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ADJUSTMENTS IN DIFFERENT GOVERNMENT SYSTEMS

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This paper develops a model in which agents have a conflict of interest over what instrument to use for policy adjustment in response to shocks. Three different government systems are analyzed: cabinet systems, in which one decision-maker has full control over adjustment policies; consensus systems, in which adjustment policies must be agreed upon by all agents; and checks-and-balances systems, in which one agent decides what instrument should be used for adjustment, but the remaining agents may veto its use. All three systems may lead to inefficient policies. The cabinet system adjusts too often. The other systems may fail to adjust when adjustment is optimal. The relative performance of the three systems depends on the degree of political fragmentation and the size distribution of shocks.

1. INTRODUCTION

THIS PAPER studies how governments in different political and institutional settings react and adjust (or fail to adjust) to a changing environment.

The relationship between political and institutional factors and adjustment policies has been documented in numerous empirical studies. Pioneering work on different patterns of fiscal policy after the 1973 oil shock was done by Roubini and Sachs (1989a, 1989b) and Grilli et al. (1991) for industrialized countries, and Edwards and Tabellini (1991) and Roubini (1991) for developing countries. More recently, the role of institutional differences in stabilizations has been investigated by Alesina et al. (1998). An analysis of divided government and fiscal policy in US history is provided by McCubbins (1991). The empirical relevance of institutions and divided government in fiscal adjustments by state governments in the US is documented by Alt and Lowry (1994) and Poterba (1994). The relevance of institutional and political variables is also at the center of an extensive political-science literature on the politics of economic adjustment.[1]

There seems to be widespread agreement that different institutional and political settings matter for the dynamics of adjustment. However, the analytical literature has not focused on modeling and *comparing* patterns of adjustment policies *in different systems of government*. This paper seeks to take a step in that direction, by developing an analytical framework in which

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[1]Important contributions include Nelson (1990) and Haggard and Kaufman (1992).

different systems of government are defined, and their adjustment policies are derived and compared.

This work builds on a recent but already vast literature on the political economy of stabilizations and reform.[2] In particular, this paper's view of political conflict is related to influential work by Alesina and Drazen (1991) and Drazen and Grilli (1993), who show how some beneficial reforms may be delayed as a result of conflicts of interest between groups with different objectives. Inefficient delays have been studied in other recent contributions to the literature on reform. For example, Velasco (1998) analyzes the inefficiencies (including delays) that arise when several agents with redistributive aims have control over fiscal policy. Fernandez and Rodrik (1991) and Rodrik (1993) have pioneered an alternative approach in which beneficial reforms are not adopted if enough groups are uncertain about their net benefits.[3] An interesting model of inefficient policy inaction in a two-party democracy is provided by Howitt and Wintrobe (1995); in their model, inaction stems from each party's fear of ending up with the other party's policy. Other important studies on the political economy of reform are collected in Sturzenegger and Tommasi (1998).

This study, unlike most previous analyses of adjustments and stabilizations, has a comparative emphasis. That is, the focus of this paper is not only on the positive behavior of specific institutional/political arrangements, but also on the analysis of the *relative* performance of different systems of governments. By developing a framework geared towards comparative analysis, we are able to study how the behavior of different systems and their relative performance depend on key politico-economic variables, such as the number of political agents involved, the extent of their conflict of interest, and the distribution of the shocks to the system.

What do we mean by *different systems of government*? When considering adjustment policies in different government systems, our primary focus is on the way *control* over adjustment policies is allocated across agents with different preferences. Actual government systems vary extensively across countries in that respect, even if we limit our attention to industrialized democracies. In some countries, such as Britain, the electoral and (unwritten) constitutional rules tend to give full control of the legislative and executive branches to the leadership of a single party. In these systems, a government can be elected without the support of an absolute majority of the voters, and tends to have full authority over its policies. Major and possibly controversial decisions can be taken by the premier without the consensus of the opposition. Those characteristics may allow prompt and

[2]A useful introduction to the literature on the political economy of reform is Drazen (1996). See also Alesina and Perotti (1995), Sturzenegger and Tommasi (1998, chapter 1), and Drazen (2000, chapter 10).

[3]A dynamic extension of the Fernandez–Rodrik approach is provided by Laban and Sturzenegger (1994).

drastic adjustments. In fact, Walter Bagehot (1867) stated that the concentration of power in the hands of the cabinet was the "efficient secret" of the British system of government. Other countries (for instance, France during the Fourth Republic, Italy, Belgium, and Israel) have institutional features, such as proportional-representation multi-party systems, constitutional rules, that give veto power to a large number of political agents. In these systems, many policy decisions require a large consensus, or even unanimity. In other countries, such as the United States, separate voting for the legislative and executive branches – together with a complex system of checks and balances – can produce divided government, in which important policy decisions require bipartisan support.[4]

In this paper we follow the strategy of abstracting from institutional details (party systems, electoral systems, executive–legislative relations, role of trade unions, and so on), and focusing on the final allocation of control across groups.[5] In particular, we consider three classes of government systems: "cabinet" systems, "consensus" systems, and "checks-and-balances" systems.

Cabinet systems give full control over policies to one decision-maker. By contrast, in consensus systems control is fully shared across n political agents with different interests. The distinction between cabinet systems and consensus systems is consistent with classifications from the political science literature. For example, it is partly reminiscent of Woodrow Wilson's (1884) comparison of "committee" and "cabinet" governments, and of Arend Lijphart's (1984) two basic models of "majoritarian" and "consensus" governments.[6]

An important variation of the consensus system is a checks-and-balances system that attributes primary control to one agent but gives other political agents the power to constrain the decision-maker. Whereas power is equally distributed in a consensus system, the checks-and-balances system, like the cabinet system, attributes control *asymmetrically*. However, while the cabinet system gives complete decisional power to one agent, the checks-and-

[4]Analyses of divided government include Fiorina (1992) and Alesina and Rosenthal (1995).

[5]In so far as we take a comparative-politics approach to economic policy, this paper is related to recent work by Persson et al. (2000) and Persson and Tabellini (2000). However, our focus is not as much on the legal and constitutional details (electoral rules, etc.) as on the consequences that the final distribution of power across different agents has on the dynamics of stabilizations. When writing any model, one faces a tradeoff between level of institutional detail and generality of insights. Our choice is to provide a model that, while as simple as possible, contains general insights which can be applied to a vast range of different institutional settings. In this sense, our approach is complementary to institutionally detailed analyses of specific political processes and rules.

[6]Real-world government systems are unlikely to be perfectly pure instances of those ideal types, and may share features of one or more systems depending on the specific policies under consideration. For example, decision-making systems are often consensual when major constitutional changes are involved, but may give full power to specific policy-makers over less momentous matters.

balances system gives power to select adjustment policies to one agent, but allows other agents to retain some veto power on those decisions. In many respects, the United States constitution provides a real-world example of a ‘‘checks-and-balances’’ system.

We will ask ourselves questions such as: In what systems of governments would one expect inefficient inaction/delays, and in what systems would adjustment occur ‘‘too often’’? When is ‘‘excessive inaction’’ better or worse than ‘‘excessive action’’ from an efficiency perspective? How does the relative performance of alternative systems depend on the stochastic distribution of the economic shocks? How does it depend on the degree of ‘‘political fragmentation’’ and the level of ‘‘conflict of interests’’ among political agents?

This paper’s main results can be summarized as follows.

The cabinet system provides prompt adjustment when faced with large shocks for which adjustment is optimal. However, when the system is hit by relatively smaller shocks for which adjustment is not optimal, the cabinet system may react with inefficient adjustment, as the policy-maker fails to internalize the adjustment costs borne by the groups which are not part of the cabinet’s constituency.[7] By contrast, consensus systems may fail to adjust when adjustment is optimal. In a ‘‘pure’’ consensus system, in which each group retains veto power over adjustment policies, one may observe either inefficient inaction (when shocks are relatively smaller) or inefficient delayed action (when shocks are relatively larger).

