expressive motive, there is no effect of turnout per se (and no asymmetric information, which is the source of agency problem).

Some existing works study repeated elections in which voters have an incentive to signal her ideology by voting or abstaining (e.g., Shotts (2006) and Hummel (2011); Razin (2003) and Meirowitz and Shotts (2009) do not allow abstention). The theory of costly political action in Lohmann (1993) is in the same vein. But no theory in this literature considers discipline. The current paper complements existing ones by focusing on discipline.

Section 4.2 sets up the model, which is solved for perfect Bayesian equilibrium in Section 4.3. Section 4.4 discusses implications for policy decisions that affect turnout, such as the number of polling places or making election day a public holiday, and Section 4.5 concludes. Omitted proofs are contained in Appendix 4.B.

4.2 The Model

An electoral constituency composed of a single voter delegates a policy decision to an elected official in each period $t = 1, 2$. Specifically, an election is held at the beginning of each period to select one of the two politicians $i = -1, 1$.

4.2.1 Politicians

The basic structure about politicians borrows from Besley (2007, Section 3.3). A politician is either congruent ($\theta_i = 1$) or dissonant ($\theta_i = 0$), which is her private information. Each politician's 'type' is

independently determined by the nature before the first period, with $\Pr\{\theta_i = 1\} = 1/2$.[2] The elected politician chooses a policy $e^t \in \{0, 1\}$, which adds Be^t to the voter's payoff. Her payoff in that period is

$$E + B\theta_i e^t + R(1 - \theta_i)(1 - e^t). \tag{4.1}$$

The first term comes from holding office per se, such as 'ego rents' or material benefits. The last two terms reflect whether she shares the voters' policy preferences, where R is a 'dissonance rent'. The unelected politician's payoff is zero in that period.[3]

4.2.2 Voter

In each election, the voter decides whether to vote for a politician or abstain. Let $v^t = i$ if she votes for politician i in the tth election, and 0 otherwise. Her cycle-t payoff is

$$Be^t - c|v^t|, \tag{4.2}$$

where $c \in \{\underline{c}, \overline{c}\}$, $0 < \underline{c} < \overline{c}$, is her opportunity cost of voting, which is her private information. It is determined by the nature before the first cycle, with $\Pr\{c = \overline{c}\} = p$.

Politician i is elected in the tth election if $v^t = i$; otherwise, the winner is decided by a fair coin toss. Every player receives her payoff at the end of each cycle, and future payoffs are discounted by a factor β. Figure 4.1 summarizes the timing in the model.

[Figure 4.1 about here]

4.3 Equilibrium

Let us solve the game in perfect Bayesian equilibrium (Fudenberg and Tirole, 1991, Definition 8.2), focusing on symmetric equilibria (regarding politicians) in pure strategies. A pure strategy of the voter assigns a vote choice-vote for one of the politicians or abstain-in each election following every possible history. Similarly, a pure strategy of a politician assigns a policy in each period she is elected following every possible history. Let s denote a strategy profile. Given history h, let $\mu(\theta_i|h)$ denote the probability that politician i's type is θ_i, assigned by the (voter's) posterior belief when the game has reached h. $\mu(c|h)$ denotes the analogous probability for the voter's type.[4]

[2] This rules out situations in which one politician has a better reputation at the beginning, due, for instance, to her performance in some previous mandate. This assumption is made to focus only on the signaling incentive of turnout.

[3] Since B and R are defined as reflecting policy preferences, assuming that the unelected politician's payoff is as in (4.1) except for the ego rent E might be more natural. This does not alter the analysis below, except for the exact threshold levels.

[4] Notations are kept minimal for brevity. More precise notations are used in the appendix.

4.3.1 How to Discipline Dissonant Incumbent

Since the policy decision in the second cycle is the last stage of the game, every politician chooses her preferred policy in equilibrium. The interest lies in whether the dissonant politician chooses the "right" policy for the voter in the first period (i.e., $e^1 = 1$), in which case we say that *discipline is effective*. She will have such an incentive if doing so sufficiently improves her reelection perspective, because of the additional ego rent she can enjoy.

