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ECONOMIC ANALYSIS OF POLITICAL INSTITUTIONS:
AN INTRODUCTION

by
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Abstract. This paper surveys four game-theoretic models of politics, to offer an introduction to the analysis of political institutions. The first two models focus on electoral competition, to show how successful candidates' equilibrium strategies may differ under different electoral systems. The other two models probe the consequences of legislative bargaining under different constitutional structures.

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The phrase "political economy" has come to mean very different things in different places. In political science departments, it generally means the study of how economic forces affect politics. As such, the phrase often has a Marxist implication, because of the particular importance that Marxist theory places on economic forces for explaining political events. In economics departments, however, political economy is often taken to mean the study of political forces that affect economic activity.

In classical social philosophy, the study of markets was not so separate from the study of government. The phrase "political economy" was taken from Greek words meaning "housekeeping of city-states," and it was applied to describe the study of how civilized societies are organized. So the classical goal of political economy was to explain the functioning of all social institutions.

The successful development of price theory forced a separation between the study of markets and the study of government. Price theory describes market competition well, but it cannot be applied to political competition. So a separation of political science from economics was necessary when price theory was the only general analytical methodology in economics. Thus economics has developed around a core analytical methodology, whereas descriptive methodologies have been more dominant in political science.

Today, with game theory alongside price theory, it makes less sense to separate the study of politics from economics. Game theory is an analytical methodology that can be applied to

political competition as well as to market competition. Game theory allows theorists to recognize the interconnections between economic and political institutions. So we can now reclaim the original broad scope of political economy, without abandoning a rigorous analytical approach.

We must approach such a reunion between economic theory and political theory with careful respect for both academic traditions. Economists have much to teach political scientists about the analysis of incentives in competitive systems. But economists need to learn from political scientists about what are good questions to ask about political competition. It is good to pursue questions about how politics can affect economic variables, but our concern should not be limited only to economic variables.

To be able to guide the writing of anti-trust laws, economists have invested generations of work in trying to understand the ways that different market structures may shape the conduct and performance of competing oligopolists. Political competition for control of governments is surely not less important to us than economic competition for profits. Furthermore, the range of explicit structural variables that need to be analyzed is greater in political competition, because rules of political competition are written in constitutions and electoral codes.

So we should study constitutional structures as the rules of the political game, defining an incentive system for politicians. To be able to guide writing of constitutions, we need to understand how constitutional structure may shape the rational conduct of politicians and the performance of government.

The analytical study of political processes, using the rational-choice modelling methodology of economic theory, is now commonly called formal political theory (or positive political theory) by political scientists. Unfortunately, interest in formal political theory has not

been widespread among political scientists outside of the United States, and the result has been a disproportionate focus on American political institutions. A broader multinational effort could greatly enrich this literature, because each nation's unique political history may suggest different questions and conjectures about how the functioning of political institutions.

In this paper, I will try to offer some introduction to the range of game-theoretic models that can be valuable in the study of political institutions. I will make no attempt here to survey the whole literature of formal political theory. Instead, I will focus on just four selected models.

Such a selection of models inevitably reflects the author's particular interests and tastes, but I have tried to make this selection with two broad criteria in mind. I have tried to select theoretical models that can offer practical insights into the questions of constitutional design and cross-national comparison of democratic institutions. And I have tried to select models that focus on different aspects of the political process.

The first two models here focus on electoral systems. The first electoral model (based on Cox 1987b, 1990, and Myerson 1993b) seeks to evaluate the impact of the electoral system on the diversity of political positions that would be taken by any given number of parties or candidates that are taken seriously by the voters. The other electoral model (taken from Myerson, 1993a) analyzes the impact of potential entry into (and exit from) the set of parties that are taken seriously by the voters in game-theoretic equilibria.

The third model in this paper (taken from Diermeier and Myerson, 1995, and Groseclose and Snyder, 1994) looks at the legislature, to see why bicameral or presidential systems may induce different forms of legislative and party organization than unicameral parliamentary systems. The fourth model (due to Austen-Smith and Banks, 1988) is a multistage model that includes both

electoral competition and legislative bargaining, to show how anticipation of post-election bargaining may affect rational voters' behavior in multiparty parliamentary democracy.

I hope that these four models may suffice for an invitation to the economic analysis of political institutions. (See also Myerson, 1995.) But much more would be needed for a comprehensive survey of the wide and growing literature of formal political theory. General introductory texts include Riker (1982a), Mueller (1989), and Shepsle (1991). For more on theoretical analysis of electoral systems, see Osborne (1995), Riker (1982b), Feddersen (1992), Cox (1994), Myerson and Weber (1993), Ledyard (1984), and Feddersen and Pesendorfer (1996). The literature on theoretical models of legislative organization includes Baron and Ferejohn (1989), Shepsle (1979), Shepsle and Weingast (1994), Weingast and Marshall (1988), Cox and McCubbins (1993), Gilligan and Krehbiel (1990), McKelvey and Riezman (1992), Alesina and Rosenthal (1995), Huber (1992), Laver and Schofield (1990), and Laver and Shepsle (1996).

