Rethinking Political Bargaining: Policymaking with a Single Proposer

David M. Primo
University of Rochester

Most political bargaining in the U.S. system has two features which are constitutionally mandated: (1) only one actor can make a formal proposal, and (2) he or she can make an indefinite number of proposals. Existing work in economics and political science ignores at least one of these features. I construct a model incorporating both of these components of political bargaining. The main finding of this article is that time preferences and the number of periods have no effect on the equilibrium policy outcomes, which are identical to those first stated by Romer and Rosenthal in a one-period model. This result suggests that impatience and time preferences may not be key features of political bargaining. This model has implications for constitutional and statutory rules regarding bargaining: it can be applied to presidential appointments, legislation, citizen initiatives, vetoes and filibusters (e.g., Krehbiel's pivotal politics model), and term limits.

1. Introduction

Most political bargaining in the U.S. system has two features which are constitutionally mandated: (1) only one actor can make a formal proposal, and (2) he or she can make an indefinite number of proposals. For example, only members of Congress can initiate bills. The president has no formal proposal power, only veto authority. Similarly, only the president can nominate Supreme Court justices or cabinet secretaries. This situation differs substantially from the usual bargaining situation in economics; for instance, negotiations over the purchase of a house or car involve alternating offers from both the buyer and the seller.[1] In addition, political bargaining is often conducted along a single spatial dimension with a status quo point.

Existing work in economics and political science ignores at least one of these features. Romer and Rosenthal's (1978) and Denzau and

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1. To be sure, there are cases in which informal proposals are made by other parties. For example, the Budget and Accounting Act of 1921 requires the president to send a budget proposal to Congress on a yearly basis.

Mackay's (1983) widely cited works on agenda setting and committee power, respectively, feature only one period of bargaining with a single proposer. Seminal works by Rubinstein (1982) and Baron and Ferejohn (1989) consist of an infinite horizon but alternating or random proposal power. Binmore, Osborne, and Rubinstein (1992), in a review of the bargaining literature, specifically ignore single-proposer models, arguing that they are uninteresting due to unrealistic predictions of agenda-setter power. They write, "These models assign all the bargaining power to the party who makes the offers" (Binmore, Osborne, and Rubinstein, 1992:184). This suggests that Congress will never lose the upper hand with the president, or that the president has virtual free reign in judicial appointments. But this prompts many interesting questions: Suppose that the proposer is very impatient, and the receiver is very patient. Does this allow the receiver to extract more from the proposer? Does the proposer lose power because of his ability to make multiple offers?[2]

In this article, I solve a single-proposer model in a single spatial dimension. The structure of the model differs substantially from previous work in three ways:

1. Bargaining takes place along a single spatial dimension. This is in contrast to a Rubinstein or Baron–Ferejohn model.
2. I allow for multiple periods of bargaining. This differs from most spatial models.
3. Uniqueness is proven for the class of subgame perfect Nash equilibria. No refinements, such as considering only stationary equilibria, are necessary to establish uniqueness.

I establish the following results, which provide surprising answers to the above questions and naturally suggest applications to presidential appointments, budget making, and citizen initiatives, to suggest just a few topics:

- The model produces the same policy outcomes as a Romer–Rosenthal model, and it holds for both finite and infinite-horizon versions of the model. This implies that the number of periods does not arbitrarily affect the equilibrium policy outcomes.
- The patience of the players does not affect the equilibrium policy outcome, except in a knife-edge case where (1) there exists an infinite time horizon and (2) the receiver is perfectly patient (i.e., $\delta_R = 1$).
- When the receiver is perfectly patient in an infinite-horizon model, the agenda setter loses power.

2. Consider what is known as the Coase Conjecture (see Fudenberg and Tirole [1991:401–405] for a straightforward explanation). In the game, a seller makes an offer to sell an object and a buyer (whose valuation for the object is unknown) either accepts or rejects it. Coase shows that moving from one take-it-or-leave-it offer to multiple periods causes the seller's profit to converge to 0 as $\delta \to 1$.

I proceed as follows. In Section 2, grounding for the model is provided. In Section 3, the single-proposer model with complete information is laid out. In Section 4, I present a general proof for the equivalence of single-proposer models with one period, multiple periods, and an infinite horizon. In Section 5, I summarize the findings and suggest both empirical applications and formal extensions to the model.

