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POLICY REFORM UNDER ELECTORAL UNCERTAINTY

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Abstract
How does uncertainty affect the process of policy reform? Our investigation identifies two types of uncertainties, one at the electoral level and another at the implementation level. When voters abstain from the electoral process, electoral uncertainty emerges. Implementation uncertainty arises whenever the politician is unable to guarantee a positive outcome from a policy implementation.
Using a political agency model where two groups of voters delegate to a politician the decision to implement reform or maintain the status quo of the economy, we show that both implementation uncertainty and electoral uncertainty affect policy implementation in different ways. Implementation uncertainty might introduce disagreement between voters about the (ex-ante) convenience of implementing the project. On the other hand, with electoral uncertainty in the political system, political power may be detached from the group's relative size, thus linking it to the citizens' probability of being the decisive vote. In short, a highly disciplined minority group could gather enough political power to impose their preferred policies over a less disciplined majority group.

Resumen
¿Cómo afecta la incertidumbre el proceso de reforma de políticas? Nuestra investigación identifica dos tipos de incertidumbre, una a nivel electoral y otra en la implementación de políticas. Cuando los votantes se abstienen del proceso electoral, emerge la incertidumbre electoral. Por otro lado, la incertidumbre de implementación surge cuando el político no es capaz de garantizar que la implementación de la política económica tendrá un resultado positivo.
Utilizando un modelo de agencia política donde dos grupos de votantes delegan a un político la decisión de implementar una reforma o mantener el status quo de la economía, mostramos que la incertidumbre de implementación y la incertidumbre electoral afectan la implementación de políticas de manera distinta. La incertidumbre de implementación puede introducir desacuerdo acerca de la conveniencia (ex ante) de implementar el proyecto. Por otra parte, con incertidumbre electoral en el sistema político, el poder político puede disociarse del tamaño relativo de cada grupo, asociándose a la probabilidad del ciudadano de ser el voto decisivo. En resumen, un grupo minoritario pero bien disciplinado podría reunir suficiente poder político como para imponer sus preferencias sobre un grupo mayoritario pero menos disciplinado.

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"[D]emocracy is a form of institutionalization of continual conflicts . . . [and] of uncertainty, of subjecting all interests to uncertainty . . . ." (Przeworski 1986, 58)

1 Introduction

The core idea of a democratic political system is that decisions are taken with the consent of the majority of citizens.[1] Elections constitute democracy's main mechanism to arrive at collective decisions in a way which accommodates and facilitates the fullest possible participation of interested parties.

During elections, the majority expresses its preferences and decides the outcome of the electoral contest. In this way, in theory, public policies are determined by the electoral majority–either directly through the vote or indirectly through freely elected officials (Pennock, 1979, 9). If the electoral majority dictates public policy, then why do many welfare enhancing policies that benefit the majority of the population often fail to be implemented?

We argue that with electoral uncertainty embedded in the political system, political power–or the ability of one group of citizens to achieve implementation of their preferred policies–is detached from the group's relative size. In short, highly disciplined minoritarian groups could muster sufficient political power to impose their preferred policies over a less disciplined majoritarian group. In other words, if the incumbent politician is unsure about which group of voters will have the deciding vote at election day, he'll satisfy the demands of the group that maximizes his reelection probabilities no matter the relative size of the group.

Two forms of uncertainty frame our investigation: implementation uncertainty and electoral uncertainty. Implementation uncertainty simply describes a situation in which a politician is unable to guarantee a positive outcome from a policy implementation. This uncertainty decreases the citizens' expected payoff from the policy. Then, if citizens have heterogenous preferences, implementation uncertainty may introduce disagreement between citizens regarding the ex-ante convenience of implementing reform.

Electoral uncertainty is more complex, ensuing when voters falter on their commitment

[1] Although, it is widely accepted that some restrictions on the rule of the majority must be in place in order to guarantee the rights of the minorities in the society (Finer 1997, 1568-1570).

to vote (Aidt and Dutta, 2004, 2009). In such circumstances, differences in the electoral turnout among groups in society might create a gap between the electoral majority and the popular majority. This cleavage opens the possibility that well organized minoritarian groups defeat less organized majoritarian groups and therefore determine the course of public policy. Given electoral uncertainty in the political system, we cannot assume that policy reforms are more likely to be adopted should they benefit or enjoy the preference of the majority.

A key characteristic of electoral uncertainty is that, facing two groups of voters at election, the politician does not know ex-ante which group will hold the majority. In such a situation, the probability that each particular group will constitute the majority is positive. Any reelection reward for the politician will be uncertain, unless the politician satisfies the demands of all groups of voters through successful policy implementation.

But how important is the issue of differences in voting turnout? Table 1 shows the average voter turnout for each U.S. state for presidential and congressional elections during the period 1980-2006 and its standard deviations. For presidential elections, the average voter turnout in the U.S. ranges around 52%, with a minimum of 42,6% in the state of Nevada and a maximum of 68,4% in the state of Minnesota. The standard deviation for average voter turnout in the U.S. reaches almost 2,7%, with a minimum of 1,92% in the state of Hawaii and a maximum of 6,36% in the state of Utah. For congressional elections we observe similar levels of irregularity.

Electoral turnout also appears variable across different demographics. Table 2 shows the voter turnout for each U.S. presidential and congressional election during the period 1972-2000, as classified into selected demographics. Again, the data seems to support the notion that different demographics posses different voting turnout patters. For example, in the 1992 presidential election, the voter turnout among men and women aged between 18-24 was 53% and 49% compared to 73% and 72% for men and women aged above 24. Simple observation from the data on the U.S. elections seems to suggest that voter turnout is far from 100%. This empirical regularity give us reasons to believe that uncertain voting turnout is a factor at deciding elections and thereby affecting economic policy, presenting major fluctuations across time, space and demographics. Nevertheless, we acknowledge

that in order to make a valid empirical assessment of the effects of differences in voting turnout on election results, regression analysis is needed.[2]

The idea that the characteristics of a political system are critical to the adoption of policy implementation has received strong theoretical support. Existing interest groups will use their political influence to stop reforms that might diminish their present economic rents (Kuznets, 1968; Mokyr, 1990). When a new policy is implemented, the private sector reacts with investments oriented to take full benefit of it (Coate and Morris, 1999). Such investments have the effect of increasing the aforementioned interest group's willingness to pay for the policy in the future, thus decreasing the likelihood of policy reversal. Reforms that change the structure of political power will be opposed by those groups whose political power is eroded (Acemoglu and Robinson, 2000). Overall, when reform generates winners and losers, it is clear groups will align in their self interest.

Policy uncertainty is another major source of distortion in policy implementation. Welfare enhancing policy reforms that lack credibility are more likely to be reversed (Rodrik, 1989). Good economic policies may not deliver the intended results, if citizens have doubts about the future survival of the reform (Rodrik, 1991). If agreement is required to change policy, then policy reform may be delayed, with conflicting interest groups engaging in a war of attrition to distribute the reform's uncertain benefits (Alesina and Drazen, 1991).