My main concern here is with analytical theory. However, we must not overlook the importance of empirical studies of comparative political institutions. Our best hopes for real progress in the understanding of political institutions must be based on a complementary development of both empirical comparison of existing political systems, and theoretical comparison of equilibria in game models of different political systems. For an introduction to the empirical literature on comparison of electoral systems, see Rae (1971), Grofman and Lijphart (1986), Lijphart (1990, 1994), and Taagepera and Shugart (1989). For more on presidential and parliamentary forms of government, see Shugart and Carey (1992), Lijphart (1992), Moe and Caldwell (1994), and Laver and Shepsle (1994).

Model 1: Diversity of candidates in symmetric equilibria of election games

Many papers in formal political theory build on the model of spatial competition of Hotelling (1929). Hotelling's formal analysis was focused on a duopoly game played by two shops choosing their location on Main Street, with customers distributed uniformly along the street. After arguing that the two shops would rationally choose to locate together at the location of the median consumer, Hotelling went on to extend the interpretation of his model to the analysis of politics. Like the two shops converging in the middle of the town, the Democrats and Republicans of American politics seemed in 1929 to converge in the middle of the political spectrum.

Hotelling's paper stands as a classic in both oligopoly theory and formal political theory, but there is a sense in which it sets a bad example. Doing one model for two different applications can obscure the important differences between the two applications. Notice, for example, that welfare analysis may be very different in these two applications. In the oligopoly game, separating the two shops could decrease the total of consumers' transportation costs, because each consumer's transportation cost depends on the location of the shop to which he gives his business. In the political game, however, each voter's welfare depends on the policies of the party that wins the election, not the party to which he gives his vote, and so there is no aggregate welfare benefit from separating the two parties. So the negative connotation that Hotelling gave to "excessive sameness" may be inappropriate in political competition, even if it has some merit in oligopolistic competition.

Much attention has been focused on relaxing the assumption of two parties in Hotelling's discussion. (See Shepsle, 1991.) But when we extend our analysis to multiparty or

multicandidate elections, we must recognize the great diversity of multicandidate electoral systems that can be used. In oligopoly theory, it is reasonable to assume that each consumer will generally give all his business to the store that offers him the best terms, when price and location are taken into account. But in politics, some electoral systems allow or require voters to distribute their votes in various ways across different candidates. And even in electoral systems that require voters to choose one candidate, a voter might rationally choose to vote for his second-favorite candidate, if the most likely way of his vote influencing the election's outcome is in a close race between his second-favorite and his third-favorite candidates. So we need to explicitly compare different electoral systems, and we need to consider strategic theories of rational voting in which voters take account of each other's predicted voting patterns.

To introduce this literature, I focus here on a simplified version of the model of Cox (1987b, 1990). Cox developed his model in the one-dimensional policy space of the Hotelling model, but I simplify the analysis here by considering just a two-point policy space. (See also Myerson, 1993b.)

So suppose that there is just one political question on which the various parties or candidates may differ: say, whether our nation should ratify some regional free-trade agreement. On this question, each candidate must choose one of two policy positions: "Yes" (for ratifying the treaty) or "No" (against ratifying the treaty). The voters have some known distribution of preferences. Let Q denote the fraction of the voters who prefer the "Yes" position. Assuming that no one is indifferent, the remaining fraction $1-Q$ of the voters all prefer the "No" position.

In this simple game, we can safely assume that voters of each type will vote for the parties that endorse their favored position. But with multiple candidates, we must address the question

of how voters might distinguish among two or more candidates who adopt the same policy position. Following Cox (1987), let us for now apply an assumption of symmetry in this regard. That is, we assume for now that voters of each type will (in aggregate) treat candidates at the same position symmetrically. (This symmetry assumption will be dropped in the next section.)

Given these assumptions about voters' behavior, let us now analyze a simple model of an electoral game in which the candidates for some political office choose their policy positions. For now, let us assume that there is some given number of candidates, which we denote by K . Suppose that the candidates choose their policy positions simultaneously and independently, each with the goal of maximizing his chances of winning the election.

In this game, if the fraction Q of voters who favor the "Yes" policy is very close to 1, then we would expect all K candidates to adopt the "Yes" policy. Similarly, if the fraction Q is very close to 0, then we would expect all K candidates to adopt the "No" position. Now, let us ask, what is the highest Q such that there is a symmetric equilibrium of this game in which all candidates choose the "No" position? This largest minority that could be ignored by all candidates in a symmetric equilibrium is the Cox threshold of candidate diversity, and we denote it here by Q^* .

Cox's analysis shows that different electoral systems yield very different thresholds of diversity. The common system of plurality voting stipulates that each voter must give one vote to only one candidate, and the candidate with the most votes wins (even if he has less than a majority). Under plurality voting, the Cox threshold is $Q^* = 1/K$, which goes to zero as K becomes large. Thus, when there are many serious candidates of under plurality voting, we may expect to find candidates who advocate small minority positions and have a positive probability of

winning the election.