Let $P(e^1; v^1)$ denote the probability she believes to be reelected when choosing e^1 given the voter's choice v^1 in the first election. Her expected payoff is

$$\begin{array}{rcll} E + R & + & \beta P(0; v^1)(E + R) & \text{if } e^1 = 0, \\ E & + & \beta P(1; v^1)(E + R) & \text{if } e^1 = 1. \end{array} \tag{4.3}$$

Thus, $e^1 = 1$ is optimal for her if and only if

$$P(1; v^1) - P(0; v^1) \geq \frac{R}{\beta(E + R)}. \tag{4.4}$$

This shows that discipline requires punishing the wrong policy, or equivalently rewarding the right policy, in the following election. For such a threat to be credible, she must believe the punishment to be optimal for the voter. Let $h = (v^1, i, e^1)$ be a history in the second election in which politician i is the first-period incumbent. The voter's expected payoff in h is

$$\begin{array}{rl} B\mu(\theta_i = 1|h) - c & \text{if votes for the incumbent,} \\ B[\mu(\theta_i = 1|h) + 1/2]/2 & \text{if abstains,} \\ B/2 - c & \text{if votes against the incumbent.} \end{array} \tag{4.5}$$

Now the voter's optimal action in the second election follows.

Lemma 4.1. *The voter's optimal action in the second election $h = (v^1, i, e^1)$ is to vote for the incumbent if $\mu(\theta_i = 1|h) \geq 2c/B + 1/2$, vote against the incumbent if $\mu(\theta_i = 1|h) \leq 1/2 - 2c/B$, and abstain otherwise.*

Figure 4.2 depicts the voter's optimal action for each possible value of the posterior belief and voting cost.

[Figure 4.2 about here]

If discipline is effective, both types of politicians will choose the right policy in the first period. In that case, a right policy does not deliver any information about the incumbent, and $\mu(\theta_i = 1|h) = 1/2$. The voter's optimal action in the following election is to abstain, and $P(1; v^1) = 1/2$. Then, (4.4)

implies that discipline requires $P(0; v^1) < 1/2$, which is possible only if the voter votes against the incumbent when observing a wrong policy, in which case $P(0; v^1) = 0$. Thus, the only possibility for a credible threat is to vote against the incumbent after observing the wrong policy, and abstain otherwise.

Lemma 4.2. *Suppose (s, μ) is an equilibrium in which the dissonant politician chooses the right policy in the first period following some action v^1 of the voter in the election. Then,*
(a) the congruent politician also chooses the right policy in the first period following v^1;
(b) the voter always abstains in the second election following v^1 and the right policy;
(c) the posterior belief in v^1 assigns a positive probability on some voting cost at which the voter finds it optimal to vote against the incumbent in the second election following v^1 and the wrong policy.

Part (a) is natural, because the congruent politician would choose the right policy as long as doing so does not hurt her reelection perspective. Part (b) is a restatement of the above observation that a right policy does not deliver any information about the incumbent when discipline is effective, in which case the optimal choice of the voter is to abstain (see Figure 4.2). Part (c) follows because the dissonant politician must believe the wrong policy to be punished with a positive probability. If the ex-ante probability of punishment is sufficiently large, discipline will not require the costly signaling of turning out in the first election. If, on the other hand, that probability is not big enough, discipline will require the costly turnout. The analysis below will revolve around relation between the ex-ante and posterior-after the first election-probability of punishment.

By Lemma 4.2, the incumbent choosing the right policy is reelected with probability 1/2 when discipline is effective. For the dissonant politician, thus, the present value of the expected gain from giving up the dissonant rent R and choosing the right policy is $\beta(E + R)/2$. A direct implication is that discipline requires patience, i.e., $\beta > 2R/(E + R)$.[5] It also requires the dissonant politician to believe the punishment to be optimal for some cost (part (c) of Lemma 4.2). By Lemma 4.1, a necessary condition for this is $\underline{c} < B/4$; for, otherwise, the voter will never find punishment optimal. Thus, let

$$\beta > 2R/(E + R) \quad \text{and} \quad \underline{c} < B/4 \tag{4.6}$$

in the following.

4.3.2 Discipline Without the Costly Signal of Turnout

Let us first consider the simple case where even the high-cost voter is willing to punish. In that case, the probability of punishment will be 1 regardless of the voter's choice in the first election,

[5] The requires the dissonant rent (R) to be smaller than the ego rent (E).

and choosing the right policy in any history of the first period will be optimal for the dissonant politician, under the assumption in (4.6). Thus discipline will be effective without the costly signal of turning out in this case.