With uncertainty regarding the distribution of gains and losses from the new policy, the presence of individual specific uncertainty can distort aggregate preferences. Welfare improving reforms may not be able to gather enough political support to be initially implemented (Fernandez and Rodrik, 1991). This result survives even if we allow the government to compensate the losers (Jain and Mukand, 2003). However before the election, the politician does not know if he is going to be aligned with the winners or the losers. When the incumbent faces uncertainty regarding which group will emerge as victorious, he is unable to credibly commit to compensate losers. Previous literature on policy implementation takes voters' turnout for granted, assuming that all voters turn out to vote on election day. We contribute to the literature on policy implementation by exploring the

[2]In this line of empirical research, Mueller and Stratmann (2003) use cross-sectional data to find that higher electoral participation is associated with larger government and lower income inequality.

impact of differences in voting turnout on policy implementation.

In this paper we develop a political agency model where two groups of voters (the principals) delegate to a politician (the agent) the decision to implement a project or to keep the status quo of the economy. The status quo is effort costless to the politician and delivers the same positive payoff to both groups of citizens every time it is implemented. There is no uncertainty about the policy outcome when the status quo is maintained. On the other hand, the project is effort costly to the politician. It also delivers a higher positive payoff than the status quo to both principals, but only with a probability which is a function of the politician's effort. We call this uncertainty *implementation uncertainty*. A second form of uncertainty, *electoral uncertainty*, is incorporated into the model in the form of uncertainty about the election result, if the two groups in the society disagree about reelecting the incumbent politician.

Our model resembles common agency models such as Bernhein and Whinston (1986), Grossman and Helpman (1994) and Dixit, Grossman and Helpman (1997), among others. In these models, a number of principals simultaneously attempt to influence the actions of the agent, by promising payments contingent upon the action chosen.

However, there are several differences between the models mentioned above and the model we present here. First, in our model, the re-election rule constitutes the only instrument at the principals disposal to control the agent. This clearly undermines the ability of the principals to control the politician. Second, the politician commands only universal public goods at his disposal to generate utility to the voters. This limits the extent of Bertrand-like underbidding allowing the principals to retain part of the surplus. Third, in the presence of electoral uncertainty, the principals can only grant reelection to the politician if they both agree with this decision.

In addition, contrary to Dixit, Grossman and Helpman (1997), our model presents principals which are not perfect substitutes from the agent's point of view. Finally, the presence of implementation uncertainty implies that it is not enough for the agent to try to comply with the principals' demands to actually comply with them. When the politician implements the project, the principals enjoy a positive outcome at a probability of less than one. This further limits the ability of the principals to influence the politician's

actions.

Our model is closely related to work pioneered by Aidt and Dutta (2004). They show that in a dynamic common agency game where the retention rule is uncertain if the two principals disagree, there are many possible equilibrium paths, but all of them display so-called strategic consensus. A sequence of performance standards display strategic consensus if the agent prefers to meet both standards at all time, both principals support his reappointment, and the agent is reappointed with certainty. Then, strategic consensus insures the politician against random committee decisions and voters in each group against partisan behavior of the politician. In our model, strategic consensus is not guaranteed due to the presence of a discontinuous political cost function.[3] The political cost function shows the minimum cost of providing utility to the voters. In our model, the political cost function presents discontinuity because both projects (status quo and the new project) have indivisible policy outcomes.

We show that both implementation uncertainty and electoral uncertainty affect policy implementation in different ways: First, implementation uncertainty might introduce disagreement between voters about the (ex-ante) convenience of implementing the project. Implementation uncertainty decreases the voters expected payoff from implementing the new project making less likely that both groups of citizens agree ex-ante in the convenience of implementing the project.

Second, with electoral uncertainty in the political system, policies that are ex-ante preferred by the majority of the population are not always implemented by the incumbent. On the other hand, policies that are ex-ante preferred by a minority of the population might sometimes be implemented. With electoral uncertainty, the political power is detached from the relative size of each group and linked to the probability of being the decisive vote at elections. In particular, policies supported by a minority of the population are more likely to be implemented if they are low effort intensive for the politician, present high probability of success and the minority group ex-ante probability of being decisive is high.

[3] Aidt and Dutta (2004) assume the existence of a political cost function which is both differentiable and weakly increasing in their arguments. With our discontinuous political cost function, to ensure strategic consensus we need to make the extra assumption: when indifferent between voting for the incumbent or the challenger, the principal votes for the incumbent.

The presence of electoral uncertainty in the political system could have important practical policy implications regarding the design of electoral systems. For example, when analyzing the impact of compulsory voting rules on policy outcome we face the following trade-off. On the one hand, strongly enforced compulsory voting seems to improve income distribution (Chong and Olivera, 2008). On the other hand, compulsory voting laws increase voting turnout, thereby reducing electoral uncertainty and making less likely the implementation of policies that benefit minorities.

The rest of the paper is organized as follows. In section 2, we present the model and discuss our main results. In section 3, we analyze the likelihood of adoption of policy reform. Finally, in section 4, we conclude.

2 The Model

Consider an economy populated by two groups A and B of n_A and n_B identical within each group, infinitely lived citizens. Each period a politician is selected from a pool of politicians to run the government. The politician has to decide whether to implement a new project or to keep the status quo. The politician's *implementation-decision* space is:

$$I_t = \{0, 1\}$$

where $I_t = 0$ means not implement and $I_t = 1$ means implement the project in period t.

The outcome of the policy decision is $y_t = I_t y_t^P + (1 - I_t)\, y_t^{SQ}$, where y_t^P and y_t^{SQ} are the outcomes of the new project and the status quo, respectively. The status quo policy delivers a fixed positive outcome every period that it is implemented. This is:

$$y_t^{SQ} = \delta$$

where $\delta > 0$. The characteristics of the status quo are known by the politician and all the citizens in both groups.

On the other hand, there is a new project available to the incumbent. The outcome of

the new project is determined by the politician's effort. The policy outcome is:

$$y_t^P = \begin{cases} \Delta & with \quad probability = f(e_t) \\ 0 & with \quad probability = 1 - f(e_t) \end{cases}$$

where $\Delta > \delta$, $e_t \geq 0$ stands for incumbent's effort and $f(0) = 0, f_e \geq 0$, $f_{ee} < 0$, and $f(e_t) \in [0,1]$. From now on we refer to $f(e_t)$ as the *implementation uncertainty* of the new project. We specify the new project as a function with a dichotomous outcome. The motivation for this specification lies on our interest in studying the effects of uncertainty on the decision to embark in policy reform and not in its effect on the reform itself. The politician and both groups of citizens observe the characteristics of the new project.