Our analysis relates the efficiency loss of consensus systems and the expected delay in implementing adjustment policies to the *number* of decision-makers with veto power. The larger the number of decision-makers, the larger the efficiency loss associated to inaction and longer delays.[8]

The checks-and-balances systems, while implying inefficient inaction as in ‘‘pure’’ consensus systems, are overall less inefficient, since they avoid inefficient delays when shocks reach very large values. Like ‘‘pure’’ consensus systems, checks-and-balances systems are more inefficient the larger the conflict of interest among agents and the larger the number of decision-makers involved.

In terms of relative performance, we find that checks-and-balances systems dominate pure consensus systems, but may or may not outperform cabinet systems. The relative performance of cabinet systems with respect to checks-and-balances systems and consensus systems crucially depends on the degree of political fragmentation (number of political agents) and on the stochastic distribution of shocks. Ceteris paribus, the cabinet system outperforms the checks-and-balances system if the society is highly fragmented

[7]In that respect, Bagehot was not completely correct: the cabinet system may be inefficient *because* of its concentration of power.

[8]This result is consistent with empirical work that relates delayed stabilizations in coalition governments to the number of parties within the coalition. For example, see Roubini and Sachs (1989a, 1989b), Grilli et al. (1991), and Alesina et al. (1998).

and/or faces relatively higher shocks. On the other hand, a checks-and-balances system (or even a "pure" consensus system) may be less inefficient than a cabinet system at lower degrees of fragmentation or when larger shocks occur with a lower probability.

In the first part of the paper we consider how governments react to once-for-all shocks. In the second part of the paper we extend our analysis to allow for a more general dynamics, in which shocks follow a continuous stochastic process. We then find that adjustment policies in different systems of government are characterized by "inaction bands" of different width. The inaction bands of the cabinet system are "too narrow," while the checks-and-balances system and the pure consensus system follow policies with inaction bands that are "too wide." Interestingly, relatively small levels of political conflict translate in large inaction bands when consensus-based systems are adopted.[9] This result implies that differences in political conflict across societies are amplified in consensus-based systems: small differences in the degree of conflict across societies may be reflected in large policy differences, with slightly more conflictual societies showing much larger ranges of policy inaction. This result may help to explain patterns of adjustment policies in industrialized democracies, and to account for large divergences across relatively similar societies.

A caveat is in order. This paper compares different government systems along *one* dimension: the dynamics of adjustment policies. This analysis is not meant as a general evaluation of the total benefits and costs of different systems of government. The ability (or inability) to respond to shocks and implement efficient adjustment policies is not the only characteristic of a government system. However, it is an important one, and understanding it better may help us to assess different systems of government from a broader perspective. In this respect, this paper can be viewed as a contribution to the more general discussion over different "models of government," as developed in the literature on comparative politics and constitutional design.[10]

The paper is organized as follows. Section 2 presents the basic framework. Section 3 studies adjustment policies in three systems of government ("cabinet," "consensus," and "checks and balances") within the basic framework. Section 4 extends the analysis to a more general dynamic-stochastic setting. Section 5 discusses the robustness and limits of the analysis, possible extensions, and the relationship between the theoretical results and the empirical and historical record. Section 6 concludes.

[9]Formally, we show that fourth-order degrees of conflict are reflected in first-order inaction bands.

[10]The classical reference within the economic literature on constitutional design is Buchanan and Tullock (1962).

2. THE BASIC SETUP

Consider an economy in which n political agents[11] care about some variable $z(t)$.[12] Time is continuous. At each instant t, each agent bears a loss equal to $z^2(t)$.[13] At each time t, the variable $z(t)$ can be set equal to its "optimal value" zero by using any among n possible control instruments. Agents attach different adjustment costs to the use of different instruments. In particular, we assume that the use of instrument i entails an adjustment cost equal to $c+\chi$ for agent i, while all other agents bear a lower cost c (where $c \geq 0$, $\chi \geq 0$, and $i=1, 2, \ldots, n$).[14] Therefore, as long as $\chi > 0$, adjustment entails a conflict of interest among agents: for any possible adjustment, there is always an agent who prefers to use a different instrument. If $\chi = 0$, no conflict exists. The higher is χ, the larger are the stakes in a conflict over instruments. In other words, the parameter χ measures the magnitude of the conflict of interest among agents when a control instrument is chosen. The parameter n (number of political agents) measures how "fragmented" those conflicting interests are. n can be interpreted as the number of organized and homogeneous political groups ("parties") in society. In the rest of this paper we will refer to χ as the degree of (interest) conflict, and to n as the degree of (political) fragmentation.

All agents discount future losses at the rate $\rho > 0$. For each agent i (where $i=1, 2, \ldots, n$), expected utility at time 0 is given by

$$U_i = E_0\left\{-\int_0^\infty z^2(t)e^{-\rho t}dt - \sum_h (c+\chi)e^{-\rho t_h} - \sum_j ce^{-\rho t_j}\right\}, \tag{1}$$

where t_h's are the instants at which instrument i is used, whilst t_j's are the instants at which an instrument different from i is used.

In what follows we will consider a simple dynamics for $z(t)$. We assume that at each time t, $z(t)$ is equal to a non-zero level z (which can be interpreted as the size of a "shock") as long as no instrument is used, and goes to zero as soon as control is exercised. In section 4 we will extend the analysis to a richer dynamic process.

[11]A "political agent" is defined as an organized group of individuals who share the same preferences over adjustment policies. In the rest of this paper we will sometimes refer to those agents as "parties."

[12]$z(t)$ can be interpreted as the deviation of some variable $y(t)$ from its first-best value $y^*(t)$.

[13]The quadratic specification is adopted for notational and analytical convenience and can be easily generalized.

[14]For example, $z^2(t)$ could be the cost associated with some distortionary tax (e.g. an inflation tax). The tax can be eliminated by cutting one among n expenditure programs. Each agent has a "pet program" and would pay additional political and/or economic costs should the program be cut.

2.1 Efficient Adjustment

Suppose that adjustment decisions were taken in order to maximize the sum of utilities $\sum_{i=1}^{n} U_i$ in the economy. Let b denote the average adjustment cost:

$$b \equiv c + \frac{\chi}{n}. \tag{2}$$

Then, adjustment policy should follow a simple "efficiency rule":

Adjust immediately (i.e. at time 0) if

$$\frac{z^2}{\rho} > b, \tag{3}$$

do nothing otherwise.

z^2/ρ is the average present discounted value of inaction costs. The efficient policy dictates that an adjustment should take place only when its average cost is lower than the costs of inaction. When adjustment is the efficient policy, it should be undertaken right away (that is, at time 0). As each instrument has the same average cost, a total-utility-maximizing controller is indifferent with respect to the specific instrument to use.[15]

Suppose that, at time 0, before it is realized, z^2/ρ is expected to be distributed between zero and infinity according to some known c.d.f. $\Psi(z^2/\rho)$ with support $(0, +\infty)$. Then, the efficient system will fetch the following average expected utility:[16]

$$U_{eff} = -\int_0^b \frac{z^2}{\rho} d\Psi - \int_b^\infty b d\Psi = -\int_0^b \frac{z^2}{\rho} d\Psi - [1 - \Psi(b)]b. \tag{4}$$

This efficient policy maximizes the expected "size of the pie," and would be implemented by an impartial social planner who fully internalizes all social costs from inaction and adjustment.

But what adjustment policies will be implemented in less idealistic circumstances, when actual policy choices reflect the resolution of the conflicts of interest among the n agents, as mediated through specific political processes?

[15]If we require that each agent should receive the same expected utility before adjustment, each instrument should be chosen with probability $1/n$.

[16]As usual, the average utility can be interpreted as the expected utility of a political agent "behind a veil of ignorance," i.e. of a political agent who attaches equal probabilities to being any of the n agents. If each instrument is selected with probability $1/n$, the average utility is also identical to each political agent's expected utility (before adjustment) after the "veil of ignorance" has been removed.