If the high-cost voter is not willing to punish, reelection after choosing the wrong policy will be possible if the voter is high-cost and the incumbent wins the coin toss. If both types of voter abstain in the first election, this probability is simply $p/2$. Thus, if the probability of high cost is sufficiently low, in the sense that $p \leq 1 - 2R/[\beta(E+R)]$ (see (4.4)), choosing the right policy in the first period following abstention will be optimal for the dissonant politician. This will make abstention itself optimal for both types of voter.

Proposition 4.1. *There is an equilibrium in which the voter always abstains in the first election and the dissonant politician chooses the right policy in the first period following abstention, if and only if* $\overline{c} \leq B/4$ *or* $p \leq 1 - 2R/[\beta(E+R)]$.

Note that the voter's expected payoff is the largest in this type of equilibrium, because discipline is effective at zero cost.

4.3.3 Discipline Requiring the Costly Signal of Turnout

The more interesting case is when discipline requires the costly signal of turning out in the first election. As shown in the previous case, a trivial necessary condition for such an equilibrium is that punishment is not optimal for the high-cost voter. In particular:

Lemma 4.3. *Let* $\overline{c} < B/4$. *There is no equilibrium in which the dissonant politician chooses the right policy in the first period if and only if the voter turned out.*

Thus let $\overline{c} > B/4$ in the remaining of this subsection. Lemma 4.3 also implies that discipline is achieved at zero cost in every equilibrium when $\overline{c} < B/4$ (see Proposition 4.1).

The high-cost voter finds it too costly to punish a wrong policy (recall Figure 4.2). The low-cost voter, however, may find it optimal if she is sure enough that the incumbent is dissonant, in the sense that $\mu(\theta_i = 1|v^1, i, e^1 = 0) \leq 1/2 - 2\underline{c}/B$ (see Lemma 4.1). In that case, the only possibility of reelection after choosing the wrong policy is when the voter is high-cost and the incumbent wins the coin toss. The posterior belief assigns a probability $\mu(c = \overline{c}|v^1)/2$ on that event. Thus choosing the right policy is optimal for the dissonant politician if and only if

$$\mu(c = \overline{c}|v^1) \leq 1 - \frac{2R}{\beta(E+R)} \tag{4.7}$$

(see (4.4)), with uniqueness when the inequality is strict.

When turning out in the first election achieves discipline, Lemma 4.2 implies that the voter's expected payoff in the first election is $B - c + \beta B/2$ if she turns out, and no larger than $B/2 + \beta(3B/4 - c)$ if she abstains. Thus her optimal action in the first election is determined by voting cost. In particular:

Lemma 4.4. *Suppose the dissonant politician chooses the right policy in the first period if and only if the voter turned out. Then the voter turns out in the first election whenever $c < B/2$.*

Since $\underline{c} < B/4$, the low-cost voter turns out in the first election whenever it achieves discipline. If the high-cost does not mimic the low-cost (and abstains), which is optimal for her if and only if $\overline{c} \geq B/4$, turnout is a sure sign of low cost. Choosing the right policy is optimal for the dissonant politician in that case (see (4.7)). But if $\overline{c} < B/2$, the high cost will also turn out, in which case turnout gives no information about the voter. In that case, the optimality of choosing the right policy for the dissonant politician is determined by the ex-ante probability of punishment (low cost). In particular, it requires $p \leq 1 - 2R/[\beta(E + R)]$ (see (4.7)).

Proposition 4.2. *There is an equilibrium with the following property if and only if $\overline{c} \geq B/2$ or $p \leq 1 - 2R/[\beta(E + R)]$: The dissonant politician chooses the right policy in the first period if and only if the voter turned out. Furthermore,*
(a) if $\overline{c} > B/2$, the voter turns out in the first election if and only if her voting cost is low, in any such equilibrium;
(b) if $\overline{c} < B/2$, the voter always turns out in the first election in any such equilibrium.

Although the voter is indifferent between the two politicians, and hence turning out is statically not optimal for her, it disciplines the incumbent by signaling her willingness to punish a wrong policy in the following election. Even though the high-cost voter will never punish a wrong policy, she can mimic the low-cost in the first election and achieve discipline, as long as her cost is not too high (part (b)). In that case, discipline further requires the ex-ante probability of punishment (low cost) to be sufficiently high.