Effort is costly for the politician, $C(e)$, where $C(0) = 0, C_e \geq 0$, and $C_{ee} > 0$. The payoff of the politician in office in period t is represented by the function:

$$U_t^P(e_t) = R - C(e_t) \tag{1}$$

where $R > 0$ represent ego rents. The "ego rents" (R) can be interpreted as the value of holding office for a single term and represents the incumbent's explicit compensations from being in office plus any additional rent he may derive from his tenure. Out of the office he receives zero payoff and never returns to office again. Note that the politician's objective function is inspired by Ferejohn (1986). The politician does not steal from the pool of resources of the economy as in Persson et al. (1997). Instead, the politician has to exert positive effort that decreases his per period ego rent to implement the new project.

Citizens in both groups care only about the policy outcome and the implementation decision of the politician. The payoffs of the citizens in each group in period t are:

$$U_t^A\left(y_t^P, I_t\right) = I_t(1+\lambda)\, y_t^P + (1 - I_t)\,\delta \tag{2}$$

$$U_t^B\left(y_t^P, I_t\right) = I_t(1-\lambda)\, y_t^P + (1 - I_t)\,\delta \tag{3}$$

where $I_t = \{0,1\}$ is the politician's implementation decision, y_t^P is the outcome of the policy (if $I_t = 1$) and δ is the outcome of the status quo (if $I_t = 0$). Both the status quo

and the new project are universal public goods. Citizens in both groups have the same preferences with respect to the status quo but have different preferences with respect to the new policy. The degree of disagreement with respect of the benefits of the new policy between the two groups is characterized by λ. We assume that citizens in both groups ex-post prefer to have the project successfully implemented to the status quo. This is,

$$\delta < (1-\lambda)\,\Delta < (1+\lambda)\,\Delta.$$

As we mentioned before, we are interested in identifying the effects of uncertainty in stopping sensible projects from being implemented. For this reason, we start from a project that when stripped of the implementation uncertainty is strictly preferred by both groups of citizens although with different intensities. For example, we can think in a project developed to improve the social welfare system. If successful, the project benefits everyone in the society although, we expect it to benefit low income individuals more than high income ones.

Elections are held every period. In each election, the incumbent politician competes against a challenger (randomly) selected from a pool of politicians. The challenger is assumed to be a perfect substitute for the incumbent. Both groups of citizens and the politician have the same discount factor $\beta \in [0,1]$.

Let's denote the set performance standards announced at the beginning of period t by $\widehat{s}_t = \{\widehat{s}_{A,t}, \widehat{s}_{B,t}\}$, where $\widehat{s}_{A,t} = \left\{\widehat{U}_{A,t}\right\}$ and $\widehat{s}_{B,t} = \left\{\widehat{U}_{B,t}\right\}$ are the respective performance standards announced by the voters in each group. The standards require the incumbent to deliver minimum utility level of $U_{i,t} \geq \widehat{U}_{i,t}$ to a voter in group $i = A, B$ to get his vote.

Electoral uncertainty is incorporated into the model by assuming that voters in each group cannot promise to turn out to vote at the election day in full force. Then, unexpected differences in the electoral turnout among the two groups might create a gap between the electoral majority and the population majority. In other words, before each election the politician is uncertain to which group will eventually hold majority at the election day. For this reason, the politician assigns to each group a positive probability of being the majority at the moment of the referendum. Our underlying assumption is that citizens

follow their announced voting rule if they show up to vote but they do not stick in advance to any particular turnout rate. The next assumption follows from Aidt and Dutta (2009) and captures the previous discussion.

Assumption 1 (Electoral Uncertainty 1) *Electoral turnout,* $\widetilde{n}_t = \{\widetilde{n}_{At}, \widetilde{n}_{Bt}\}$*, is random. The ex-ante probability that the turnout of group A is greater than that of group B,* $P(\widetilde{n}_{At} \geq \widetilde{n}_{Bt})$*, is equal to* $z \in]0,1[$ *and constant over time.*

When $0 < z < 1$ none of the groups of voters is able in solitary to warrant reelection to the politician. Aidt and Dutta (2009) argue that it is more likely to have electoral uncertainty embedded in the political system when turnout shocks are correlated within groups and not between groups and when the differences in group sizes are small.[4]

The game unfolds in the following way: At the beginning of each electoral term, each group of citizens announces the performance standards that the incumbent needs to satisfy to get their support in the next election. The standards are chosen by the two groups of citizens noncooperative and simultaneously and are denoted $\widehat{s}_t = \{\widehat{s}_{A,t}, \widehat{s}_{B,t}\}$. The incumbent observes the standards and decides whether to keep the status quo or implement the new project. The incumbent simultaneously chooses the level of effort he exerts, e_t. Citizens in each group observe the implementation decision of the incumbent and the outcome of the policy. They do not observe the effort exerted by the incumbent. At the end of the electoral term, an election takes place and citizens in each group judge the performance of the politician against their standards. After this, the sequence of the events is repeated.

2.1 Equilibrium

There are $n_A + n_B + 1$ strategic players, n_A are citizens in group A, n_B are citizens in group B and one is the incumbent politician. For simplification following Ferejohn (1986) and

[4]The data on U.S. presidential elections seems to support the idea that turnouts shocks are not correlated between groups. For example, the turnout correlation between the state of New York and the state of New Hampshire is less the 0,3. The correlation turnout between the state of Utah and the state of New Hampshire is -0,12.

Persson et al. (1997) we assume citizens in each group randomly select one of themselves as a representative in charge of casting his vote at elections. Thus, we can treat each group as a single agent reducing the game to a three players game.[5] Assumption 1 can now be rewritten as follows:

Assumption 2 (Electoral Uncertainty 2) *Suppose the two representatives disagree about whether to reelect or not the politician. The ex-ante probability that representative A (B) is decisive in the sense of imposing his preferences about the politician is equal to* z $(1-z)$. *Assume* z *constant over time.*

Each representative $i \in \{A, B\}$ sets a performance standard immediately after each election, $\widehat{s}_{i,t} = \left\{\widehat{U}_{i,t}\right\}$ at time t, letting it be known to the incumbent that he is only getting representative's i vote in the next election if he delivers the utility level that is found satisfactory by the representative. Representatives cannot commit to turn out to vote at the election day. Generally speaking, representative's i voting function is a mapping from the utility level space into the probability of voting for the incumbent if the representative turns out to vote:

$$\phi_{i,t}\left(U_{i,t}\right) : \{0, \delta, \Delta\} \rightarrow [0, 1]$$

where $i = A, B$. A pure strategy for representative i is a voting function $\phi_{i,t}\left(U_{i,t}\right) \in [0, 1]$ that maximizes the representative's utility given the other representative voting function, $\phi_{-i,t}\left(U_{-i,t}\right)$, the implementation-decision and the effort level exerted by the incumbent. We restrict our attention to threshold vote functions of the following type:

$$\begin{aligned} \phi_{i,t}\left(U_{i,t}\right) &= 1 \text{ iff } U_{i,t} \geq \widehat{U}_{i,t} \\ \phi_{i,t}\left(U_{i,t}\right) &= 0 \text{ iff } U_{i,t} < \widehat{U}_{i,t} \end{aligned}$$

where $\widehat{U}_{i,t}$ is the performance standard announced by representative i at time t.