In what follows we will consider three different institutional settings:

(a) A "cabinet system," in which one agent is in complete control of adjustment policies.
(b) A pure "consensus system," in which adjustment policies must be agreed upon by all agents.
(c) A "checks-and-balances system," a variant of the consensus system, in which one agent selects adjustment instruments, but the other agents can veto their use.

3. ADJUSTMENTS IN DIFFERENT GOVERNMENT SYSTEMS

3.1 The Cabinet System

Consider a system in which one of the n agents has full control over adjustment policies. In this case we will observe immediate adjustment if

$$\frac{z^2}{\rho} > c, \tag{5}$$

no adjustment otherwise.

When compared with the efficient rule, this system adjusts *too often*. The cabinet system adjusts efficiently when faced with "larger" shocks $[(z^2/\rho) > b]$, but produces inefficient policies when faced with "smaller" shocks $[c < (z^2/\rho) < b]$. That is, when $c < (z^2/\rho) < b$, the agent in control will adjust although adjustment has a *negative* social value.

We can now calculate the "efficiency loss" associated with the cabinet system. For a given c.d.f. $\Psi(z^2/\rho)$, the cabinet system provides the following average expected utility U_{cab}:

$$U_{cab} = -\int_0^c \frac{z^2}{\rho} d\Psi - \int_c^\infty b d\Psi = -\int_0^c \frac{z^2}{\rho} d\Psi - [1 - \Psi(c)]b. \tag{6}$$

The efficiency loss associated with the cabinet system (which we will denote with L_{cab}) is due to *inefficient adjustment* when the inaction costs lie between c and b. In fact:

$$L_{cab} = U_{eff} - U_{cab} = \int_c^b \left(b - \frac{z^2}{\rho}\right) d\Psi > 0. \tag{7}$$

A simple close-form solution for the efficiency loss can be derived by assuming that the distribution of z^2/ρ is uniform between c and b. Let π be defined as $\pi \equiv \Psi(b) - \Psi(c)$. That is, π is the probability of observing a shock to which the cabinet system responds inefficiently. Then we have

$$L_{cab} = \frac{\chi\pi}{2n}. \tag{8}$$

It is interesting to note that the efficiency loss associated with the cabinet system is increasing in "conflict" (χ) and decreasing in "fragmentation" (n).

3.2 *The Consensus System*

Now, consider a system in which, at each instant, only instruments that are agreed upon by all agents can be used for adjustment. In particular, each agent i has veto power over the use of instrument i. For brevity's sake, we will say that agent i "concedes" when she authorizes the use of instrument i.

To be more specific, consider the following game. At each instant t, each agent's action space is given by all subsets of $\{1, 2, 3,\ldots, n\}$, including the empty set. By choosing a specific subset at time t – say, $\{2, 3, 5\}$ – agent i authorizes the use of instruments 2, 3, and 5 for adjustment at time t. At each instant t, only those instruments that are authorized by all n agents can be used. When all agents agree on more than one instrument, one of the authorized instruments is chosen randomly. When no instrument is authorized by all agents, no adjustment takes place.

Four cases must be considered:

Case 1: $\dfrac{z^2}{\rho} \leq c.$

In this case, no agent would ever benefit from adjustment. The only equilibrium outcome is no adjustment ever. The outcome is the same as in the efficient system.

Case 2: $c < \dfrac{z^2}{\rho} < b.$

In this case each agent i would benefit from an adjustment in which an instrument *different from i* is used. However, no agent will ever concede, even if she expects that all other agents concede.[17] Again, no adjustment will ever take place, as in the efficient system.

Case 3: $b < \dfrac{z^2}{\rho} < c + \chi.$

In this case, no agent will benefit by conceding alone. However, each agent prefers concession by all agents to no adjustment. However, concession by any $m \leq n$ agents is not a Nash equilibrium. As in a Prisoners' Dilemma, any agent who expects that other $m-1$ agents will concede is better off by *not*

[17]When $m \leq n$ instruments are authorized, the expected loss for each agent who has "conceded" is

$$c + \frac{\chi}{m} \geq c + \frac{\chi}{n} > \frac{z^2}{\rho}.$$

conceding. As a result, no adjustment will be observed in equilibrium. In this case, the consensus system delivers inefficient inaction.

Case 4: $\frac{z^2}{\rho} > c + \chi$.

Now, adjustment is in everybody's best interest, no matter what instrument is used. However, one may not observe immediate adjustment in equilibrium. In fact, it is immediate to show that the only symmetric equilibrium is a war of attrition, in which, at time t, each agent "concedes" with some probability smaller than one. More precisely, in equilibrium each agent concedes by time t or before with probability $G(t)$, and does not concede by time t or before with probability $1-G(t)$.[18]

The equilibrium $G(t)$ can be derived as follows. Let $H(t)$ denote the probability that at least one out of $n-1$ agents concedes before time t. Then

$$H(t) = 1 - [1 - G(t)]^{n-1}. \tag{9}$$

Let $Q(t)$ denote the concession hazard rate; that is, the conditional probability that at least one out of $n-1$ agents concedes in the infinitesimal interval $(t, t+dt)$, given that nobody has conceded by instant t. By definition

$$Q(t) = \frac{dH(t)}{1 - H(t)}. \tag{10}$$

In equilibrium, at each time t each agent will be indifferent between conceding (and paying a cost $c+\chi$) and waiting until time $t+dt$. Therefore, in equilibrium we have

$$c + \chi = z^2 dt + (Qdt)c + (1 - Qdt - \rho dt)(c + \chi), \tag{11}$$

where the right-hand side is the costs associated with waiting to concede until time $t+dt$.

By solving the above equation for $Q(t)$ we obtain

$$Q(t) = \frac{z^2 - \rho(c + \chi)}{\chi} \equiv \theta, \tag{12}$$

[18]The selection of the unique symmetric equilibrium for war-of-attrition games is standard in the literature (for instance, see Tirole, 1988, pp. 311–314, and Fudenberg and Tirole, 1991, pp. 119–126). A convincing justification for mixed-strategy equilibria as a reasonable and realistic solution concept for games of this nature has been provided by Harsanyi's (1973) "purification argument." That is, our mixed-strategy equilibrium can be interpreted as the limit of *pure-strategy* equilibria of "slightly perturbed" games of incomplete information (see Fudenberg and Tirole, 1991, pp. 230–234). If we adopt Harsanyi's interpretation, the intuition for the delay in our equilibrium is substantially the same as in imperfect-information specifications (e.g. Alesina and Drazen, 1991): in the presence of uncertainty about the other agents' types/actions, decision-makers may find it optimal to "wait-and-see." Introducing imperfect information explicitly in our model would complicate the algebra considerably but would not change the results.

which implies

$$G(t) = 1 - e^{-\frac{\theta t}{n-1}}. \tag{13}$$

As each agent plays the above equilibrium strategy, we can calculate the probability of an adjustment having taken place by time t or before as

$$S(t) = 1 - [1 - G(t)]^n = 1 - e^{-\frac{n\theta t}{n-1}}. \tag{14}$$

If either $n = 1$ (no fragmentation) or $\chi = 0$ (no conflict), we have immediate adjustment, that is, $S(t) = 1$ for every t.

More importantly, we have that:

The probability of an adjustment is decreasing in c, χ, and ρ and increasing in z.

An especially interesting result is the relationship between adjustment probability and fragmentation:

The probability of an adjustment is decreasing in the number of decision-makers n.

That is, a larger number of political agents are less likely to implement adjustment by time t or before. This result is consistent with the evidence that, ceteris paribus, a larger number of decision-makers with conflicting interests will tend to generate longer delays when adjustments are required.[19]

While the timing of an adjustment is random, one can calculate the average time that elapses from time 0 to the time T in which adjustment is finally implemented:

$$E[T] = \int_0^\infty t dS(t) = \frac{n-1}{\theta n}. \tag{15}$$

Therefore, we find that, when each of n political agents has veto power over adjustment policies,

The expected delay in implementing an efficient adjustment is increasing in the number of political agents n.[20]

While the cabinet system tends to adjust too much and too often, *the consensus system adjusts too little and too late*. Formally, given the c.d.f.