4.3.4 Explaining the Empirical Evidence

The main motivation for this paper is the empirical evidence that turnout induces subsequent performance from elected official, in a cross-section of constituencies (Chareyron, Joe and Monnery, 2016; Joe, 2016). A simple way to explain this pattern with the current model is by assuming that constituencies differ in the distribution of voting cost, i.e., in $\overline{c}$ and p.

Even if constituencies have the same distribution of voting cost, the model still explains the pattern; and this may be a better explanation, because those empirical works control for relevant constituency characteristics in their regressions. For this, let us consider a set of independent draws

(constituencies) of this model, with $\overline{c} > B/2$ and $p > 1 - 2R/[\beta(E+R)]$. Propositions 4.1 and 4.2 imply that those constituencies that happen to have a low cost will have a "high" turnout and the right policy in the first period with probability 1. Similarly, those constituencies that happen to have a high cost will have a "low" turnout with probability 1 and, with probability 1/2, the wrong policy. This way, the model explains the cross-sectional evidence even if constituencies are ex-ante identical.[6]

4.4 Policy Implications

Since the key parameter of the model is the distribution of voting cost, it has implications for policy decisions which affect that distribution. Let us consider two such decisions: increasing the number of polling places, and making election day a public holiday. These are relevant policy variables that vary across countries and elections. In France, for instance, the government recommends to each city (*commune*) to decide the number of polling places such that each place is assigned with $800 \sim 1,000$ voters,[7] while the only requirement is to have at least one place in each polling district (smaller than constituency) in Canada and South Korea.[8] Between the 12th (2002) and the 13th (2007) legislative elections in France (for the *Assemblée Nationale*), the number of polling places changed in at least 490 constituencies, with the mean absolute change larger than 4.[9] Also, election days for national offices are public holidays in France (Sundays) and South Korea (Wednesdays),[10] but not in the U.S.; and Senator Bernard Sanders proposed a bill in 2014 to change it.[11]

The discussion in this section refers to Figure 4.3, which summarizes the results in the $p - \overline{c}$ plane.

[Figure 4.3 about here]

[6] The instruments used in the empirical works, such as the rainfall on election day or the number of polling places, are observable by politicians. While the effect of the number of polling places on voting cost is easy to predict, the effect of election day rainfall is not clear ex-ante, as the contradicting evidence cited in Joe (2016) shows. This is particularly so in the environment studied in Joe (2016), because the particular election day was the first major election day in the recent history with significant rainfall across the country. In that case, even if politicians observe rainfall, they may still have incomplete information on its effect of voting cost, in which case the current model applies.

[7] Article R40 of the *Code électoral*, and *Circulaire* n° NOR/INT/A/06/00092C of October 16, 2006, *Ministre de l'intérieur et de l'aménagement du territoire*.

[8] Section 120 of the Canada Elections Act; and Article 31 of the Public Official Election Act for South Korea.

[9] Computed using the data from the *Ministère de l'Intérieur*, available at `https://www.data.gouv.fr/en/datasets/elections-legislatives-'year'-resultats-par-bureaux-de-vote` (change 'year' for the corresponding four-digit year; last accessed on May 7, 2016).

[10] Articles L55 and L56 of the *Code électoral*, and Article 3 of Loi n° 62-1292 of November 6, 1962 for France; Article 34 of the Public Official Election Act, and Article 2 of the Regulations on Holidays of Public Agencies for South Korea.

[11] `https://www.congress.gov/bill/113th-congress/senate-bill/2918`; last accessed on May 1, 2016.

4.4.1 Number of Polling Places

Empirical evidence suggests that the number of polling places in a constituency significantly affects the voting cost (Gibson et al., 2013). Recall that c is the *opportunity cost* of voting, which is the sum of the cost of voting per se and the utility of the best alternative to voting, possibly net of the 'civic duty' (Riker and Ordeshook, 1968).

Having more polling places will clearly reduce the cost of voting per se. At the same time, it is unlikely to affect whether the voter is someone with a good alternative (high-cost) or not (low-cost), or with a high sense of civic duty (low-cost) or not (high-cost). Thus, increasing the number of polling places is likely to decrease $\overline{c}$ *without* affecting p.