[5] Aidt and Magris (2006) show how to do the analysis in a political agency model when citizens do not coordinate their voting behavior.

A pure strategy of the incumbent is a selection of implementation-decisions and effort levels that maximizes his utility function in each subgame given each representatives voting rule and their probability to turn out to vote:

$$\vartheta\left(\phi_A, \phi_B, z, 1-z\right) : \{0,1\}^3 \rightarrow \{0,1\}\, X\, [0, \overline{e}]$$

This three-players game is a dynamic game with complete but imperfect information. Therefore the solution concept is subgame perfection. A *subgame perfect equilibrium* of this game is a profile of strategies for each representative and the incumbent politician that satisfies the following conditions:

1. In every period, the voting strategy of representative $A\,(B)$ is optimal given the equilibrium strategy of representative $B\,(A)$ and the politician.

2. In every period, the strategy of the politician is optimal given the equilibrium voting strategy of the each representative.

Finally, we restrict our attention to stationary equilibria. Therefore, we set $e = e_t$ for all t.

2.2 The Political Model With Electoral Uncertainty

Our model belongs to the literature of repeated performance voting and builds on work done by Ferejohn (1987), Persson et al. (1997), Coate and Morris (1999) and Aidt and Dutta (2004).

First we characterize the sequence of incentive compatible performance standards as follows. Each representative announces a performance standard $\widehat{s}_i = \left\{\widehat{U}_i\right\}$ at time t, where $i = A, B$. There are two standards, one for each representative. Depending on the pair of performance standards set by the representatives, the politician has the alternative choices of trying to comply with one, both or to deviate from both performance standards. The politician might have more than one way to try to comply or deviate from the standards of the representatives. Additionally, the politician cannot always comply with the standards

with certainty because of the implementation uncertainty attached to the new project. The politician's decision depends on the expected discounted utility that each available course of action delivers to him. Denote $V(I,j)$ as the politician's value of being in office giving his implementation-decision ($I=0,1$), and that he is trying to comply either with the standard of representative A, representative B, both representatives (AB) or deviating from both standards (D), where $j=\{A,B,AB,D\}$. Formally, a politician who tries to comply with either representative's A, B or AB standard by setting I gets:

$$\begin{aligned} V(I,A) &= \max_{e}\left[R-C(e)+z\beta\pi\left(\widehat{U}_A,I,e\right)V^*\right] \\ V(I,B) &= \max_{e}\left[R-C(e)+(1-z)\beta\pi\left(\widehat{U}_B,I,e\right)V^*\right] \\ V(I,AB) &= \max_{e}\left[R-C(e)+\beta\pi\left(\widehat{U}_A,\widehat{U}_B,I,e\right)V^*\right] \end{aligned}$$

where V^* is the continuation value of holding office. The probabilities $\pi\left(\widehat{U}_A,I,e\right)$, $\pi\left(\widehat{U}_B,I,e\right)$ and $\pi\left(\widehat{U}_A,\widehat{U}_B,I,e\right)$ are the respective probabilities of complying *exclusively* with the performance standards that the politician is trying to comply, given the politician's implementation-decision ($I=0,1$) and the effort the politician exerts, e. Formally,

$$\pi\left(\widehat{U}_A,I,e\right)=\begin{cases} 1 & if \quad I=0 \quad and \quad \widehat{U}_A\leq\delta \\ 0 & if \quad I=0 \quad and \quad \widehat{U}_A>\delta \\ f(e) & if \quad I=1 \quad and \quad \widehat{U}_A\leq(1+\lambda)\Delta \\ 0 & if \quad I=1 \quad and \quad \widehat{U}_A>(1+\lambda)\Delta \end{cases}$$

,

$$\pi\left(\widehat{U}_B,I,e\right)=\begin{cases} 1 & if \quad I=0 \quad and \quad \widehat{U}_B\leq\delta \\ 0 & if \quad I=0 \quad and \quad \widehat{U}_B>\delta \\ f(e) & if \quad I=1 \quad and \quad \widehat{U}_B\leq(1-\lambda)\Delta \\ 0 & if \quad I=1 \quad and \quad \widehat{U}_B>(1-\lambda)\Delta \end{cases}$$

and

$$\pi\left(\widehat{U}_A,\widehat{U}_B,I,e\right)=\begin{cases}1 & if \quad I=0 \quad and & \widehat{U}_A\leq\delta \quad \& \quad \widehat{U}_B\leq\delta\\ 0 & if \quad I=0 \quad and & \widehat{U}_A>\delta \ or \ \widehat{U}_A>\delta\\ 0 & if \quad I=0 \quad and & \widehat{U}_A>\delta \quad \& \quad \widehat{U}_A>\delta\\ f(e) & if \quad I=1 \quad and & \widehat{U}_A\leq(1+\lambda)\Delta \quad \& \quad \widehat{U}_B\leq(1-\lambda)\Delta\\ 0 & if \quad I=1 \quad and & \widehat{U}_A>(1+\lambda)\Delta \ or \ \widehat{U}_B>(1-\lambda)\Delta\\ 0 & if \quad I=1 \quad and & \widehat{U}_A>(1+\lambda)\Delta \quad \& \quad \widehat{U}_B>(1-\lambda)\Delta\end{cases}$$

We can see clearly how the implementation uncertainty and the electoral uncertainty affect negatively the politician's expected value of holding office. When the politician tries to comply exclusively with the standard of representative A, he is reelected with probability $z\pi\left(\widehat{U}_A,I,e\right)$. This reelection probability can be divided into two terms. Firstly, the politician is only able to satisfy the standard of representative A with probability $\pi\left(\widehat{U}_A,I,e\right)$. This is due to the implementation uncertainty. Secondly, representative A is only able to decide the electoral outcome with probability z. This is due to the electoral uncertainty. Similarly, when the politician tries to comply exclusively with the standard of representative B, he is reelected with probability $(1-z)\,\pi\left(\widehat{U}_B,I,e\right)$. The politician is able to satisfy the standard with probability $\pi\left(\widehat{U}_b,I,e\right)$ (implementation uncertainty) and representative B decides the electoral outcome with probability $(1-z)$ (electoral uncertainty). Finally, when the politician tries to comply with the standards of representatives A and B simultaneously, there is no electoral uncertainty and the incumbent is reelected with probability $\pi\left(\widehat{U}_A,\widehat{U}_B,I,e\right)$ due to the implementation uncertainty.

Both types of uncertainty have a negative effect on the politician's expected payoff of trying to comply with the standards. Although the uncertainties affect each course of action with different intensities depending on the relative values of z and $(1-z)$ and the standards set by the representatives, $\widehat{U}_A$ and $\widehat{U}_B$.