[19]For example, Roubini and Sachs (1989a, 1989b), Grilli et al. (1991), and Alesina et al. (1998).

[20]This comparative-statics result is derived considering c as independent of n. If we assume that the average adjustment cost $b = c + (\chi/n)$ is constant across different n's, c itself becomes an increasing function of n, and the relationship between expected delay and n becomes *stronger*.

$\Psi(z^2/\rho)$, we can calculate the average expected utility U_{con}:

$$U_{con} = -\int_0^{c+\chi} \frac{z^2}{\rho} d\Psi - \int_{c+\chi}^{\infty} (c+\chi) d\Psi$$
$$= -\int_0^{c+\chi} \frac{z^2}{\rho} d\Psi - [1 - \Psi(c+\chi)](c+\chi). \quad (16)$$

It is interesting to note that the consensus system provides the utility that an efficient system would provide if the average adjustment cost were $c+\chi$ instead of $b < c+\chi$.

The efficiency loss is

$$L_{con} = U_{eff} - U_{con} = \int_b^{c+\chi} \left[\frac{z^2}{\rho} - b\right] d\Psi + \int_{c+\chi}^{\infty} [c+\chi-b] d\Psi. \quad (17)$$

The first term of the efficiency loss is due to inefficient gridlock when the inaction costs z^2/ρ lie between b and $c+\chi$. In that range, as we have seen, no adjustment takes place since all agents block adjustments in an n-player Prisoners' Dilemma. The second term captures the efficiency loss due to the delayed adjustment when $(z^2/\rho) > c+\chi$, and agents engage in an n-player war of attrition.

Is it possible to eliminate those inefficiencies through a different allocation of control across agents? The analysis of the following subsection suggests a partially positive answer. In what follows we will consider a variation of the consensus system (the "checks-and-balances" system) which eliminates the second source of inefficiency (delays) but not the first source (gridlocks).

3.3 The Checks-and-Balances System

Consider a system in which, at time 0, each agent has a chance $1/n$ of becoming a "leader." The leader chooses what instrument can be used for adjustment, but the other agents retain the right to veto its use at each point in time.[21]

Clearly, the leader will choose one among the $n-1$ instruments that have cost c to herself. The use of any instrument will be vetoed by at least one agent as long as $(z^2/\rho) < c+\chi$. Therefore, as long as $(z^2/\rho) < c+\chi$, the checks-and-balances system behaves as the pure consensus system. However, things differ for $(z^2/\rho) > c+\chi$. In this case, once the leader has chosen an instrument (say, instrument i), agent i will concede in equilibrium. The key difference with respect to the consensus system is that, by attributing

[21] In real-world checks-and-balances systems, such as the US system, the "leader" may be the President for some policy variables, and the group in control of Congress (say, the "Speaker") for some other variables.

primary control over instruments to a "leader," the checks-and-balance system eliminates the incentives to "wait-and-see."[22]

Since it eliminates inefficient delays, the checks-and-balances system dominates the pure consensus system: ex ante, it provides higher expected utility to each agent for values of $(z^2/\rho) > c + \chi$. However, this system is not efficient, as it fails to adjust when the inaction costs lie between b and $c + \chi$. That is, the checks-and-balances system behaves efficiently when faced with "smaller" shocks $[(z^2/\rho) < b]$, but may produce inefficient policies when faced with "larger" shocks $[b < (z^2/\rho) < c + \chi]$. However, like the cabinet system but unlike the pure consensus system, the checks-and-balances system does respond efficiently to "very large" shocks $[(z^2/\rho) > c + \chi]$.

Formally, for any c.d.f. $\Psi(z^2/\rho)$, the checks-and-balances system provides the following average expected utility U_{che}:

$$U_{che} = -\int_0^{c+\chi} \frac{z^2}{\rho} d\Psi - \int_{c+\chi}^{\infty} b d\Psi$$
$$= -\int_0^{c+\chi} \frac{z^2}{\rho} d\Psi - [1 - \Psi(c+\chi)]b. \tag{18}$$

The efficiency loss is given by

$$L_{che} = U_{eff} - U_{che} = \int_b^{c+\chi} \left(b - \frac{z^2}{\rho}\right) d\Psi > 0. \tag{19}$$

For example, suppose that the distribution of z^2/ρ is uniform between b and $c + \chi$, and π' is defined as $\pi' = \Psi(c+\chi) - \Psi(b)$, i.e. π' is the probability of observing a shock to which the checks-and-balances system responds inefficiently. Then, we have that

$$L_{che} = \frac{\chi(n-1)\pi'}{2n}. \tag{20}$$

It is interesting to note that the efficiency loss associated with this system is increasing in n. An increase in political fragmentation is associated with a larger social cost per capita from political gridlocks.

The results for the four different systems are illustrated in Figure 1.

3.4 *Relative Performance*

Each of the three systems we analyzed is suboptimal. Then a key question is: What system is *less* inefficient? In other words, how do the three systems differ in their relative performance as far as adjustment policies are concerned?

As we have seen, the checks-and-balances system is always less inefficient than the pure consensus system. However, it may or may not be less

[22] In our analysis we are assuming that the leader's choice is credible and final. Formally, we assume that the leader's action space is given by $\{1, 2, \ldots, i, \ldots, n\}$ (no "renegotiation" over the choice of instruments). That is, the leader makes a credible "take-or-leave" offer to the other agents. The model can be generalized to allow for "imperfect commitment" to a proposed plan; that is, for the possibility that, faced with opposition, the leader may change her adjustment plan. The analysis for this case is available upon request.

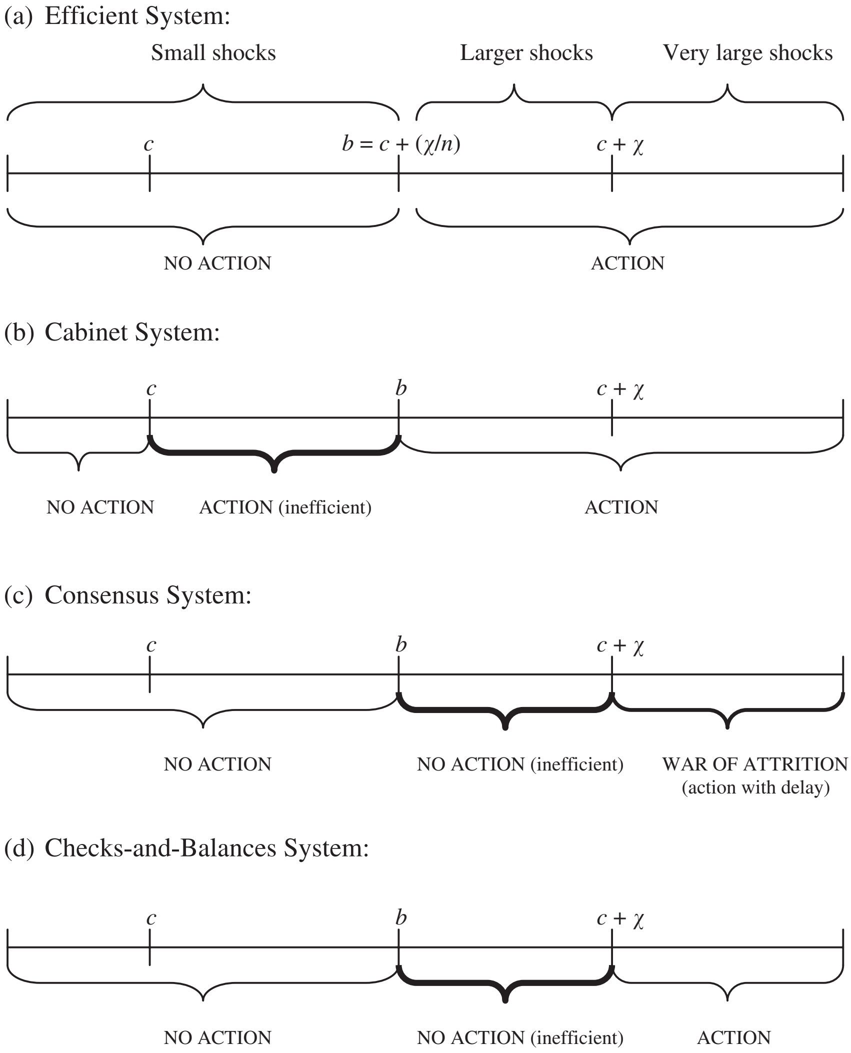

Figure 1.