If the number increases sufficiently and results in $\overline{c}' < B/4$, any resulting equilibrium will have DA; that is, discipline achieved by abstention, the best equilibrium for the voter. If, on the other hand, the increase reduces the high cost from $\overline{c} > B/2$ to $B/4 < \overline{c}' < B/2$, such a change can destroy the possibility of discipline altogether when $p > 1 - 2R/[\beta(E + R)]$ (a shift from DT(L) to No). This is because such a change allows the high-cost to mimic the low-cost in the first election, with no willingness to actually punish, which makes the conceived probability of punishment $(1 - p)$ too low. When the initial distribution has $B/4 < \overline{c} < B/2$ and $p > 1 - 2R/[\beta(E + R)]$, reducing the number of polling places, instead of increasing it, can restore discipline (a shift from No to DT(L)).

This simple comparative statics suggests a careful examination of the initial distribution of voting cost when changing the number of polling places in a constituency.

4.4.2 Making Election Day a Public Holiday

Unlike having more polling places, making election day a public holiday is likely to change the best alternative to voting the voter has. In particular, it is likely to improve the best alternative, because of the possibility of leisure activities, for instance. Unless it increases the sense of civic duty sufficiently, such a change is likely to increase $\overline{c}$, thereby reducing the capacity for discipline. One exception is when the initial distribution of voting cost did not allow discipline in equilibrium (i.e., No). In that case, the increase in the utility of the best alternative can dissuade the high-cost voter from mimicking the low-cost; and the low-cost can achieve discipline by turning out (a shift to DT(L)).

4.5 Conclusion

Motivated by recent empirical evidence (Chareyron, Joe and Monnery, 2016; Joe, 2016), this paper considers the possibility that voter turnout disciplines elected official, in a two-period model of political agency. Even though the pivotal voter with purely instrumental motive is indifferent

between politicians in the first election, and voting is costly, she may still turn out to signal her willingness-low cost-to punish wrong policy. By shedding light on this new topic, this paper contributes to the theoretical literature on political agency, as well as to the models of signaling incentive of voting in repeated elections.

A general implication of this model is that what is important for disciplining the dissonant politician is the voter's willingness to punish misbehavior. The best scenario for the voter is when she does not need to make a costly signal of that willingness, which requires the ex-ante probability of punishment to be sufficiently high. In that case, discipline is achieved in every equilibrium at zero cost. The second best scenario is when discipline is achieved through the costly signal of turnout. When the ex-ante probability of punishment is not high enough, this second best requires the type of voter who is not willing to punish to have a sufficiently large voting cost. This is because that unwilling type will have an incentive to mimic the willing type when voting cost is not large enough, in which case the costly signal does not deliver any information about the voter's willingness to punish. In that case, increasing the voting cost will dissuade the unwilling type from mimicking, thereby restoring the willing type's capacity for discipline.

The model also has implications for two policy decisions that are likely to affect the distribution of voting cost, namely the number of polling places and making election day a public holiday. The general conclusion is that their impact on discipline depends on the initial distribution of voting cost. In most cases, having more polling places is likely to improve discipline, while the opposite is true for making election day a public holiday.

This paper models the situation as one of pure adverse selection: The elected politician directly chooses the outcome-policy-observed by the voter, as opposed to exerting effort which only determines the probability distribution on the outcome. But the same argument can be made with adverse selection and moral hazard, as long as the voter observes the policy or has access to an informative signal of it. An interesting extension in this direction will be to study the voter's incentive to acquire costly information (by reading newspapers, for instance), and its relation with the signaling incentive of turnout.

A clear shortcoming of the current model is its focus on the single-voter case. It is left for future research to see if the particular signaling motive of voting survives as the electorate grows in size.