A politician who decides to deviate (D) from both representatives' standards at time t

by setting I sees his tenure terminated at the next election. His payoff is:

$$V(I, D) = \max_{e} [R - C(e)] = R$$

It is worth to notice that due to the characteristics of the status quo and the new project, the politician might not always be able to implement partisan outcomes. This is, to satisfy the performance standard of only one representative. In our model, the politician is unable to increase the utility of one representative without increasing the utility of the other since both the status quo and the new project are public goods. Also, the status quo and the new project deliver fixed policy outcome, although with a probability in the case of the new project. Then, the politician's ability to satisfy or deviate from the performance standards of a single representative depends on the pair of standards set by the representatives. For example, if both representatives set standards lower or higher to the status quo payoff δ, the politician is unable to satisfy the standards of only one representative. Then, $V(I, A)$ and $V(I, B)$ become irrelevant to the politician's decision. Similarly, if one or both representatives set standards lower or equal to the status quo payoff δ, the politician is unable to deviate from both representatives' standards simultaneously by setting $I = 0$. Then, $V(0, D)$ becomes irrelevant in the politician's decision.

Definition 3 *We define a sequence of performance standards* $\{\widehat{s}_t\}_{t=0}^{\infty}$ *as incentive compatible if and only if*

$$\max \left\{ \begin{array}{c} V(0, A), V(0, B), V(0, AB), \\ V(1, A), V(1, B), V(1, AB) \end{array} \right\} \geq R \text{ for } t = 0, 1, 2, ...$$

In words, incentive compatibility requires the politician to voluntarily try to comply with at least one of the standards set by one of the representatives. To make the politician to voluntary try to comply, the standards have to allow him to enjoy a higher discounted utility by trying to comply with the standards than by deviating in any way from them.

Since there are three possible policy outcomes $y \in \{0, \delta, \Delta\}$, there are three possible utility outcomes for each representative. Remember that we assume that citizens in both

groups ex-post prefer the project successfully implemented to the status quo. This is,

$$\delta < (1-\lambda)\,\Delta < (1+\lambda)\,\Delta$$

Then, for representative A any performance standard based on U_A can be classified into one of the following four groups:

$$1A)\ \widehat{U}_A = 0;\quad 2A)\ \widehat{U}_A \in\,]0,\delta]\,;\quad 3A)\ \widehat{U}_A \in\,]\delta,(1+\lambda)\Delta]\,;\quad 4A)\ \widehat{U}_A \in\,](1+\lambda)\Delta,\infty]\,.$$

Similarly, for representative B:

$$1B)\ \widehat{U}_B = 0;\quad 2B)\ \widehat{U}_B \in\,]0,\delta]\,;\quad 3B)\ \widehat{U}_B \in\,]\delta,(1-\lambda)\Delta]\,;\quad 4B)\ \widehat{U}_B \in\,](1-\lambda)\Delta,\infty]\,;$$

Is important to notice that incentive compatibility could arise in some groups of performance standards but not necessarily in all. For example, standards belonging to the groups $4A$ and $4B$ are never incentive compatible because the politician is unable to comply with any of them. Additionally, standards in the group $1A$ and $1B$ constitute the worst possible outcome for the representatives. They can always do better by setting the status quo as standard. We study a sequence of incentive compatible performance standards based on the observable utility outcome and we focus on those standards that maximize voters' lifetime utility. These are standards classified into groups 2 and 3. Therefore we have 4 combinations of performance standards between the two representatives. The following lemmas account for these different possibilities.

Lemma 4 (E1) *If the representatives' standards are $\widehat{U}_A \in\,]0,\delta]$ and $\widehat{U}_B \in\,]0,\delta]$, then the project is not implemented ($I=0$). The politician is reelected, gets $V(0,AB) = \frac{R}{1-\beta}$ and both representatives get δ every period.*

Proof. Suppose representatives A and B set standards $2A$ and $2B$ respectively. The politician has two ways to try to comply with both standards simultaneously. The first one is setting $I=0$. If the politician tries to comply with both standards setting $I=0$ he

gets:

$$V(0, AB) = \max_{e} [R - C(e) + \beta V^*]$$

By routine substitution we get that:[6]

$$V(0, AB) = \max_{e} \left[\frac{R}{1-\beta} \right] = \frac{R}{1-\beta}$$

The politician will exert effort equal to $e = 0$. The second way for the politician to try to comply with both standards is setting $I = 1$. Then he gets:

$$V(1, AB) = \max_{e} [R - C(e) + \beta f(e) V^*]$$

By routine substitution we get that:[7]

$$V(1, AB) = \max_{e} \left[\frac{R - C(e)}{1 - \beta f(e)} \right] = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})} \right]$$

The politician will exert effort equal to $e = e_{AB}$ where:

$$C_e(e_{AB}) = \frac{(R - C(e_{AB}))\, \beta f_e(e_{AB})}{1 - \beta f(e_{AB})}$$

We can see that $V(0, AB) > V(1, AB)$. To try to comply with both standards by setting $I = 1$ requires the politician to exert a positive effort e_{AB} and to face an implementation uncertainty of $f(e_{AB})$. On the other hand, the politician is able to comply with by standards by setting $I = 0$ without having to exert any effort or face any implementation uncertainty. Then, if the politician decides to try to comply with both standards he does

[6] Remember we restrict our attention to stationary equilibria.

[7] The first order condition of this maximization problem is:

$$\frac{\partial V(1, AB)}{de} = \frac{(-C_e(e))(1 - \beta f(e)) + (R - C(e))\, \beta f_e(e)}{(1 - \beta f(e))^2} = 0$$

The second order condition evaluated at the maximum is:

$$\frac{\partial^2 V(1,AB)}{de^2} = \frac{(-C_{ee}(e_{AB}))(1-\beta f(e_{AB})) + (R - C(e_{AB}))\beta f_{ee}(e_{AB})}{(1-\beta f(e_{AB}))^2} < 0$$

it by setting $I = 0$. If the politician deviate from both standards by setting $I = 1$ then he gets:

$$V(1, D) = R$$

Then, since $V(0, AB) \geq V(1, D)$ the politician complies with both standards by setting $I = 0$ and $e = 0$. The representatives get a utility payoff of $U_A = \delta$ and $U_B = \delta$. Finally, since both representatives set standards lower or equal to δ, the politician is unable to satisfy or deviate from only one of the standards. Also, the politician is unable to deviate from both standards simultaneously by setting $I = 0$. Then, $V(0, A)$, $V(0, B)$, $V(1, A)$,$V(1, B)$ and $V(0, AB)$ are irrelevant in the politician's decision. ■

Lemma 5 (E2) *If the representatives' standards are* $\widehat{U}_A \in]0, \delta]$ *and* $\widehat{U}_B \in]\delta, (1-\lambda)\Delta]$, *then:*