inefficient than the cabinet system. The relative performance of the two systems can be measured as follows:

$$\begin{aligned} R &= U_{che} - U_{cab} = L_{cab} - L_{che} \\ &= \int_c^b \left(b - \frac{z^2}{\rho} \right) d\Psi - \int_b^{c+\chi} \left(b - \frac{z^2}{\rho} \right) d\Psi. \end{aligned} \tag{21}$$

It is important to notice that R *is decreasing in* n,[23] which means that

All other things equal, the larger is the number of political agents (i.e. the larger is the degree of political fragmentation), the more inefficient is the checks-and-balances system with respect to the cabinet system.

That is, as the number of agents with conflicting interests increases, we see a deterioration of the relative performance of the checks-and-balances system with respect to the cabinet system. If systems are chosen in order to maximize average utility, the cabinet system will be preferred at higher values of n, while the checks-and-balances system may be preferred at lower values of n.

It is immediate to verify that the "pure consensus system" may also be preferred to the cabinet system at lower values of n.[24] Moreover, since the consensus system is more inefficient than the checks-and-balances system, there may exist a range of values of n in which the cabinet system is preferred to the "pure" consensus system but is inferior to the checks and balances system.

A closed-form solution of the relative performance can be obtained as follows. Assume that the distribution of z^2/ρ is uniform between c and b, with π defined as $\pi \equiv \Psi(b) - \Psi(c)$, and that the distribution of z^2/ρ is also uniform between b and $c+\chi$, with $\pi' = \Psi(c+\chi) - \Psi(b)$. That is, π is the probability the inaction costs z^2/ρ falling in the "inefficient area" of the cabinet system, and π' is the probability of the inaction costs z^2/ρ falling in the "inefficient area" of the checks-and-balances system. Then we have that

$$R = \frac{\chi}{2n}[\pi - (n-1)\pi'], \tag{22}$$

which implies that the efficiency loss associated with the checks-and-balances system is smaller than the efficiency loss associated with the cabinet system

[23]The result can be derived as follows. By definition $b(n) \equiv c + (\chi/n)$ is decreasing in n, which implies that the integral

$$\int_{c}^{b(n)} \left(b(n) - \frac{z^2}{\rho}\right) d\Psi$$

is decreasing in n, while the integral

$$\int_{b(n)}^{c+\chi} \left(b(n) - \frac{z^2}{\rho}\right) d\Psi$$

is increasing in n. Hence, R is decreasing in n.

[24]The efficiency loss associated with the consensus system is equal to the efficiency loss of the checks-and-balances system plus the term $\int_{c+\chi}^{\infty}[c + \chi - b(n)]d\Psi$, which is *increasing* in n. This also means that the consensus system becomes increasingly worse than the checks-and-balances system at higher levels of political fragmentation.

as long as

$$n < \frac{\pi + \pi'}{\pi'}, \tag{23}$$

that is, as long as the degree of fragmentation n is below a critical value given by $(\pi + \pi')/\pi'$. The critical value is increasing in the probability that the inaction costs will fall in the cabinet system's "inefficient area," and decreasing in the probability that they will fall in the "inefficient area" of the checks-and-balances system.[25] Therefore, the higher is the likelihood of facing "larger" shocks rather than "smaller" shocks, the lower is the critical level of fragmentation at which the cabinet system becomes "better" than the checks-and-balances system. In summary, the cabinet system is better than the checks-and-balances system (a) when fragmentation is high, and (b) when the probability of observing "larger" rather than "smaller" shocks is high.

4. DYNAMIC CONTROL

In the previous section we have examined alternative systems under the simplifying assumption that $z(t)$ is constant over time at either z (before the adjustment) or 0 (after the adjustment). In this section we will study alternative systems under the more general assumption that $z(t)$ follows a random process. By pursuing this extension, we can assess the robustness of the results we obtained within our simplified setting, and we can obtain additional insights on the dynamics of adjustment policies in different government systems.

Following a large literature on control in a stochastic environment, we will assume that, in the absence of control, $z(t)$ follows a driftless Brownian motion with unit variance σ^2:

$$dz = \sigma dW, \tag{24}$$

where dW is a standard Wiener process.[26]

4.1 The Efficient Solution

By definition, the efficient solution maximizes the average utility, which is given by

$$\frac{1}{n}\sum_{i=1}^{n} U_i = -\int_0^{\infty} z^2(t)e^{-\rho t}dt - \sum_k \left(c + \frac{\chi}{n}\right)e^{-\rho t_k}, \tag{25}$$

where t_k's denote the instants at which an adjustment has taken place.

[25]In fact, the critical value can be interpreted as the inverse of the conditional probability of observing inaction costs in the checks-and-balances inefficient area rather than in the cabinet system inefficient area, provided that they fall in one of the two areas.

[26]For a definition of these concepts see Harrison (1985) and Karatzas and Shreve (1988).

This problem is equivalent to the well-known problem of minimizing a quadratic cost function using one control instrument with fixed cost $b \equiv c + (\chi/n)$. It can be shown that the optimal policy is characterized by an inaction band $(z_b,\ Z_b)$, where z_b and Z_b are, respectively, the lower and upper barriers.[27] No control is exercised as long as $z(t)$ stays inside the inaction band. Adjustment takes place any time either barrier is reached. Because of symmetry, we have $z_b = -Z_b$. An explicit approximate solution for the inaction band is given by[28]

$$Z_b = -z_b \simeq (6\sigma^2 b)^{\frac{1}{4}}. \tag{26}$$

An example of efficient dynamics is given in Figure 2a.

5. THE CABINET SYSTEM

If a single agent can exercise unrestrained control over the adjustment instruments, she will act like a controller who uses one instrument with fixed adjustment cost c. The inaction bands will be narrower than the efficient bands:

$$Z_c = -z_c \simeq (6\sigma^2 c)^{\frac{1}{4}} < Z_b. \tag{27}$$

An example of cabinet dynamics is illustrated in Figure 2b.

5.1 The Consensus System

In analogy with the previous analysis, we can characterize the behavior of the consensus system as follows:

Let

$$Z_{c+\chi} = -z_{c+\chi} \simeq [6\sigma^2(c+\chi)]^{\frac{1}{4}} \tag{28}$$

be the inaction bands that would be used by a single controller facing an adjustment cost equal to $c+\chi$. Define a (Markov)[29] symmetric "consensus equilibrium" as follows:

(a) Each agent will not concede as long as $z_{c+\chi} < z(t) < Z_{c+\chi}$.
(b) When $z(t)$ goes outside the inaction band, each agent will follow a mixed strategy. As long as $z(t)$ remains outside the band, each agent is indifferent between conceding at time t or waiting until time $t + dt$.

[27]For a formal proof see Harrison et al. (1983).
[28]For a formal derivation, see the Appendix.
[29]A natural extension is to consider history-dependent equilibria in which some form of "cooperation" may emerge. We leave such analysis for future research.