But now consider a very different system called negative plurality voting, which stipulates that each voter must vote for all except one of the candidates, whom the voter "rejects." The candidate who has been rejected by the fewest voters wins. Under negative plurality voting, the Cox threshold is $Q^* = (K-1)/K$, which goes to one as K becomes large. This result may seem very strange, because it allows an absolute majority ($Q > 1/2$) to be ignored by all candidates. To see how this can happen, consider the case of $K = 10$, which gives us $Q^* = .9$. Suppose that 81% of the voters (an overwhelming majority) favor the "Yes" policy, but all of the 10 candidates are expected to choose the "No" position. If one candidate deviated alone to the "Yes" position, then he would be rejected by the 19% of the voters, whereas the other 9 candidates would each be rejected by only 9% of the voters, because the 81% "Yes" majority must split their rejection-votes among 9 different "No" candidates; and so the deviating candidate would lose. Thus, when there are many serious candidates under negative plurality voting, we may expect to find them clustered around a shared policy position, which may be a position that is opposed by a large majority of the voters.

This result might seem a minor academic curiosity, because negative plurality voting is not used in any major democratic system. But the point is that this analysis enables us to see why negative plurality voting may be an undesirable system, even without trying it. Our theoretical model gives us a diagnostic tool for predicting some qualitative aspects about the performance of an electoral system.

Let us consider two more systems: Borda voting and approval voting. Borda voting stipulates that each voter must give 0 points to one candidate, 1 point to another, 2 points to

another, and so on up to $K-1$ points for the voter's highest-ranked candidate; and then the winner is the candidate with the highest total number of points from the voters. Approval voting stipulates that each voter must give either 0 or 1 point to each candidate, with no restriction on the number of candidates getting a point from the voter; and again the winner is the candidate with the highest total number of points. Borda voting and approval voting both have Cox thresholds of $Q^* = 1/2$, for any number of candidates. Thus, approval voting and Borda voting can guarantee that, in a symmetric equilibrium with any number of candidates, all potentially-winning candidates choose the policy favored by the majority.

Model 2: Barriers to entry and nonsymmetric equilibria of election games

The analysis in the preceding section used an assumption that candidates or parties that adopt the same policy position will be treated identically by the voters. This is a common assumption, but it should be severely questioned. In no democratic system could I really hope to get as many votes as a leading politician simply by announcing that I favor the same policies! Simply filing a candidacy petition and announcing policy positions would not necessarily make me a serious candidate in the eyes of the voters. There are other barriers to entry into politics that need to be considered.

Some of these barriers arise from the basic problems of credibly communicating a candidate's credentials and promises to a mass electorate, and these communication problems would arise under any democratic system. But other barriers are created by the game-theoretic properties of the electoral system itself. In particular, some electoral systems define a game for the voters that has multiple nonsymmetric equilibria. In such nonsymmetric equilibria, it often

happens that one candidate may get no support from the voters merely because each voter expects that the other voters will give this candidate no support. When such equilibria exist, the perception of not being a serious candidate can become a self-fulfilling prophecy which acts as a barrier to entry against new parties.

Political scientists have long observed that, when elections are run under the system of winner-take-all plurality voting, there tend to be only two major parties. This observation is known as Duverger's law (see Riker, 1982b, and Duverger, 1954). In contrast, democracies that use proportional-representation electoral systems often have many more parties that win substantial representation in the legislature. So the number of major parties should be an endogenous variable to be explained by analysis of electoral systems, not just an exogenous parameter.

Economic theorists should be particularly sensitive to the questions about how the number of large competitors is determined, because such questions are very important in oligopoly theory. It is widely appreciated that barriers to entry of new competitors may be the most important determinant of long-run profits in an oligopolistic market. From this perspective, Duverger's law looks like a statement about high barriers to entry in democracies that use plurality voting. So when we study the degree to which electoral systems might raise or lower barriers to entry against new parties, we should ask whether such barriers to entry might have some effect on the extent to which the leaders of the existing major parties can exploit their privileged positions and take profits from government. Such political profit-taking is called corruption.

So let us consider a voting game (from Myerson, 1993a) in which voters are allocating seats in a legislature among parties that have different levels of corruption. To be specific, for

each party r , suppose that there is some number $c(r)$, called the corruption level of party r , such that each voter will have to pay $c(r)$ in extra taxes for each seat that party r wins in the legislature. We want to focus on the question of how the amount of corruption that is allowed by individually rational voters may depend on the game-theoretic properties of the electoral system. So we assume that the parties' corruption levels are all publicly known to the voters. Given that voters pay the costs of this corruption and get no benefits from it (it goes only to the politicians, who are a negligible fraction of the electorate), one might guess that rational voters would never vote to give any seats to a more corrupt party. In fact, we shall show that this guess may be wrong, depending on which electoral system is being used.