- *If* $V(1, AB) \geq V(0, A)$ *the project is implemented* $(I = 1)$. *The politician gets* $V(1, AB) = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})}\right]$ *and he is reelected with probability* $f(e_{AB})$ *where* e_{AB} *solves* $C_e(e_{AB}) = \frac{(R - C(e_{AB}))\beta f_e(e_{AB})}{1 - \beta f(e_{AB})}$. *Representatives A and B get an expected payoff of* $(1 + \lambda)\Delta f(e_{AB})$ *and* $(1 - \lambda)\Delta f(e_{AB})$ *respectively.*

- *If* $V(1, AB) < V(0, A)$ *the project is not implemented* $(I = 0)$. *The politician gets* $V(0, A) = \frac{R}{1 - z\beta}$, *is reelected with probability z and both representatives get* δ *every period.*

Proof. Suppose representatives A and B set standards $2A$ and $3B$ respectively. The politician has one way to try to comply with both standards simultaneously. If the politician tries to comply with both standards setting $I = 1$ he gets:

$$V(1, AB) = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})}\right]$$

The politician will exert effort equal to $e = e_{AB}$. A second possibility for the politician is to try to comply only with the standard of representative A by setting $I = 0$. Then he gets:

$$V(0, A) = \max_{e} [R - C(e) + z\beta V^*]$$

By routine substitution we get that:

$$V(0, A) = \frac{R}{1 - z\beta}$$

The politician can only deviate from both standards simultaneously by setting $I = 1$. If the politician deviates from both standards setting $I = 1$ then he gets:

$$V(1, D) = R$$

We can see that $V(0, A) > V(1, D)$. To try to comply with the standard of representative A by setting $I = 0$ requires no effort and has no implementation uncertainty but due to the electoral uncertainty delivers reelection to the politician with probability z. To deviate from both standards simultaneously by setting $I = 1$ also requires no effort and has no implementation uncertainty but the politician is never reelected. Then, the politician never deviates from both standards voluntarily. Moreover, if

$$V(1, AB) \geq V_t(0, A)$$

the politician tries to comply with both standards by setting $I = 1$ and $e = e_{AB}$. The representatives get a expected utility payoff of $U_A = (1 + \lambda)\Delta f(e_{AB})$ and $U_B = (1 - \lambda)\Delta f(e_{AB})$. If

$$V(1, AB) < V(0, A)$$

the politician tries to comply only with the standards of representative A by setting $I = 0$ and $e = 0$. The representatives get a utility payoff of $U_A = \delta$ and $U_B = \delta$. Finally, notice that the politician is unable to satisfy or deviate from both standards by setting the status quo. The politician is unable to satisfy or deviate only from the standard of representative B. And, the politician is unable to satisfy only the standard of representative A by setting $I = 1$. Then, $V(0, AB)$, $V(0, D)$, $V(0, B)$, $V(1, B)$ and $V(1, A)$ are irrelevant in the politician's decision. ■

Lemma 6 (E3) *If the representatives' standards are* $\widehat{U}_A \in]\delta, (1 + \lambda)\Delta]$ *and* $\widehat{U}_B \in]0, \delta]$

then:

- *If* $V(1, AB) \geq V(0, B)$ *the project is implemented* $(I = 1)$*. The politician gets* $V(1, AB) = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})}\right]$ *and he is reelected with probability* $f(e_{AB})$*. Representatives* A *and* B *get an expected payoff of* $(1 + \lambda)\Delta f(e_{AB})$ *and* $(1 - \lambda)\Delta f(e_{AB})$ *respectively.*

- *If* $V(1, AB) < V(0, B)$ *the project is not implemented* $(I = 0)$*. The politician gets* $V(0, B) = \frac{R}{1 - (1 - z)\beta}$*, is reelected with probability* $(1 - z)$ *and both representatives get* δ *every period.*

Proof. Similar to E2. ■

Lemma 7 (E4) *If the representatives' standards are* $\widehat{U}_A \in]\delta, (1 + \lambda)\Delta]$ *and* $\widehat{U}_B \in]\delta, (1 - \lambda)\Delta]$ *then:*

- *If* $V(1, AB) \geq R$ *the project is implemented* $(I = 1)$*. The politician gets* $V(1, AB) = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})}\right]$ *and he is reelected with probability* $f(e_{AB})$*. Representatives* A *and* B *get an expected payoff of* $(1 + \lambda)\Delta f(e_{AB})$ *and* $(1 - \lambda)\Delta f(e_{AB})$ *respectively.*

- *If* $V(1, AB) < R$ *the politician exerts zero effort and is indifferent between implementing the status quo or implementing the project. The politician gets* R *as payoff and he is not reelected. Representatives* A *and* B *get* δ *or zero each period depending of the politician's implementation decision .*

Proof. Suppose representatives A and B set standards $3A$ and $3B$ respectively. The politician has one way to try to comply with both standards simultaneously. If the politician tries to comply with both standards setting $I = 1$ he gets:

$$V(1, AB) = \left[\frac{R - C(e_{AB})}{1 - \beta f(e_{AB})}\right]$$

The politician will exert effort equal to $e = e_{AB}$. The politician has two ways to deviate from both standards simultaneously. The politician can keep the status quo or implement

the project exerting no effort. If the politician deviates from both standards setting by either setting $I = 0$ or $I = 1$ then he gets:

$$V(0, D) = V(1, D) = R$$

We can see that if:

$$V(1, AB) \geq R$$

the politician tries to comply with the standards of both representatives by setting $I = 1$ and $e = e_{AB}$. The representatives get an expected utility payoff of $U_A = (1 + \lambda)\Delta f(e_{AB})$ and $U_B = (1 - \lambda)\Delta f(e_{AB})$. On the other hand, if

$$V(1, AB) < R$$

the politician deviates from the standards of both representatives. The politician exerts no effort ($e = 0$) and is indifferent between setting $I = 0$ or $I = 1$. The representatives get a utility payoff of $U_A = \delta$ and $U_B = \delta$ or $U_A = 0$ and $U_B = 0$ depending of the politician's implementation decision. Finally, since both representatives set standards higher than δ, the politician is unable to satisfy or deviate from only one of the standards. Also, the politician is unable to satisfy both representatives standards simultaneously by setting $I = 0$. Then, $V(0, A)$, $V(0, B)$, $V(1, A)$, $V(1, B)$ and $V(0, AB)$ are irrelevant in the politician's decision. ■

To characterize the equilibrium solutions of this game, we have to take into consideration the relative value of the *expected* payoffs of the representatives. We know that ex-post both representatives prefer to have the project successfully implemented. This is, $\delta < (1 - \lambda)\Delta < (1 + \lambda)\Delta$. However, to implement the project entails risk for the politician and the representatives. When the politician implements the project he exerts the level of effort that maximizes his expected utility. At this level of effort, the project only delivers the positive outcome with probability $f(e_{AB}) \leq 1$. This implementation uncertainty is known by the representatives, who then use their *expected* payoffs to decide their strategies. Three different cases arise depending on the relative values of the expected

payoffs for the representatives, $(1+\lambda)\,\Delta f\,(e_{AB})$, $(1-\lambda)\,\Delta f\,(e_{AB})$ and δ. We also assume that when indifferent representatives reelect the incumbent politician and that $z > (1-z)$ which means that $V\,(0,A) > V\,(0,B)$.[8] The following propositions summarize our results.