Appendices

4.A Figures

Figure 4.1: Timing in the model

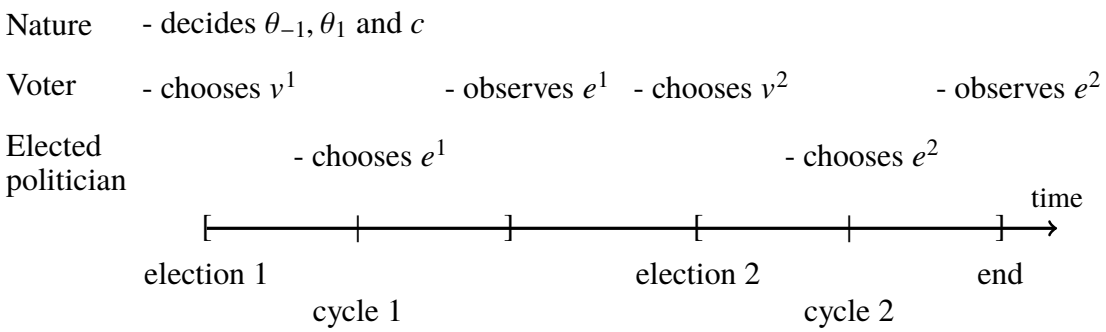
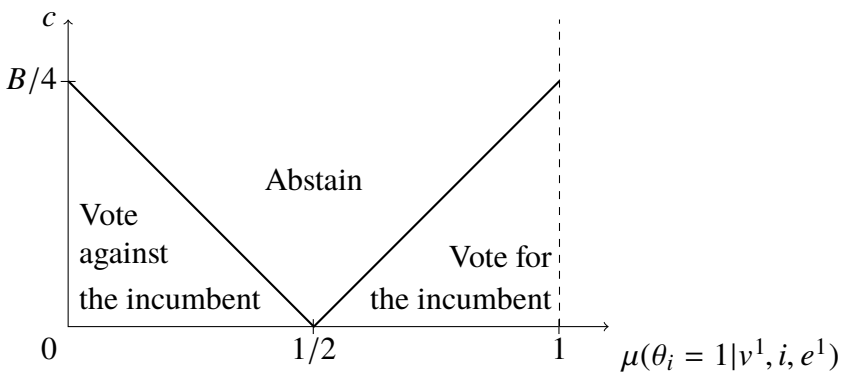
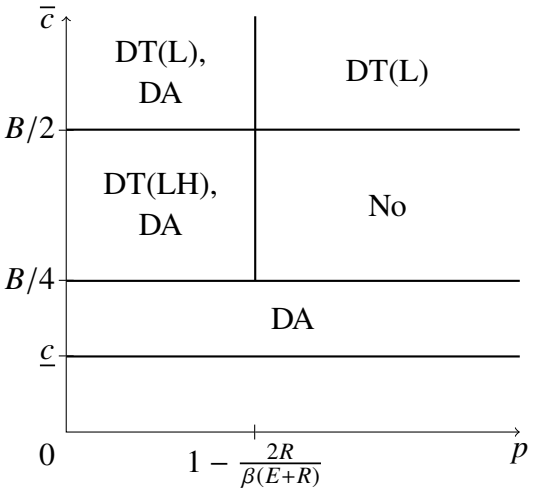


Figure 4.2: The voter's optimal action in the second election



Note: In each area, the voter's optimal action when (μ, c) falls in the area is written (see Lemma 4.1)

Figure 4.3: Existence of equilibrium with discipline



- DT(L): Discipline achieved by Turnout, and only the Low-cost turns out
- DT(LH): Discipline achieved by Turnout, and both the Low-cost and High-cost turnout
- DA: Discipline acheived by Abstention
- No: No equilibrium with discipline

Note: For $(p, \overline{c})$ that falls in an area, an equilibrium corresponding to each symbols in the area exists.

4.B Proofs

For precision, I use the following standard notations (Fudenberg and Tirole, 1991, Section 8.2.3) in this appendix.

- $h^{3(t-1)}$ is an arbitrary history in the tth election; so h^0 is the first election, and h^3 is the second.
- $h^{3(t-1)+1} := (h^{3(t-1)}, v^t)$ is an arbitrary history after voting in the tth election.
- $h^{3(t-1)+2} := (h^{3(t-1)}, v^t, i)$, $v^t \neq -i$, is an arbitrary history when politician i decides e^t as the elected politician in period t.

The voter's pure strategy is $v := (v(\cdot|c))_c$, where $v(\cdot|c)$ maps $h^{3(t-1)}$ into $\{-1, 0, 1\}$. Similarly, $e_i := (e_i(\cdot|\theta_i))_{\theta_i}$ is politician i's pure strategy, where $e_i(\cdot|\theta_i)$ maps $(h^{3(t-1)}, v^t, i)$ into $\{0, 1\}$. $s := (v, e_{-1}, e_1)$ is a strategy profile.