There is one minor wrinkle that needs to be addressed first. Consider the simple case of one corrupt party versus one noncorrupt and otherwise identical party, in a single-seat winner-take-all election. If there are many voters and they all expect everyone else to vote for the corrupt party, then there is no reason for any voter to do otherwise, because there is no chance of one vote changing the outcome of the election. To eliminate this perverse equilibrium, we can either use a dominance argument, or we can add some uncertainty about the number of voters. So let us assume that each voter has an independent $1/1000$ probability of forgetting to vote (but if everyone forgets to vote then the election will be reheld the next day). Then each voter has a positive probability of affecting the outcome, and no one votes for the corrupt party in equilibrium.

But this result, that known corrupt parties do not win in equilibrium, depends crucially on the assumptions that there are only two parties and that parties differ only in their corruption levels. Once we admit three or more parties that differ even over a two-point policy space, then

the ability of rational voters to deter corruption becomes very dependent on the details of the electoral system.

For a specific example, consider a winner-take-all election by plurality voting. As in the preceding section, suppose that there are two policy alternatives: the "Yes" policy and the "No" policy (on the ratification of a regional trade treaty). Suppose that there are four parties. Parties 1 and 3 advocate the "Yes" policy, and parties 2 and 4 advocate the "No" policy. Suppose that there are 10 voters, including five voters who prefer the "Yes" policy, and five voters who prefer the "No" policy, and suppose that each voter would gain 1 unit of money from the implementation of his preferred policy rather than the other policy alternative. But suppose also that parties 1 and 2 are known to be corrupt, with corruption levels $c(1) = c(2) = \gamma$, where γ is some positive number. Parties 3 and 4 are known to be clean parties, with corruption levels $c(3) = c(4) = 0$. So each voter would lose γ from the victory of a corrupt party instead of the clean party that has the same policy position.

As above, let us assume that each voter has an independent $1/1000$ probability of forgetting to vote, so that each voter perceives some chance of affecting the outcome of the election. From Myerson (1993a), ties are assumed to be broken by a tie-breaking ballot from a randomly-sampled voter. Most importantly, we assume here that each voter chooses his vote to optimize his expected payoff from the outcome of the election, to the extent that his vote may influence who wins, taking account of how other voters are expected to vote in equilibrium. (This last assumption is called instrumental or strategic voting, in contrast to another common assumption that voters vote merely to express their sincere preferences over the candidates.)

In this example, then, plurality voting admits a Nash equilibrium in which all the "Yes"

voters plan to vote for party 1, and all the "No" voters plan to vote for party 2, and so one of these corrupt parties will win. Given that ties will be broken by randomization, this equilibrium gives each voter a probability of almost 1/2 (over .495) that he can affect the outcome of a tie between parties 1 and 2 by voting for party 1 or 2. But a single voter's out-of-equilibrium vote for party 3 or 4 could enable a noncorrupt party to win only if at least 7 other voters forget to vote (so that parties 1 and 2 each get at most one vote), which has probability less than 10^{-19} . So even if the cost of corruption γ were as high as 10^{19} , each voter would find it rational to vote for the corrupt major party that he prefers, rather than waste his vote on a clean minor party.

Of course there is another equilibrium of this game in which nobody votes for the corrupt parties. So we could hope that the voters might focus on the equilibrium that they all prefer. But suppose that the clean parties 3 and 4 are new parties, and so history operates as a countervailing focal factor in favor of the corrupt equilibrium. Then the perception that this election is likely to be a close race between parties 1 and 2, as in past elections, can become a self-fulfilling prophecy.

The problem is that getting the voters to coordinate their expectations on the equilibrium that they prefer may require some coordinating leadership, and they already have leaders in parties 1 and 2 who prefer to maintain the old equilibrium. The need for coordinating leadership to guide blocs of like-minded voters in plurality elections seems particularly problematic when we recognize that the whole point of democratic elections is to select our leaders. Thus, the need for coordination in plurality voting can create a barrier to entry which can sustain the profit-taking of corrupt parties.

If we change electoral systems, then the analysis of this example becomes very different. Under approval voting, it can be shown (see Myerson, 1993a) that, in a class of games that

includes this example, corrupt parties cannot have any positive probability of winning any legislative seats. To see why, consider again the scenario in which every voter is expected to vote for party 1 or 2. It can be easily shown that a voter might gain, and could not possibly lose, by adding a second approval vote for his most-preferred clean party. But no one needs to vote for a corrupt party when all like-minded voters are voting for the most-preferred clean party. The crucial difference is that, under approval voting, adding a vote for party 3 or 4 does not reduce a voter's ability to affect the electoral outcome in the case of a close race between parties 1 and 2. Thus, under approval voting, a perception that it will probably be a close race between parties 1 and 2 cannot so easily become a self-fulfilling prophecy.