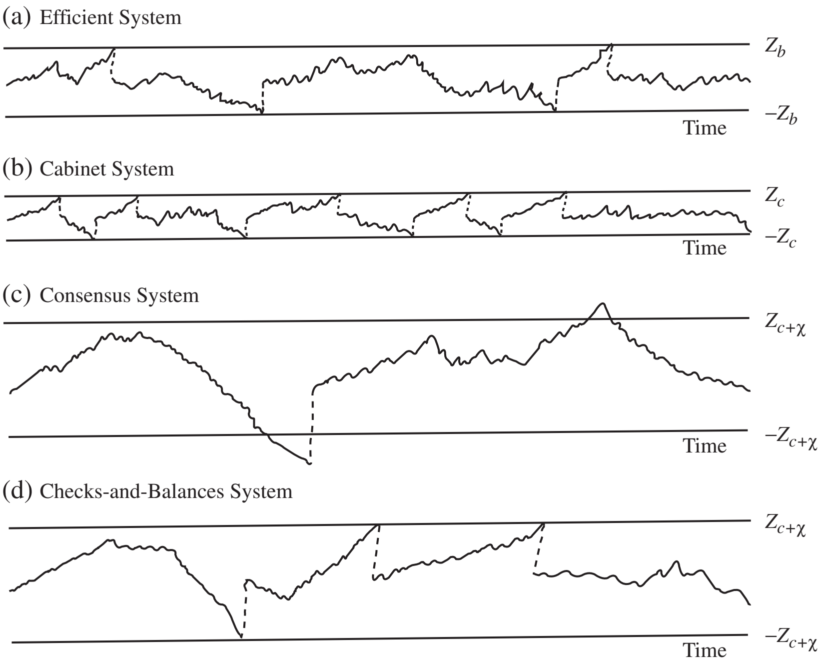

Figure 2.

As each agent is indifferent between conceding and not conceding when $z(t)$ hits either barrier, each agent's expected loss in equilibrium is equal to the expected loss of a single controller who uses a control instrument with fixed adjustment cost equal to $c + \chi$. The concession hazard rate outside the inaction band is given by

$$Q(z(t)) = \frac{z^2(t) - \rho[(c + \chi) - V_{c+\chi}]}{\chi}, \tag{29}$$

where $V_{c+\chi}$is the expected utility [evaluated when $z(t) = 0$] associated with the optimal policy *when adjustment costs are equal to* $c + \chi$.

It is worth noting that the concession hazard rate is *lower* than in the case of constant inaction costs studied in the previous section. When $z(t)$ follows a Brownian motion, because of the option value of waiting, the cost of conceding is *higher* for each agent.

An example of consensus dynamics is illustrated in Figure 2c.

5.2 *The Checks-and-Balances System*

Unlike in the pure consensus system, in the checks-and-balances system control will take place as soon as z_t leaves the inaction band $(z_{c+\chi},\ Z_{c+\chi})$. An example of checks-and-balances dynamics is given in Figure 2d.

Like the consensus system, the checks-and-balances system has inaction bands that are too large. However, unlike the consensus system, the checks-and-balances system adjusts without inefficient delays when those bands are hit.

Both the consensus system and the checks-and-balances system fail to adjust as soon as adjustment becomes the efficient policy. Therefore, ex ante the two systems lead to inefficient adjustment policies.

It is worth noting that the variable $z(t)$, when left untouched, may return within the efficient inaction band by itself. Hence, in some circumstances, consensus systems and checks-and-balances systems may end up with policies associated with higher average utility than in the cabinet system or even in the efficient system. However, the possibility of those "lucky" occurrences does not invalidate the ex-ante inefficiency of the consensus-based systems.

Another interesting aspect of the analysis relates to the "width" of the inaction band. As $Z_{c+\chi} = -z_{c+\chi} \simeq [6\sigma^2(c+\chi)]^{1/4}$, we have that a *fourth-order* difference in the degree of political conflict within the system implies a *first-order* difference in the inaction bands. This means that even a relatively small degree of political conflict among decision-makers may lead to extensive inaction. This result suggests that, when societies adopt "consensus-based" systems of governments, their adjustment policies may diverge dramatically because of relatively small differences in their "political fundamentals." By contrast, cabinet systems will tend to "bury" those political differences and react similarly, as long as they face the same stochastic environment.

6. DISCUSSION

6.1 Alternative Specifications and Extensions

The paper has presented three relatively simple models to capture general properties of different distributions of power across heterogeneous agents. However, the three systems do not exhaust all logical possibilities and are not meant to provide a complete characterization of all feasible decision-making systems. On the contrary, by changing the agreement protocols and other aspects of the systems' specifications it is possible to obtain variations of the systems that can produce different policy responses. An interesting question then is: How robust are the general insights of our analysis to modifications in the specifications of the framework?

In order to address this question, it is useful to view the three systems as lying along a conceptual continuum, with the degree of "asymmetry" in the distribution of "effective power" as the relevant dimension. By "effective power" we mean an agent's actual ability to influence the choice of policies. In the consensus system, such ability is always perfectly symmetric: at each point in time, each agent has the same power as anybody else. In the cabinet system, by contrast, power is highly asymmetric once the decision-maker has been selected.[30] In the checks-and-balances system, power is less asymmetric than in the cabinet system, since the non-selected agents retain some veto power, but the selected leader (the "president"), by being able to move first and select what policy to propose, has more "effective power" than the other agents. Once we consider the different systems from this perspective (degree of asymmetry in effective assignment of decisional power), we can appreciate that there exist many alternative ways in which systems can be "asymmetric." Paraphrasing Tolstoy's celebrated opening of *Anna Karenina*, each asymmetric system is "asymmetric its own way." More precisely, the degree and characteristics of "power asymmetry" depend on the specific protocols of agreement. This is especially important for the checks-and-balances system, in which the asymmetric power of the president hinges on the details of the extensive game, and especially on the president's ability to credibly commit to his or her policy proposal. For example, if the model were modified in ways that reduce the commitment ability of the president, the system would become more similar to the consensus system. Specifically, inefficient delays analogous to the ones that take place in the consensus system could arise if the bargaining power of the president were reduced by allowing a multi-stage process, in which rejection of the original presidential choice could be followed by new rounds of proposals rather than inaction. In this sense, we could think of a "more consensual" checks-and-balances system, with efficiency properties that would be closer to the pure consensus system. On the other hand, we could modify the decisional mechanisms in order to increase the power of the president and further reduce the power of the other agents. For instance, we could strengthen the president's power by allowing him/her to override the other agents' opposition in some circumstances.[31] Of course, this would move the checks-and-balances system closer to the "cabinet" system. In such perspective, "the" checks-and-balances system studied in this paper should really be viewed as "a" checks-and-balances system; that is, as a representative example of a more general class of systems, in which power is neither fully symmetric nor fully asymmetric. Hence, alternative specifications of a system of checks-and-balances could produce quantitatively different behavior for some range of the parameter. However, as long as both the "leader" and the other agents retain some effective power, and a significant asymmetry is maintained in the model, one should expect the general *comparative* results to be robust in a qualitative sense: the introduction of asymmetric checks and balances would reduce the

[30]Our framework abstracts from the complexities of the process of decision-maker selection. We will return to this issue below.

[31]More generally, following the growing game-theoretical literature on constitutional design, we could specify more complex extensive forms in which the "president" and different members of "congress" (plus possibly other agents, such as the judiciary) play a multi-stage, sequential game with a large range of possible actions. However, this would be well beyond the scope of this paper, whose aim is to provide the simplest possible characterization of alternative systems of government.

range and extent of inefficient action or delays when compared to a pure consensus system, while it would be associated with more inaction when compared with pure ''cabinet'' systems.