2. Existing Models

Many economic models represent bargaining through divide-the-dollar games in which payoffs are given once an agreement is reached. Rubinstein's model (1982) is the classic in the literature; two players alternate in making offers to divide a dollar. In the model, the amount that goes to the proposer varies with the patience of the players and the number of periods. Therefore the predictions of the model are contingent on the time horizon as well as discounting. Political models often follow a divide-the-dollar framework. For example, Baron and Ferejohn (1989), in their oft-cited article on bargaining in legislatures, use a divide-the-dollar approach with randomly chosen agenda setters. However, political bargaining often features a status quo on the real line which remains in place until an agreement is reached. The location of the status quo often significantly reduces the power of the agenda setter.

I adopt a spatial framework to study bargaining.[3] This fits more naturally in most political contexts, since a change in policy usually affects both players. This need not be the case in other bargaining situations. For example, in a divide-the-dollar setup, player x is concerned only with his own allocation, and his payoffs are unaffected by the allocation granted to player y.[4]

Romer and Rosenthal (1978) introduce the seminal model for political bargaining. They consider a proposer who has one chance to make a proposal to a finite number of voters, given a status quo point and a unidimensional policy space. Their results demonstrate that any status quo point within the Pareto set will be unchanged in equilibrium, extreme status quo points will lead to the proposer realizing his ideal point, and status quo points outside the Pareto set but not too extreme will be moved inside the Pareto set.[5] Of importance, in the Romer–Rosenthal model, is that the equilibrium policy outcomes are always in the Pareto set, and therefore are Pareto optimal.[6]

3. See Enelow and Hinich (1984) for an introduction to the concept of a policy space.

4. Formally, in a two-player divide-the-dollar framework, the set of feasible proposals is a two-dimensional simplex. Player x's indifference curves are lines from $(a, 0)$ to $(a, 1-a)$, for $a \in [0, 1]$, and player y's indifference curves are lines from $(0, a)$ to $(1-a, a)$. In a unidimensional spatial setting, the set of feasible proposals is the real line. If there exist strictly single-peaked preferences, then it is easy to show that a change in policy location can never affect only one player.

5. The Pareto set consists of those policies which cannot be altered without making at least one of the players worse off.

6. There have been many extensions to this model since it originally appeared. Some consider uncertainty or incomplete information, and others allow for endogenous reversion points, such

One potential drawback to this and other models (e.g., Krehbiel, 1998) is that they are one period long.[7] An infinite-horizon model may be more appropriate to modeling political negotiations. For instance, if a president's initial nominee to the Supreme Court is rejected, a vacancy still exists, and it needs to be filled. So the nomination game continues.

Starting with Baron and Ferejohn (1989), researchers have emphasized the importance of the future in the study of bargaining, whether through repeated bargaining (e.g., Baron, 1996) or infinite-horizon bargaining (e.g., Baron, 1991; Gilligan and Krehbiel, 1994; McCarty, 2000). While these models tend to address bargaining within legislatures rather than bilateral bargaining situations, they nonetheless emphasize the importance of the future in shaping the decisions political actors make. As McCarty (2000:117) puts it, agents in an infinite-horizon model "no longer bargain in the shadow of an exogenous status quo but in view of endogenous expectations about future... decisions." In his pivotal politics model, Krehbiel (1998) acknowledges the importance of future legislative sessions, though he does not explicitly model legislative change. Krehbiel (2001) builds on the pivotal politics model by including random shocks between periods which change the location of the players or the status quo point.

There are several other examples in the literature where spatial models are examined as a one-period case, while the authors speak to the importance of multiple periods of bargaining. For example, Kiewiet and McCubbins (1988) consider a model of congressional–presidential bargaining that follows the Romer–Rosenthal framework. They write that there is some reversion point that stays in effect until new legislation is enacted, and that "the repeat-play appropriations process can be modeled as a single play."[8]

Moraski and Shipan (1999) acknowledge the value of studying how the time horizon affects bargaining, but justify focusing on a one-period judicial appointments model in part because of the multiplicity of equilibria that may result in a repeated game, as well as the fact that the president will not want the game to continue beyond the first round of bargaining.[9] In fact, the equilibrium in this game is not affected if bargaining can continue when an agreement is not initially reached. Further, the president's impatience can

as indexing status quo spending in period $t+1$ to be some percentage of spending in period t, if no agreement is reached. Rosenthal (1990) provides a nice overview of this literature, and Enelow and Hinich (1984:131–168) discuss how uncertainty affects the power of the agenda setter in a multidimensional framework. Banks and Duggan (2000, 2001) and Cho and Duggan (2001) explore the equilibrium properties of unidimensional and multidimensional bargaining models, of which Romer and Rosenthal's model is a special case.