Myerson (1993a) has found that proportional-representation systems also yield good sets of equilibria in these games. In our simple conceptual example, proportional representation (in its ideal sense) would mean that each voter can allocate an equal fraction of the legislative seats ($1/10$ when everyone votes). We assume here that the realized government policy will depend on whether the "Yes" parties or "No" parties have a majority (with a tie going to the status quo, say the "No" side). So even if a voter who favors "Yes" expected all other "Yes" voters to vote for the corrupt "Yes" party 1, he would prefer to vote for the clean "Yes" party 3, because doing so would reduce the corruption cost without affecting the "Yes/No" balance in the legislature. Thus under proportional representation, in any equilibrium of this game, every voter should vote for a noncorrupt party that advocates the policy which the voter prefers.

Myerson (1993a) has shown that Borda voting (like plurality voting) allows equilibria in which corrupt parties win with positive probability, in spite of the fact that noncorrupt parties with the same policy positions are on the ballot. To see why, consider again the above four-party

example, but now suppose that the election is winner-take-all, with Borda voting. If it were certain that only parties 3 and 4 could have any chance of winning the election, then all the "No" voters would prefer to maximize their impact on the race between 3 and 4 by ranking party 3 on the bottom of their Borda ballots and party 4 at the top. Similarly, all "Yes" voters would put party 4 at the bottom of their Borda ballots, and party 3 at the top. But then the total Borda score for parties 1 and 2 must equal the total Borda score for parties 3 and 4, and so at least one of the corrupt parties must be a contender to win!

Essentially, the problem with Borda voting here is the opposite of the problem with plurality voting. Under plurality voting, if a party is perceived as a likely loser, then rational voters tend to not give it electoral support, which can function as a barrier to entry against clean parties. Under Borda voting, when a party is perceived as a likely loser, then some voters may rationally give it more support (moving it up so that some other more serious contender can be moved to the bottom of their Borda ballots), and this effect acts as a barrier to exit which protects the corrupt parties. Approval voting and proportional representation perform well in these games because perceptions of electoral strength or weakness have relatively less impact on voters' rational behavior under these systems.

To compare this model with the model from the preceding section, it may be useful to mention Riker's (1982a) discussions of "liberal" and "populist" theories about the functional goals of democracy. Populist theories, in Riker's sense, emphasize the problem of aggregating the diverse preferences and beliefs of voters. From this populist perspective, the success of a democracy should be judged by its ability to generate reasonable compromises among the conflicting interests of different groups of voters. Liberal theories, in contrast, emphasize the

problem of deterring the leaders of government from abusing their power. From this liberal perspective, the success of a democracy should be judged by its ability to deter government corruption, by threatening to turn corrupt leaders out of office. Models that focus exclusively on the choice among policy positions favored by different voters, like the first model in the preceding section, could be classified as populist in Riker's scheme. The model in this section, with its focus on corruption of political leaders, might be classified as liberal in this scheme. (For other theories of corruption in politics, see Galeotti and Merlo, 1994.)

Model 3: Party discipline and legislative organization

The essence of constitutional government is a separation of powers among many elected officials who must then interact and compromise to govern between elections. The structure of the constitutional separation of powers defines a complex game of policy determination, to be played by legislators and other elected officials. To understand how constitutional structures may influence political behavior, we need to look beyond the election and study models of the post-election legislative games. So in this section, we consider a simple example of such a legislative model.

Legislatures in different countries have developed very different forms of internal organization and leadership. The Congress of the United States has a much weaker central leadership than the British House of Commons. In the United States, congressmen regularly make individual decisions about whether to support legislation, independently of their party leadership. Congressional committees have substantial negative power to block legislation in their domain of jurisdiction, but a favorable report by a committee does not guarantee passage on the

floor of the American House or Senate. In the British House of Commons, however, it is generally understood that all members of the governing legislative coalition will follow the lead of the Cabinet in supporting any given legislative proposal or bill.

This distinction is often explained by the fact that political parties in Britain have much more cohesion and discipline than political parties in America. But there is reason to suspect that this "explanation" might reverse the cause and effect. To begin, we should be careful to distinguish electoral party discipline from legislative party discipline. Here electoral party discipline may be taken to mean that voters tend to choose a party and then support candidates only according to the endorsement of their party. Legislative party discipline means that legislators of any given party are expected to regularly vote their party's line in the legislature.

There is an obvious interconnection between legislative party discipline and electoral party discipline. If voters are expected to vote purely along party lines, then a party's nomination becomes a candidate's principal asset, and a candidate's record of independent action can do little to improve his electoral prospects. Conversely, if legislators are expected to vote in the legislature purely along party lines, then voters have little reason to ask more about a candidate than his party affiliation. But as Cox (1987a) has observed, this leaves us with a chicken-and-egg question: Which came first, legislative party discipline or electoral party discipline?