Agreement protocols are probably the most important aspects of our framework that, if modified, could lead to significant variations in the behavior of our different systems. But they are not the only aspects. For instance, as we have already mentioned, our analysis abstracts from the complexities of the process of ''leader selection.'' We assume a relatively efficient and rapid ''lottery'' through which the ''president'' or ''prime minister'' is selected. This is certainly a simplification. In the real world, selecting a decision-maker is often a complex process. In some circumstances, the selection of a decision-maker may involve complex bargaining across heterogeneous agents or lengthy legal procedures. Hence, in principle, a ''checks-and-balances system'' or even a ''cabinet system'' in which the decision-maker is chosen with lengthy delays could end up behaving more similarly to the consensual system. This said, one should also notice that in most real-world systems delays in the selection of a government tend to be of a much smaller order of magnitude when compared to delays in the choice of policies.[32] Hence it seems reasonable to abstract from such complications, at least as a first approximation. One can also notice that in practice delays in the formation of governments tend to be observed more often in ''consensus-like'' systems with vast and heterogeneous coalitions, rather than in ''checks-and-balances'' systems with an independently selected executive or in Westminster-type cabinet systems.[33] Nonetheless, the issue of decision-maker selection is certainly an important one, and could be profitably addressed in future extensions of our framework.

Closely related to the issue of decision-maker selection is the issue of the relationship between our systems and electoral rules. In our model we abstract from issues of representation. In particular, we take asymmetries in power distribution within each system as given, and do not explore how such asymmetries might reflect alternative electoral mechanisms. But electoral rules (for example, first-past-the-post versus proportional representation) and other specifications of the electoral game, together with other institutional details, are likely to play a crucial role in determining whether real-world systems of government can be characterized as ''consensual,'' ''checks-and-balances,'' or ''cabinet-like.'' A fully fledged exploration of the

[32]However, some extreme cases might represent an exception to the rule. For instance, the longest gap between governments in post-1945 Italy was 126 days and led to the formation of a coalition government (''the fifth Andreotti'') which lasted only 11 days (from April 20 to April 30, 1979).

[33]In so far as delays in decision-maker formation are more likely in ''consensus systems'' than in checks-and-balances or cabinet systems, their existence would reinforce rather than contradict our results. For interesting analyses of the dynamics of government formation, see Merlo (1997) and Diermeier and Merlo (2004).

links between our analysis and different electoral systems is another important area that we leave for further research.

In summary, this discussion points to the following three conclusions. (1) The specific behavior of each system – and especially of the checks-and-balances system – does depend on the details of the simple games with which we have captured the decision-making process. In particular, changes in the agreement protocols could bring about quantitatively different outcomes. (2) However, the general insights about the *relative* behavior and performance of the three systems can be viewed as "robust" to changes in various aspects of the specification, in so far as those changes do not reverse the relative ranking of the three systems along a critical dimension, i.e. the degree of "asymmetry" in the distribution of effective power among heterogeneous agents. (3) Finally, the model could be usefully extended along numerous directions, including a less stylized specification of the process of leader selection and, more generally, of the relationship between systems of government and alternative electoral and institutional mechanisms of indirect representation.

6.2 Empirical Implications

How do our highly stylized and simplified characterizations of different systems of government relate to real-world institutions? And is the existing historical record consistent with the predictions of our model? While an empirical investigation of adjustment policies in alternative systems of government is beyond the scope of this paper, a brief discussion of the relationship between our theoretical analysis and the empirical record is in order.

In order to link our analysis to actual systems of government we must consider four important issues: (1) the "continuum" nature of asymmetries in the distribution of effective power; (2) the multidimensionality of relevant parameters; (3) the gaps between "formal" constitutions and "material" constitutions; and (4) the instrument-specific nature of different systems of government in actual institutional settings.

(1) As discussed in the previous subsection, our three systems of government should be viewed as simplified examples of institutions that lie along a continuum, from more consensual systems to more "cabinet-like" systems, depending on the degree of asymmetry in the distribution of power among heterogeneous agents. In the real world one should not expect to observe three discrete groups. On the contrary, each actual system should be ranked along a consensus-cabinet continuum depending on the degree of asymmetry in the distribution of effective power. That said, it may nonetheless be useful to view different real-world systems as examples, up to a first approximation, of one or the other of our three ideal systems. For instance, "continental" parliamentary systems with proportional representation and extensive veto

power given to each party in multi-party coalitions and even opposition parties are pretty close to the consensus model. As mentioned in the introduction, typical examples would include the Belgian system, the French Fourth Republic, and the Italian (so-called) First Republic. By contrast, the British system and other examples of the Westminster system outside Britain (e.g. New Zealand before a recent reform) are good examples of cabinet systems in a democratic setting. The US system is a prime example of the checks-and-balances system.

(2) Even if one were to abstract from the complexities of asymmetric distributions of power and classify real-world systems as examples of our "ideal" types, one would still face a second, conceptual issue: while our theoretical predictions are based on a simplified, one-dimensional characterization of important parameters such as fragmentation and polarization, the real-world analogues tend to be multidimensional. How many heterogeneous groups have veto power over policies in a consensual system? Can different societies be ranked in terms of the degree of conflict of interest among those heterogeneous groups? In some circumstances one can find useful although imperfect proxies in measurable variables, such as the "number of parties" in a given coalition. But those measures should be taken with a grain of salt, since there may be a substantial gap between those measured variables and the "correct" parameters.

(3) Our analysis abstracts from issues of fine constitutional design and focuses on the "effective" distribution of power. However, in most cases it is easier to measure formal constitutions than "material" constitutions. In some settings some agents (e.g. trade unions, organized interest groups) may have extensive although informal veto power over stabilization policies.

(4) Finally, as already mentioned in our analysis, there is no reason to believe that each society would use the same system of government for all decisions. Some systems of government may have consensual characteristics over, say, constitutional reform but give all power to a homogeneous agent over some other decisions. In other words, societies may give policy-makers "consensual" control over some "adjustment instruments" but cabinet-like control over some other instruments. In that respect, the nature of the appropriate system to associate with a given society may be "instrument-specific," i.e. it may depend on the specific adjustment problem at hand.

With the above caveats in mind, we are ready to discuss the connections between our analysis and some important empirical studies on the political economy of adjustments. For example, in a pioneering work Roubini and Sachs (1989a) found that delays in fiscal adjustments following the 1973 oil shock were positively related to a political variable defined as 0 for one-party majority parliamentary government, or presidential government with the same party in the majority in the executive and legislative branch; 1 for coalition parliamentary government with two coalition partners, or presidential government with different parties in control of the executive and legislative branch; 2 for coalition parliamentary governments with three or more coalition partners; and 3 for minority parliamentary government. All other things equal, annual budget deficits were 1.5 percentage points higher in the case of a minority government than under a majority government. This evidence is consistent with an interpretation of our framework in which the political variable captures the degree of asymmetry in the distribution of power. In particular, the value of the dummy at 0 is close to our characterization of a "cabinet-type" government, while higher values of the dummy variable are associated with increasing fragmentation and dispersion of political power.

The importance of the degree of asymmetry and fragmentation in the distribution of political power, along lines that are consistent with our framework, is also documented in Grilli et al. (1991) for industrialized countries, and Edwards and Tabellini (1991) and Roubini (1991) for developing countries. More recently, the role of institutional differences in stabilizations has been investigated by Alesina et al. (1998). In particular, their study points to a relationship between large coalitions and delays in stabilizations, as our model predicts.

A key test of our theory stems from different dynamic patterns of alternative institutional settings. In particular, the characterization of adjustment policies in different systems in terms of "inaction bands" of different width may shed some light on the patterns of adjustment in industrialized countries over different decades. Interestingly from our perspective, Roubini and Sachs (1989a, 1989b) found no detectable difference in the behavior of governments with different political and institutional characteristics in the 1960s, when shocks were relatively small, but found substantial differences in the 1970s and 1980s, when shocks were much larger. Those differences are consistent with the institutional aspects we stress in our analysis ("cabinet system" adjusting more promptly, presidential systems with divided government adjusting less promptly, and coalition governments with a larger number of parties adjusting with even longer delays or not adjusting at all).

More generally, our analysis suggests that differences in the degree of political conflict across different coalition governments and minority governments may go a long way in explaining substantial differences in the patterns of adjustment. In particular, our analysis may provide insights that could be used to extend important work on the empirics of "crises" and stabilizations (Bruno and Easterly, 1996; Drazen and Easterly, 2001; see also Drazen, 2000, chapter 10). Our model suggests that the effect of crises on adjustment policies should be contingent on the institutional and political setting. Specifically, crises should have a major effect on stabilizations for consensus systems with high fragmentation and polarization, but would matter less when adjustments take place through less consensual mechanisms.