7. Romer and Rosenthal (1979) consider an extension to their model, with T periods and uncertainty over voter turnout. The model in this article is different for two reasons: it considers two players with perfect and complete information, and it considers an infinite horizon.

8. While technically the model they consider allows for multiple periods of bargaining, as opposed to repeated bargaining, their point is correct.

9. Again, the distinction between a repeated game and a game with multiple rounds of bargaining should be made.

be modeled by selecting a particular value for his discount factor. Surprisingly, as I will show, the relative patience of the players does not affect the equilibrium.

Snyder and Weingast (2000) consider a model of appointments to the National Labor Relations Board (NLRB), in which appointments are proposed by the president until an agreement is reached. They too solve a one-period version of the model, while discussing the importance of allowing bargaining to continue if agreement is not reached. Chang (2001) considers a similar model of appointments to the Federal Reserve that allows for bargaining to continue until agreement is reached. She provides a solution to a one-period case only, as well, while stating that her results hold for a case where bargaining can continue if agreement is not reached.

This article is the first to prove that the one-period case extends to a case with multiple rounds or an infinite horizon. Most researchers agree that modeling political bargaining in this manner is preferable to considering the one-shot case. There are several examples in the literature of spatial models resembling the Romer and Rosenthal framework in which researchers discuss the importance of multiple periods of bargaining. This article shows that solving the one-period case is sufficient to generate policy predictions. Except in a knife-edge case, the infinite-horizon model gives results identical to the single-period model and is not contingent on discount rates. Thus when solving for subgame perfect Nash equilibria in other games of this type (i.e., two-player, one-dimensional games of complete and perfect information with one proposer), one can simply solve the one-period version of the model. This can be justified by referencing the results presented in this article. In the final section of the article, I will address the importance of this result for the bargaining and veto literature.

3. The Model

3.1 Actors, Game Structure, and Preferences

The game has two players, a proposer P and a receiver R. They are to choose a policy in $\Re$. x_P and x_R are P and R's ideal points, respectively, and z is a policy outcome. Utility functions, $U_i(z), i \in \{P, R\}$, are strictly single-peaked, symmetric, and continuous.[10] Without loss of generality, let $x_P = 0$ and $x_R = 1$. Let δ_P and δ_R be the discount factors ($\in (0, 1]$) of P

10. The assumption of continuity is needed to prove the infinite-horizon case. The assumption of symmetry is used to guarantee that for every policy x, there is a policy $R(x)$ such that player R receives the same utility from both policies (i.e., R(x) is his indifference point for x). The existence of $R(x)$ is required to generate precise point predictions for policy outcomes. Without symmetry, it is possible to construct a strictly single-peaked and continuous utility function such that indifference points do not exist for all policies. As an example, consider a utility function as follows: for $x \in (-\infty, 0]$, $U(x) = -\frac{x^2}{x^2+1}$, and for $x \in [0, \infty]$, $U(x) = -x^2$. Note that for policies to the left of 0, $U(x)$ asymptotes at -1, while for policies to the right of 0, $U(x)$ decreases without bound. So there is no policy to the left of 0 that provides the same utility as, say, $x = 10$. Another way to guarantee the existence of $R(x)$ is to assume that $\lim_{x\to\infty} U(x) = -\infty$ and $\lim_{x\to-\infty} U(x) = -\infty$. Note that this assumption is neither weaker nor stronger than assuming

and R, respectively. Let $q \in \Re$ denote the status quo policy and x_t denote the policy proposal that P makes in period t. Let z_t denote the policy outcome in period t. $z_t = q$ if R has rejected all of P's offers. Otherwise it is the first offer that R accepts. I consider two types of games: one with a finite number of proposal periods, and one with an infinite number of proposal periods. A single period of either game has the following structure:

1. The proposer, P, makes a proposal, x_t, at the beginning of period t.
2. The receiver, R, accepts or rejects the proposal.
3. If R accepts the proposal, x_t becomes the policy for the remainder of the game's periods, and the game ends.
4. If R rejects the proposal, q remains the policy in that period, and a new period begins. If the rejection took place in the game's final period, the game ends with the status quo as the policy.

Each player maximizes his or her discounted stream of utility,

$$\sum_{t=1}^{T} \delta_i^{t-1} U_i(z_t), \quad i = P, R,$$

where T is not necessarily finite.