There is good reason to expect that electoral party discipline can be affected by the electoral system; see Carey and Shugart (1995). In particular, a high degree of electoral party discipline is forced by closed-list proportional representation, in which candidates can run only as names on a general party list. But the United States and Great Britain both elect legislators by plurality voting in single-member districts, and legislative candidates appear as individuals on the

voters' ballots. So the electoral system cannot be the cause of the different levels of party discipline in these two countries. Furthermore, Cox (1987a) finds that, in Victorian Britain, legislative party discipline seems to have developed ahead of electoral party discipline.

So if we are to find a structural explanation of the different levels of legislative party cohesion in Britain and the USA, then we should look instead at the different constitutional structures of these legislatures. In Britain, legislation requires only a simple majority of the House of Commons. In the USA, legislation requires a majority of both the House and the Senate, plus the approval of the President (or 2/3 supermajorities in each chamber). The American constitution explicitly gives each legislative chamber control over its internal procedures, and terms of office are staggered to maintain a sense of separation between the two chambers. Building on the work of Groseclose and Snyder (1994) (see also Snyder, 1991), Diermeier and Myerson (1995) have developed a simple model to show how these constitutional structures might account for the different levels of legislative party discipline that have evolved in the USA and Great Britain.

The crucial assumption of the Diermeier-Myerson model is that legislators want to maximize the expected value of the favors or bribes that they get from outside interest groups who want to pass or block legislation. Within each chamber, legislative institutions are cooperatively designed to maximize the expected value of these favors to members of the chamber, but separation is assumed to prevent full cooperation across legislative chambers.

To give an overview of the model, let us begin by considering a simple unicameral legislature, in which the legislators are considering different forms of internal organization for their chamber. To illustrate their options, let us explicitly consider three organizational options.

One option is independent majority voting, in which the legislators vote independently, using simple majority rule on any bill that anyone proposes. An second option is to have a system of blocking committee chairs, which stipulates that each bill must go first to a committee in which the chairman has negative power to block any proposed bill, but each legislator still votes independently on proposals that are approved and reported out by the committee. A third organizational option is to have a system of full delegation to leadership, in which all legislative power is delegated to a leader of the chamber, who can both approve and reject legislation in the name of the whole chamber. Among these three organizational alternatives, it may be intuitively apparent that the full-delegation option would make it easiest to pass legislation, while the blocking-committee system would make it hardest to pass legislation.

Groseclose and Snyder's lobbying model provides one simple way of quantifying and verifying this intuition. In their model, there are two lobbying agents who may offer favors and money to legislators. Agent 1 wants to pass a specific bill and is willing to spend up to W units of money to get it passed. Agent 2 wants to block this bill and is willing to spend up to V to block it. For simplicity, it is assumed that agent 1 must move first, offering bribes to legislators if they can get the bill passed. Then agent 2 can either pay counterbribes sufficient to block the bill, or he can pay nothing and acquiesce to its passage.

Analyzing this as a game with perfect information, Groseclose and Snyder showed that, with independent majority voting, agent 1 pays $2V$ to the legislators if $W > 2V$, but the legislators get nothing if $W < 2V$. The total bribes needed to pass a bill are $2V$, because any lower amount would allow agent 2 to pay less than V and bribe some 50% of the legislators who were together offered less than V by agent 1.

With a blocking-committee system, the analysis is similar, except that agent 1 needs to offer bribes that are at least $3V$ to pass the bill, because agent 2 would block the bill if either the committee chairman or some 50% of the backbenchers in the chamber were getting less than V from agent 1. That is, with a blocking-committee system, the legislators get a total of $3V$ from agent 1 if $W > 3V$, but they get nothing if $W < 3V$.

With a full-delegation system, the price of passing legislation drops to $1V$. If $W > V$ then agent 1 pays V to the leader to pass the bill, and otherwise the leader gets nothing.

Diermeier and Myerson use the term hurdle factor to refer to this multiple of V that agent 1 must pay to pass a bill. So the hurdle factor is 1 with full delegation, 2 with independent majority voting, and 3 with a blocking committee system. Of course, this is just a simple model, but the point is that a reform of the organization in a legislative chamber can be viewed as a change in the price for lobbyists to get legislation passed. From the legislator's point of view, the optimal price or hurdle factor should depend (like any producer's price) on the demand curve. In this case, assuming that the legislative organization must be chosen before any specific values of V and W are determined, the demand curve is a function $D(r)$ that represents the expected value of a random variable that is equal to V if $W > rV$ and is equal to 0 if $W < rV$. Then with a hurdle factor r , the expected total value that the legislators get is $rD(r)$. When other forms of legislative organization are considered, any hurdle factor above 1 can be achieved by some form of legislative organization. The maximal expected value for the legislators is achieved by a hurdle factor r_0 which, at an interior optimum, must satisfy the following optimality conditions

$$D(r_0) + r_0 D'(r_0) = 0 \text{ and } D'(r_0) < 0.$$

Now let us separate the legislature into a House and Senate, which determine their internal

organizations separately. Let s denote the hurdle factor in the House, and let t denote the hurdle factor in the Senate. Then the expected total payments to the members of the House is $sD(s + t)$.