While our analysis has been motivated mainly by cross-country evidence, our framework may also shed some light on regional variations in adjustment policies within federal countries. For instance, the empirical relevance of institutions and "divided government" in fiscal adjustments by state governments in the US is documented by Alt and Lowry (1994) and Poterba (1994). For instance, Poterba (1994) finds that single-party states are more likely to respond to expenditure shocks by changing taxes, and concludes that reaction to state deficits tends to be much faster in unified-government states than in divided-government states, which seems consistent with our analysis of the "cabinet" system versus the "checks-and-balances" system.

Finally, if we interpret the US system of government as a real-world example of the checks-and-balances system, our model can also shed some light on the nature and limitations of the American presidency. It is a common observation among historians and political scientists that a necessary condition for a "great" American presidency is the existence of a crisis situation to which the President is able to react promptly and effectively. By contrast, in periods of relative tranquillity, such as the Gilded Age at the end of the nineteenth century, American presidents have been perceived as ineffective and as "political hostages" of Congressional gridlock. Our model can help to explain why the US system tends to resemble a "continental" consensus system (with costs in terms of inaction) when shocks are relatively moderate, but allows the American President to exercise "cabinet" powers when shocks exceed a critical threshold.

In summary, our analysis seems to be consistent with a large body of suggestive empirical evidence. An empirical study of adjustment policies that would explicitly test the implications of our analysis for real-world institutions is left for further research.

7. CONCLUDING REMARKS

In this paper we have developed a political-economy model of adjustment in alternative systems of government. We have considered three basic systems: a cabinet system and two "consensus-based" systems, a pure consensus system, and a checks-and-balances system. We have seen how each of the three systems may lead to inefficient policies, for different reasons. We have studied the relative performance of the three systems, and we have concluded that, while the checks-and-balances system dominates the pure consensus system, either of the two consensus-based systems may or may not outperform the cabinet system.

We have found that the degree of political fragmentation in society (that is, the number of political agents with conflicting interests over adjustment policies) plays a fundamental role in the dynamics of adjustment within each system, and in their relative performance. In particular, when inefficient delays occur in a consensus system, their expected length turns out to be an increasing function of the number of decision-makers n. The larger is the number of political agents n, the larger is the efficiency loss associated with consensus-based systems and the smaller is the efficiency loss associated with cabinet systems. Henceforth, consensus-based systems will tend to deliver "worse" adjustment policies than cabinet systems at higher levels of political fragmentation.

We have also seen that, when the assumptions about the stochastic environment are generalized, adjustment policies in different systems can be characterized as control policies with inaction bands of different width. An interesting result is that, in consensus-based systems, relatively small (fourth-order) interest conflicts may lead to large (first-order) inaction bands. By the same token, when comparing societies which differ by small amounts in their degree of conflict, one may find large differences in their adjustment policies. That is, a small increase in conflict may be associated with a dramatic increase in the extent of "political inaction."

The results obtained within our stylized framework may provide insights on the reasons why patterns of adjustment have historically differed across countries. In particular, the relationship between the number of decision-makers, expected delays and efficiency losses in consensus-based systems is consistent with empirical evidence on the behavior of divided governments and coalition governments.

Our analysis can also provide some contribution to the long-standing debate over "alternative" models of government. Our framework allows an analytically-based comparison of "costs" and "benefits" associated with different decisional mechanisms, whose merits have been informally discussed in an extensive political-science literature.[34] While we do not study all the complex tradeoffs involved when comparing alternative systems of governments, we provide some clear-cut answers about the relative performance of alternative systems in so far as the efficiency of their adjustment responses are concerned.

An important question has been left intentionally unanswered: What system should we expect a specific society to adopt? For example, why would any country adopt a pure consensus system, if it is "dominated" by a checks-and-balances system? And should we expect prompt constitutional reform from, say, a checks-and-balances system to a cabinet system if the degree of political fragmentation becomes high enough? Those issues are related to an important and difficult topic, the endogenous formation and transformation of institutions, which is beyond the scope of this paper. Nonetheless, a few considerations are in order.

First, we should stress again that we have evaluated the relative performance of alternative systems of government along *one* dimension: the efficiency of their adjustment policies. While such an aspect of government

[34]For example, see the studies cited in Lijphart (1984).

performance is certainly important, it is far from representing the only dimension along which different systems of government and constitutional rules should be assessed. Therefore, one may find that societies adopt, say, relatively inefficient consensus-based systems in order to achieve other goals (for example, protection of individual and minority rights in other policy areas), which are outside our model.

Second, even if we assume that political agents seek to adopt the system that maximizes their expected utility from adjustment, they may not be able to adopt the appropriate system of government because they lack the necessary "institutional technology." For example, a "cabinet system" requires an appropriate selection technology that credibly attributes exclusive control over policies to a single decision-maker. Such technology may not exist in some societies, as it may involve a complex web of institutional mechanisms that insure the legitimacy and effectiveness of a strong executive, and the peaceful transfer of power when a new cabinet is selected. By the same token, a checks-and-balances system requires an appropriate selection mechanism for the "leader," and the availability of a "commitment technology" that insures the credibility of the leader's proposals. In the absence of those "institutional technologies," a society may end up with a suboptimal system (say, a pure consensus system in the presence of high conflict and high fragmentation).[35]

Third, even when it is clear what institutional reforms would enhance overall efficiency, and the appropriate institutional technologies are available, institutional reforms may fail to emerge as the results of political conflict among decision-makers. We should remember that our evaluation of efficiency is based on the maximization of average expected utility: everybody would agree on such an efficiency evaluation "behind a veil of ignorance," i.e. when the identity of "winners" and "losers" is not known.[36] However, actual policy reforms are not taken behind a veil of ignorance: each change in the institutional rules may hurt specific groups given the current distribution of power in society. In other words, the failure to implement *institutional* reforms (i.e. changes in the system of government) may be explained with the same conceptual tools that we have employed to understand the failure to adjust to economic shocks within given institutional settings.

APPENDIX

The optimal barriers $(Z_b, -Z_b)$ and their analytical approximations can be derived as follows. The Bellman equation for the dynamic optimization

[35]In fact, the availability and effectiveness of those institutional devices may themselves be a function of the degree of political fragmentation and/or conflict.

[36]In that respect, our efficiency analysis is an application of Harsanyi's (1953, 1955) approach to social evaluation.

problem is

$$V_b(z) = z^2 dt + E[V_b(z + dz)e^{-\rho dt}].$$

Using Ito's lemma, we can expand the right-hand side and obtain the following differential equation:

$$\tfrac{1}{2}\sigma^2 V_b''(z) - \rho V_b(z) + z^2 = 0.$$

The general solution to this differential equation is

$$V_b(z) = A(e^{\lambda z} + e^{-\lambda z}) + \frac{z^2}{\rho} + \frac{\sigma^2}{\rho},$$

where $\lambda = \sqrt{2\rho/\sigma}$. The value-matching condition is

$$V(Z_b) - V(0) = b,$$

which implies

$$A(e^{\lambda Z_b} + e^{-\lambda Z_b} - 2) + \frac{Z_b^2}{\rho} = b.$$

The smooth pasting condition, which must hold for an optimal barrier, is

$$V_b'(Z_b) = 0,$$

which implies

$$A(e^{\lambda Z_b} - e^{-\lambda Z_b}) + \frac{Z_b^2}{\rho} = 0.$$

Following Dixit (1991), we can divide the smooth pasting condition by the smooth pasting condition times Z_b and take Taylor expansions. Some straightforward algebraic manipulations lead to the following result:

$$Z_b = -z_b = \left[6\sigma^2 b\right]^{1/4}.$$

With an analogous derivation we obtain

$$Z_c = -z_c = \left[6\sigma^2 c\right]^{1/4}.$$

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