Proof of Lemma 4.2. Suppose (s, μ) is an equilibrium in which the dissonant politician chooses the right policy in some first period $h^2 = (h^1, i)$. Since doing so must increase her reelection perspective (because she prefers the wrong policy), this implies $P(1; h^2) > P(0; h^2)$, in which case choosing the right policy is optimal for the congruent politician (because she prefers that policy). Then $\mu(\theta_i = 1|h^1, i, e^1 = 1) = 1/2$ by Bayes' rule, and abstention is uniquely optimal for the voter at any cost (see Lemma 4.1).

For the last part, note that, if there is no such c, the wrong policy will never be punished in equilibrium, and so $P(0; h^2) \geq 1/2$. But we just showed that $P(1; h^2) = 1/2$, which contradicts the optimality of the dissonant politician's choosing the right policy (see (4.4)). □

Proof of Proposition 4.1. Suppose (s, μ) is such an equilibrium. By Lemma 4.2, the congruent politician always chooses the right policy in the first election. In that case, the voter must always abstain in the first election, and abstention gives no information about the voter. By (4.4) and Lemma 4.1, the optimality of the dissonant politician choosing the right policy in the first period following abstention requires $\overline{c} \leq B/4$ or $p \leq 1 - 2R/[\beta(E + R)]$.

$(*)$ $\overline{c} \leq B/4$: For the converse, first let $\overline{c} \leq B/4$, and consider a strategy profile such that

- in the first election, the voter always abstains;
- in every first period, all politicians choose the right policy;
- in the second election, the voter always votes against the incumbent following a wrong policy, and abstain otherwise;
- in every second period, each politician chooses her preferred policy.

Also, let μ be a posterior belief that follows Bayes' rule whenever applicable.

The optimality of each part in the strategy profile is trivial or a straightforward application of Bayes' rule and Lemma 4.1, except for the voter's decision in the second election following a wrong policy, $h^4 = (h^1, i, e^1 = 0)$, on which the strategy profile assigns no probability. By Lemma 4.1, voting against the incumbent is optimal for both costs if and only if $\mu(\theta_i = |h^4) \leq 1/2 - 2\overline{c}/B$; thus, let us restrict μ to be so, noting that $1/2 - 2\overline{c}/B \geq 0$. This restricts the posterior belief to put little probability on congruence after a deviation to the wrong policy.

$(**)$ $p \leq 1 - 2R/[\beta(E+R)]$: Next, let $p \leq 1 - 2R/[\beta(E+R)]$, and for simplicity, let also $\overline{c} > B/4$. Consider a strategy profile as in the previous case, except that the high-cost always abstains in the second election.

This time, the only nontrivial decision is in the first period following turnout, $h^3 = (h^0, v^1 = i, i)$. The optimality of the dissonant politician's choosing the right policy requires $\mu(\overline{c}|h^3) \leq 1 - 2R/[\beta(E+R)]$; thus, let us restrict μ to be so, noting that $1 - 2R/[\beta(E+R)] > 0$. This restricts the posterior belief to put little probability on the high cost after a deviation to turning out. □

Proof of Lemma 4.3. Let $\overline{c} < B/4$, and suppose on the contrary (s, μ) is such an equilibrium. If the congruent politician chooses the right policy in the first period following an abstention by the voter, the Bayes' rule implies that the right policy following abstention is a sure sign that the incumbent is congruent, i.e., $\mu(\theta_i = 1|h^0, v^1 = 0, i, e^1 = 1) = 1$. In that case, the voter's optimal action in the second election following abstention and right policy is to vote for the incumbent at any cost (since $\overline{c} < B/4$; see Lemma 4.1), and the expected payoff of the congruent politician when choosing the right policy in the first period is $(1 + \beta)(E + B)$. If, instead, she chooses the wrong policy in the first period following abstention, $\mu(\theta_i = 1|h^0, v^1 = 0, i, e^1 = 0) = 1/2$ by Bayes' rule. In that case, the optimal choice of the voter in the second election following abstention and wrong policy is to abstain at any cost by Lemma 4.1. The expected payoff of the congruent politician when choosing the wrong policy in the first period is $E + \beta(E + B)/2 (< (1 + \beta)(E + B))$. Thus we must have the congruent politician choosing the right policy in the first period following abstention. But the expected payoff of the dissonant politician in that first period is $E + R$ if she chooses the wrong policy, while it is $E + \beta(E + R)/2 (> E + R)$ when choosing the right policy. This contradicts the optimality of the dissonant politician's choosing the wrong policy in the first period following abstention. □

Proof of Proposition 4.2. Let us first derive necessary and sufficient conditions for two different kinds of equilibria in which discipline requires the costly signal of turnout: $(*)$ two voting costs choose different actions in the first election, i.e., $v(h^0|\underline{c}) \neq v(h^0|\overline{c})$ (separation), and $(**)$ $v(h^0|\underline{c}) = v(h^0|\overline{c})$ (pooling). We then use those conditions to prove the statements of the proposition.