So the marginal value to the House of increasing its own hurdle factor is

$$D(s + t) + s D'(s + t),$$

which is strictly positive if $s + t = r_0$ and $t > 0$. That is, if the two chambers tried to set hurdle factors that jointly maximize their gains from lobbyists, then members of each chamber would have an incentive to unilaterally increase their own hurdle factor.

Giving veto power to an independently elected president similarly increases the incentives for higher hurdle factors in the legislature. Diermeier and Myerson consider an example where the variables V and W are independently drawn from an exponential distribution with mean 1, and in this case $D(r) = 1/(r + 1)^2$. Then the optimal hurdle factor r for a simple unicameral legislature would maximize $rD(r) = r/(r + 1)^2$; and this maximum is achieved by $r_0 = 1$, that is, by full delegation to leadership. Adding a president with veto power adds 1 to the overall hurdle factor, and so the expected total value for the legislators becomes $rD(r + 1) = r/(r + 2)^2$; and this expected value is maximized by $r_0 = 2$, that is, by independent majority voting in the legislative chamber. In general, adding more hurdles to legislation outside of a legislative chamber can incite the chamber to increase its own internal hurdle factor.

The essential idea is that, in bicameral and presidential systems, when the members of one chamber delegate full legislative powers to the leadership of a disciplined majority coalition, they are lowering their legislative hurdle factor. The resulting increased-legislation benefits must be shared with the president and other legislative chambers (if they exist). But the costs of decreased attention from lobbyists (for each bill that would have passed anyway) is entirely borne within this

chamber. From this perspective, we see how presidential vetoes and bicameral separation can erode the incentives for legislators to form disciplined coalitions with strong leadership.

Model 4: An integrated model of elections and legislative bargaining

Thus far, we have considered two models of electoral politics and one model of legislative processes. It is convenient to make a conceptual separation along these lines, but at some point we must recognize that pre-election campaigning and post-election governing are interconnected phases of the overall political process. Voters' behavior in the election depends on their perception of how the winners will behave in the post-election processes of government. Conversely, the behavior of elected officials in legislative voting and coalition-formation is largely determined by their perceptions of how decisions in government will affect behavior of voters in future elections. So we should conclude by considering an example of a model that looks at these two phases of politics in an integrated way. The best such model is due to Austen-Smith and Banks (1988).

Proportional representation has been advocated as a way of generating a legislature that is a mirror of the people, giving seats proportionately to each bloc of voters that has an organized party to express its interests. But if many voters do not give their votes to the parties that they truly prefer, then it is not clear that any party should be viewed as a true expression of the interests of the voters who supported it in the election. Austen-Smith and Banks (1988) show how this can happen.

As in the Hotelling model, the space of policy options in their model is the interval from 0 to 1. There are many voters, and each voter has a type θ that has been independently drawn from

a uniform distribution over this interval $[0,1]$. A voter with type θ gets payoff $-(y - \theta)^2$ when y is the policy position that is chosen by the government.

There are three parties, numbered 1, 2, 3 in the game. At the first stage of the game, the three parties independently choose policy positions x_1, x_2, x_3 in the interval $[0,1]$. At the second stage, the voters vote for parties in a simple proportional representation system with a minimum vote-share requirement of α . For now, let us suppose that $\alpha = .05$, so that any party must get at least 5% of the vote to earn any seats. Seats are allocated to parties that exceed this 5% quota in proportion to their respective vote totals. (Assume that integer-rounding problems can be avoided by dividing seats.)

After the election, the parties try to form a government. Forming a government here means choosing a policy position y in the interval $[0,1]$ and choosing a distribution of the transferable benefits of power (g_1, g_2, g_3) such that $g_1 + g_2 + g_3 = G$, where G is the given total value of the perquisites of power (ministerial offices, etc.) that are available to whomever controls the government. The payoff to any party i in the legislature is then $g_i - (y - x_i)^2$. It is assumed that the parameter G is a large positive number.

If one party has a majority of the legislature, then that party controls the government and chooses (y, g_1, g_2, g_3) . Otherwise, the parties must bargain to form a government. Let us assume that a coalition with a majority of the legislature can implement any feasible (y, g_1, g_2, g_3) satisfying $y \in [0,1]$ and $g_1 + g_2 + g_3 = G$, except that no g_i can be made negative without the consent of party i .

Following actual practice in many countries, Austen-Smith and Banks assume that the largest party (the one that has the most seats in the legislature) makes the first offer to form a

government, proposing a plan (y, g_1, g_2, g_3) to be implemented if another party accepts the offer. If this first offer is not accepted by any other party, then the second-largest party gets to make an offer. If this second offer is not accepted by any other party then the smallest party gets to make an offer. Finally, if no party's offer has been accepted by any other party, a nonpartisan caretaker government is formed, and all three parties get payoff 0. To complete the specification of the game, we also assume that any party that fails to get any legislative seats gets a payoff -1 (worse than anything that can happen when it is in the legislature).