Proposition 8 (Agree to implement) *Assume* $\delta \leq (1-\lambda)\Delta f\,(e_{AB})$ *then:*

- *If* $V\,(1,AB) < R$ *then (E1) is an equilibrium of this game.*
- *If* $V\,(1,AB) \in [R, V\,(0,B)\,[$ *then (E1) and (E4) are equilibria of this game.*
- *If* $V\,(1,AB) \in [V\,(0,B)\,, V\,(0,A)\,[$ *then (E3) and (E4) are equilibria of this game.*
- *If* $V\,(1,AB) \geq V\,(0,A)$ *then (E2), (E3) and (E4) are equilibria of this game.*

Proposition 9 (Disagreement) *Assume* $(1-\lambda)\Delta f\,(e_{AB}) < \delta \leq (1+\lambda)\Delta f\,(e_{AB})$ *then:*

- *If* $V\,(1,AB) < V\,(0,B)$ *then (E1) is an equilibrium of this game.*
- *If* $V\,(1,AB) \geq V\,(0,B)$ *then (E3) and (E4) are equilibria of this game.*

Proposition 10 (Agree to not implement) *Assume* $(1+\lambda)\Delta f\,(e_{AB}) < \delta$ *then:*

- *If* $V\,(1,AB) < V\,(0,A)$ *then (E1) is an equilibrium of this game.*
- *If* $V\,(1,AB) \geq V\,(0,A)$ *then (E1) and (E4) are equilibria of this game.*

Proof. see Appendix 5.1. ■

3 Analysis of Policy Reform

The model stated in the previous section sheds light in a number of interesting questions related to the adoption of new policies. First, the model give us a hint of when policy reforms have a chance to be implemented.

[8] The assumption of $z > (1-z)$ is for expositional reasons. Assuming that $z < (1-z)$ implies that $R < V\,(0,A) < V\,(0,B) < V\,(0,AB)$ and the results in propositions 8, 9 and 10 would have to be adjusted to this fact.

Proposition 11 (Incentive compatibility) *A necessary condition for policy implementation* $(I = 1)$ *is* $C(e_{AB}) \leq \beta R f(e_{AB})$.

Proof. see Appendix 5.2. ■

As we mentioned before, incentive compatibility requires the politician to voluntary try to comply with the standards set by the voters. To induce the politician to try to comply, the representatives must be able to set a pair of performance standards that allow the politician to enjoy a higher discounted utility by trying to comply with the standards than deviating in any way from them. In other words, to implement the project requires the politician to exert effort at a cost $C(e_{AB})$. He does that in order to gain ego rents R in the next period with probability $f(e_{AB})$. If the cost $C(e_{AB})$ is higher than the discounted benefit $\beta R f(e_{AB})$, the politician never implements the project.

For the rest of the analysis we assume that when both representatives agree to reelect the incumbent they are able to design a pair of incentive compatible performance standards that induce the politician to set $I = 1$ and $e = e_{AB}$. This is, we assume that $C(e_{AB}) \leq \beta R f(e_{AB})$.

Second, implementation uncertainty decreases the representatives' expected payoff of implementing the project, making it less attractive relative to the status quo. Although, ex-post both representatives prefer to have the project successfully implemented, due to the presence of implementation uncertainty, ex-ante this might not be the case. Then,

Proposition 12 *The higher the implementation uncertainty of the project (lower* $f(e_{AB})$*), the lower the likelihood that representatives (ex-ante) agree to implement it. Furthermore, ex-ante agreement in the convenience of implementing the project increases the likelihood of policy implementation.*

Proof. see Appendix 5.3. ■

Third, if the two representatives ex-ante disagree about the convenience of implementing policy reform, the answer to the question of which of the preferences will prevail is critical to explain the likelihood of reform. The following definition help us to formalize this idea.

Definition 13 *Political power is the ability of one of the representatives to impose his preferences over the other and decide the policy implementation when disagreement.*

Which representative has the political power depends on the payoff that each of them is able to offer to the politician. Then,

Proposition 14 *If* $V(1, AB) \geq V(0, B)$ *then representative* A *has the political power over the implementation of the policy. On the other hand, if* $V(1, AB) < V(0, B)$ *then representative* B *has the political power over the implementation of the policy.*

Proof. Follows from proposition 9. ■

When $(1 - \lambda)\Delta f(e_{AB}) < \delta \leq (1 + \lambda)\Delta f(e_{AB})$, representative A ex-ante prefers to have the policy implemented and is able to offer the expected payoff of $V(1, AB)$ to the politician for trying to comply with his demand. Alternatively, representative B ex-ante prefers to have the status quo implemented and is able to offer the expected payoff of $V(0, B)$ to the politician for doing this.

If $V(1, AB) \geq V(0, B)$ the politician will attempt to comply with the standards of both representatives by implementing the project. If the project is successfully implemented, both representatives vote for the politician. If the project is not successfully implemented, both representatives vote for the challenger.

If $V(1, AB) < V(0, B)$, representative B is the one able to offer a higher expected payoff to the politician for trying to comply with his standard. Here the politician tries to comply only with the standards of representative B by keeping the status quo. Representative A is ex-ante indifferent between supporting the reelection of the politician or voting for the challenger.

From proposition 14 we derive the following corollary.

Corollary 15 *With electoral uncertainty, projects that are ex-ante preferred by the majority of the population are not always implemented. On the other hand, projects that are ex-ante preferred by the minority of the population are sometimes implemented.*

The relative expected values of $V(1, AB)$ and $V(0, B)$ are the key element in determining which representative enjoys the power to impose his preferences over the other,

not the relative size of each group. Taking a closer look at proposition 14, we find that representative A enjoys the political power over policy when:

$$C\left(e_{AB}\right) \leq \frac{\beta R\left[f\left(e_{AB}\right)-(1-z)\right]}{(1-\beta(1-z))}$$

Representative A is more likely to have the political power when the politician is able to implement the policy and deliver the positive outcome with high probability (low implementation uncertainty, high $f\left(e_{AB}\right)$) and at low effort cost (low $C(e_{AB})$). Also, the probability of being the decisive vote at the election is an important factor to determine which representative holds the political power. In particular, when representative A ex-ante probability of being decisive is $z=1$, the inequality becomes $C\left(e_{AB}\right) \leq \beta R f\left(e_{AB}\right)$.[9] Then,

Proposition 16 *The higher the ex-ante probability of being decisive at elections the higher the likelihood of having the political power over the policy implementation.*

Proof. see Appendix 5.4. ■

To assess the impact of electoral uncertainty on policy implementation it is interesting to compare our results with a similar model but with complete electoral turnout (100% turnout) in both groups. With complete electoral turnout, the representative of the larger group has an ex-ante probability of being the decisive vote in the election equal to 1. In our model this translates into setting $z=1$ when $n_A > n_B$ and $z=0$ when $n_A \leq n_B$. This means that the larger group always has the political power over the implementation of the policy. Therefore, with complete electoral turnout, projects that are ex-ante preferred by the majority of the population are always implemented. On the other hand, projects that are ex-ante preferred by the minority of the population are never implemented. The results of the model without electoral uncertainty are in sharp contrast with our model with electoral uncertainty. This is specially clear when the representatives disagree about the expected benefits of implementing the project.