($*$) Separation: Suppose (s, μ) is such an equilibrium, and put $v(h^0|\underline{c}) = \underline{v^1} \neq \overline{v^1} = v(h^0|\overline{c})$. By Lemma 4.4, the low-cost must turnout. Any action other than the low-cost's is a sure sign of high cost by Bayes' rule. Thus the unique optimal action of the dissonant politician following any action other than the low-cost's is to choose the wrong policy (see 4.7). It follows that the high-cost must abstain in the first election, which is optimal for her if and only if $\overline{c} \geq B/2$.

Conversely, let $\overline{c} \geq B/2$, and consider a strategy profile in which

- in the first election, the low-cost voter turns out, and the high-cost abstains;
- in the first period,
  - the dissonant politician chooses the right policy if and only if the voter turned out (i.e., discipline by turnout),
  - the congruent politician always chooses the right policy;
- in the second election,
  - the low-cost voter votes against the incumbent whenever the first-period policy was wrong, votes for the incumbent if she abstained in the first election and the first-period policy was right, and abstains otherwise,
  - the high-cost voter always abstains; and
- in every second period, every politician chooses her preferred policy.

Also, let μ be a posterior belief that follows Bayes' rule whenever applicable.

The optimality of each part in the strategy profile is trivial or a straightforward application of Bayes' rule and Lemma 4.1, except for the low-cost's decision in the second election following turnout and wrong policy, $h^4 = (h^0, v^1 = i, i, e^1 = 0)$, on which the strategy profile assigns no probability. Voting against the incumbent is optimal for the low-cost unless $\mu(\theta_i = 1|h^4) > 1/2 - 2\underline{c}/B$ (Lemma 4.1); thus, let $\mu(\theta_i = 1|h^4) \leq 1/2 - 2\underline{c}/B$, noting that $1/2 - 2\underline{c}/B > 0$. This restricts the posterior belief to put little probability on congruence after a deviation to the wrong policy.

($**$) Pooling: Suppose (s, μ) is such an equilibrium. Since the low-cost must turn out (Lemma 4.4) in the first election, the voter must always vote (for the same politician) in the first election, which is optimal for the high-cost if and only if $\overline{c} \leq B/2$. In that case, turnout in the first election gives no information about the voter, and (4.7) becomes $p \leq 1 - 2R/[\beta(E + R)]$.

Conversely, let $\overline{c} \leq B/2$ and $p \leq 1 - 2R/[\beta(E + R)]$. Consider a strategy profile as in the separation case above, except that the voter always votes (for the same politician) in the first election. Let μ be a posterior belief that follows Bayes' rule whenever applicable.

This time, there are two nontrivial decisions: in h^4 as in the separation case, and the first period following abstention. Voting against the incumbent in the second election h^4 is optimal for the low-cost if and only if $\mu(\theta_i = 1|h^4) \leq 1/2 - 2\underline{c}/B$; thus, we restrict μ to be so. Also, choosing the wrong policy in the first period following abstention is optimal for the dissonant politician if and only if $\mu(\overline{c}|h^0, v^1 = 0) \geq 1 - 2R/[\beta(E + R)]$; thus, let us further restrict μ to be so. This restricts the posterior belief to put a high probability on high cost after a deviation to abstention.

We have shown that a separating equilibrium exists if and only if $\overline{c} \geq B/2$, and a "pooling" equilibrium exists if and only if $\overline{c} \leq B/2$ and $p \leq 1-2R/[\beta(E+R)]$. Thus, there is an equilibrium in which discipline requires the costly signal of turnout if and only if $\overline{c} \geq B/2$ or $p \leq 1-2R/[\beta(E+R)]$.

If $\overline{c} > B/2$, no pooling equilibrium exists; and the low-cost voter separates herself by turning out. Similarly, no separating equilibrium exists if $\overline{c} < B/2$, in which case the two types of the voter pool on turning out. □

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