Assuming that G is sufficiently large, Austen-Smith and Banks show that, in any sequential equilibrium of this bargaining game, if the largest party does not have a majority then it makes an offer that is designed to be accepted by the smallest party. If the smallest party rejected this offer, then the second-largest party would make an offer aimed at the largest party (because the largest party, having used up its opportunity to offer, would be most eager to reach agreement). Anticipating being thus excluded at the second stage makes the smallest party most eager to reach agreement at the first stage. In equilibrium, the largest party's initial offer is accepted by the smallest party, and so they will form the government.

A simple efficiency argument shows that the policy position chosen by a governing coalition will be the average of their promised x_i positions. If 1 is the largest and 3 is the smallest party, then choosing $y = (x_1 + x_3)/2$ minimizes the $\{1,3\}$ -coalition's total breach-of-promise cost $(y - x_1)^2 + (y - x_3)^2$, and the greater bargaining power of party 1 can be rewarded by increasing g_1 at the expense of g_3 . (Of course g_2 will be 0 when 1 and 3 form a governing coalition.)

Austen-Smith and Banks find many equilibria of the overall game, but we discuss here just one particularly interesting equilibrium. In this equilibrium, party 1 chooses a "leftist" policy

position $x_1 = .20$, party 2 chooses a "rightist" position $x_2 = .80$, and party 3 chooses a "centrist" position $x_3 = .50$.

Given these positions, if everyone voted for the party that has the position that he most prefers, then the expected vote shares would be 35% for party 1, 35% for party 2, and 30% for party 3, with party 3 getting the votes of all voters whose type is between .35 and .65. There would be some small randomness around these expected shares, because the voters' types are random variables, but the law of large numbers would make shares close to these very likely. So the voters would anticipate that no party would get a majority, and party 3 would be the smallest party, and so the governing coalition would be formed between either between parties 1 and 3 or between parties 2 and 3. Thus, the government policy position y would almost surely be either $.35 = (x_1 + x_3)/2$ or $.65 = (x_2 + x_3)/2$, depending on whether party 1 or party 2 gets more votes. But then voters would recognize that the crucial question is whether party 1 or party 2 will get more votes, and voters for party 3 would recognize that they have no impact on this crucial question. So the voters whose types are between .35 and .50 would prefer to deviate and vote for party 1, while the voters whose types are between .50 and .65 would prefer to deviate and vote for party 2. So party 3's support should be diminished by the greater incentive to vote in a way that can influence the crucial race among the two big parties (expected to be parties 1 and 2) to form the governing coalition.

The rational defections from party 3 to parties 1 and 2 do not stop until party 3 is in serious danger of being eliminated from the legislature, that is, when the expected vote share for party 3 drops to the representational quota $\alpha = .05$. So only the voters whose types are between $.475 (= .50 - \alpha/2)$ and $.525 (= .50 + \alpha/2)$ should vote for party 3, while all voters with types below

.475 vote for party 1, and all voters with types above .525 vote for party 2. In this scenario, a voter with type .475 recognizes that voting for party 1 instead of party 3 might have the beneficial effect of moving government policy from .65 to .35 (by making party 1, rather than party 2, the leader of a coalition with party 3); but voting for party 1 instead of 3 might also have the undesirable effect of moving government policy from .65 to .80 or from .35 to .20, by driving party 3 out of the legislature and allowing party 1 or 2 to form a more extreme one-party government.

To complete the description of this equilibrium, it remains to consider the first stage and explain why the parties do not want to deviate to other policy positions. The answer is that the subgame after the first stage has many equilibria. For any two parties at different positions, the subgame after the first stage has an equilibrium in which every voter votes for his more preferred among these two parties, knowing that a vote for the third party (having 0 expected votes) would be wasted. So the parties may feel constrained to choose $x_1 = .20$, $x_2 = .80$, and $x_3 = .50$ by the perception that, if any one party announced another policy position then the voters' expected behavior would shift to the equilibrium in which nobody votes for this party.

Thus, studying the post-election legislative bargaining game together with the electoral game enables us to see that voters should be concerned about which major party will get to lead the post-election coalitional bargaining. This concern may cause a voter, even in a proportional-representation system, to rationally vote for a party other than the one whose policy position he most prefers. The result can be a proportional-representation legislature that has disproportionately large parties near the extremes of the political spectrum, while small centrist parties hover at the brink of extinction. Reducing the minimal-representation quota α actually

exacerbates this effect, because the small party's vote share decreases with α in equilibrium .

The four models in this paper make different assumptions and reach different conclusions. The goal here has not been to create a unified theory of politics. Our goal has been rather to illustrate the range of political questions into which theoretical analysis can offer valuable insight. Many more theoretical models and empirical studies are needed, to help us better understand how political behavior of voters and politicians may be shaped by the structures of democracy.

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