[9] This inequality is assumed to hold.

With electoral uncertainty, the political power is detached from the relative size of each group of citizens and linked to the probability of being the decisive vote, z and $(1-z)$. This means that a highly disciplined minoritarian group could gather enough political power to be able to impose their preferred policies over a less disciplined majoritarian group. Suppose representatives A and B probabilities of being decisive are:

$$z = \frac{\theta n_A}{\theta n_A + (1-\theta)\, n_B}$$

$$1 - z = \frac{(1-\theta)\, n_B}{\theta n_A + (1-\theta)\, n_B}$$

where n_A and n_B are the number of citizens in groups A and B, and the parameter $\theta \in [0,1]$ measures the differences in the degree of voting discipline between the two representatives. When $\theta \to 1$, the difference in voting discipline is extreme, with representative A being highly disciplined compared to representative B, and having a probability of being decisive equal to one. The opposite is the case when $\theta \to 0$. Here, representative B is highly disciplined compared to representative A, and has a probability of being decisive equal to one. In this set up, one could easily imagine cases where the majority of the population favors policy implementation ($n_A > n_B$) but a more disciplined minoritarian group (low θ) is able to stop the reform process.

Our model provides an explanation to why welfare enhancing policies that benefit the majority of the population sometimes fail to be implemented. With electoral uncertainty in the system, the political power might be in hands of the minority group. Projects that are ex-ante preferred by the majority of the population, but not the minority, are not implemented. When the political power is in hands of the minority of the population, only projects that are ex-ante preferred by the minority are implemented in the economy.

4 Conclusion

In our model, electoral uncertainty emerges when voters abstain from the electoral process. In the presence of two groups of voters, absentee voters may prevent the politician from

predicting with any degree of certainty which group of citizens will hold the majority in the outcome of an election. Under this rubric, any reelection reward for the politician will be uncertain unless the politician satisfies the demands of all groups of voters through successful policy implementation.

The results presented in the paper rely on the assumption that the groups' turnout probabilities are exogenously given. One interesting extension to the model would be to make the turnout probability of each group endogenously determined. This would entail formally modelling the citizen's decision process regarding to electoral participation.

We show that both implementation uncertainty and electoral uncertainty affect policy implementation, but in different ways. Implementation uncertainty might introduce disagreement between voters about the (ex-ante) convenience of implementing the project. On the other hand, with electoral uncertainty embedded in the political system, political power may become detached from the groups' relative size and linked to the citizens' probability of being the decisive vote. In short, a highly disciplined minoritarian group could gather enough political power to impose their preferred policies over a less disciplined majoritarian group.

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5 Appendix

5.1 Proof Proposition 8, 9 and 10

We focus on the disagreement case. The other two cases can be proved in a similar fashion. Assume $(1-\lambda)\Delta f(e_{AB}) < \delta \leq (1+\lambda)\Delta f(e_{AB})$. Suppose E1: Representative A deviates to E3 if $V(1,AB) \geq V(0,B)$. Then (E1) is an equilibrium of this game if:

$$V(1,AB) < V(0,B)$$

Suppose E2 and $V(1,AB) \geq V(0,A)$: Representative B deviates to E1. Suppose E2 and $V(1,AB) < V(0,A)$: Representative B deviates to E1 (indifferent). Suppose E3 and $V(1,AB) \geq V(0,B)$: Representatives have no profitable deviation. Suppose E3 and $V(1,AB) < V(0,B)$: Representative A deviates to E1 (indifferent). Suppose E4 and $V(1,AB) \geq R$: Representative B deviates to E3 if $V(1,AB) < V(0,B)$. Suppose E4 and $V(1,AB) < R$: Representative A deviates to E2. Representative B deviates to E3. Then (E3) and (E4) are equilibria of this game if:

$$V(1,AB) \geq V(0,B)$$

Finally, making use of the assumption that $z > (1-z)$ we get that

$$V(0,AB) \geq V(0,A) > V(0,B) \geq R$$

5.2 Proof Proposition 11

Suppose $C(e_{AB}) > \beta R f(e_{AB})$. This is equivalent to $V(1,AB) < R$. Notice that $R < \min\{V(0,A), V(0,B)\}$. This implies that $V(1,AB) < \min\{V(0,A), V(0,B)\}$. Using propositions 8, 9 and 10 we see that the project is never implemented when $C(e_{AB}) >$

$\beta R f(e_{AB})$.

5.3 Proof Proposition 12

Consider the exogenous parameters $f(e_{AB})$, λ, δ and Δ.[10] Representatives agree to implement the project when representative's B expected payoff of implementing the project is higher than his expected payoff under the status quo:

$$f(e_{AB}) \geq \frac{\delta}{(1-\lambda)\Delta}$$

Representatives disagree about the convenience of implementing the project when representative's A expected payoff of implementing the project is higher than his expected payoff under the status quo and the opposite is true for representative B:

$$\frac{\delta}{(1+\lambda)\Delta} \leq f(e_{AB}) < \frac{\delta}{(1-\lambda)\Delta}$$

Representatives agree to not implement the project when representative's A expected payoff of implementing the project is lower than his expected payoff under the status quo:

$$f(e_{AB}) < \frac{\delta}{(1+\lambda)\Delta}$$

To prove the second part of the proposition we use propositions 8, 9 and 10. Proposition 8 shows that when the representatives agree to implement the project, unless the representatives fail to coordinate their strategies, the project is implemented if:

$$V(1, AB) \geq R$$

Proposition 9 shows that when the representatives disagree about the policy implementa-

[10] The effort e_{AB} is determined by the exogenous parameters R and β, and the functional forms $C(.)$ and $f(.)$.

tion, the project is implemented if:

$$V(1, AB) \geq V(0, B)$$

Finally, proposition 10 shows that when the representatives agree to not implement the project, unless the representatives fail to coordinate their strategies, the project is never implemented. Since $V(0, B) > R$, the conditions for policy implementation are harder when representatives disagree.

5.4 Proof Proposition 16

Let $\Gamma = \frac{\beta R[f(e_{AB})-(1-z)]}{(1-\beta(1-z))} - C(e_{AB})$. When $\Gamma \geq 0$ representative A has the political power. When $\Gamma < 0$ representative B has the political power. Then,

$$\frac{\partial \Gamma}{\partial z} = \frac{R\beta(1-\beta f(e_{AB}))}{(1-\beta(1-z))^2} > 0$$

An increase in z increases the likelihood if $\Gamma \geq 0$.

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