3.2 Equilibrium Concept

The equilibrium concept that I adopt is subgame perfect Nash. While in some bargaining models a stationarity refinement[11] is adopted, it is not necessary to generate the results discussed here.

4. Results

Before presenting results, it is useful to define some notation. Let $R(x)$ be R's indifference point with respect to x. In other words, $R(x) \neq x$ gives R the same utility as x. With a symmetric, absolute-value utility function, for example, $R(0) = 2$, and $R(2) = 0$, and more generally, $R(q) = 2 - q$. Note that strict single-peakedness implies that $R(x)$ is unique $\forall x \in \Re$. Further, the symmetry of $U_R(\cdot)$ assures that $R(x)$ exists $\forall x \neq 1$. So that $R(x)$ is defined $\forall x$, let $R(1) = 1$. Figure 1 presents an example of an indifference point for a symmetric, absolute value utility function.

The following is a restatement of the Romer–Rosenthal equilibrium for any single-peaked utility function.[12] It will be useful in stating the general results.

symmetry, since neither implies the other. I do not rule out the possibility that there exists another proof strategy that does not require the existence of $R(x)$ for all x (and hence would allow the symmetry condition to be dropped). I thank Marcus Berliant and an anonymous referee for helpful comments on this issue.

11. A stationary strategy is one in which all players take the same action in structurally equivalent subgames. A stationarity refinement requires that, in equilibrium, the continuation values for each structurally equivalent subgame are the same. See Baron and Ferejohn (1989).

12. Because this result will be familiar to most readers, the proof is omitted.

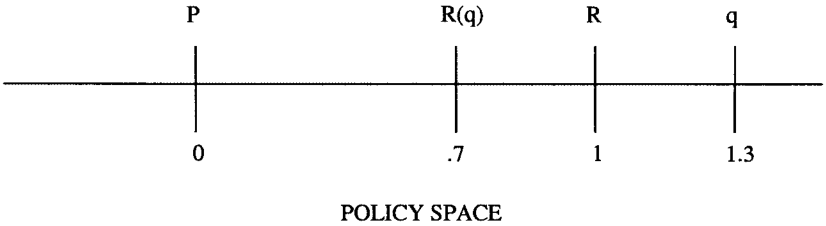

Figure 1. Example of indifference point, $R(q)$.

Proposition 1 (One-Period Equilibrium). For a given status quo, q, and $T = 1$, the equilibrium policy outcome, z^*, is unique. Specifically,

$$z^* = \hat{z} \equiv \begin{cases} 0 & \text{if } q \leq 0 \\ q & \text{if } q \in (0, 1] \\ I(q) & \text{if } q \in [1, R(0)) \\ 0 & \text{if } q \geq R(0) \end{cases}$$

Example 1. As an example, consider an absolute value utility function: $U_P = -|z|$ and $U_R = -|z - 1|$. Note that the Pareto set in this case is $\{x : x \in [0, 1]\}$. It is obvious that the status quo remains in place when it falls in the Pareto set, since any movement of the policy makes at least one player worse off. For status quo points such that $U_R(q) < U_R(0)$ (i.e., $q < 0$ or $q > 2$), P can propose his ideal point, and R accepts. For $1 < q \leq 2$, the agenda setter proposes $2 - q$, the point in the Pareto set that he most prefers given that it is acceptable to the receiver. This logic extends to any single-peaked, symmetric utility function. The key is that for any status quo point, the agenda setter selects a utility-maximizing policy subject to the constraint that the receiver is not made worse off. Figures 2 and 3 demonstrate the movement of policy, given the location of the status quo point.

Now suppose that bargaining is permitted for up to T periods, where T is finite. One might expect that this will change the equilibrium policy outcome, since there is another chance to bargain if agreement is not reached in the first period. However, this is incorrect. The equilibrium policy outcomes are unchanged as we move from 1 to T periods.

Proposition 2 (T-Period Equilibrium). For a given status quo, q, $\forall$ finite T, and $\forall\, \delta \in (0, 1]$, $z^* = \hat{z}$ is the unique equilibrium policy outcome.

Proofs are presented in the appendix.[13] Here is the intuition for solving this game. Note that the final period of the game looks like a one-period

13. While this is technically not a repeated game, it shares the property of a repeated game: if there exists a unique subgame perfect Nash equilibrium in a one-shot version of a stage game, then the strategies of that equilibrium, repeated in every period, form the unique subgame perfect Nash equilibrium in the repeated stage game. See Gibbons (1992) or Mas-Colell, Whinston, and Green (1995).

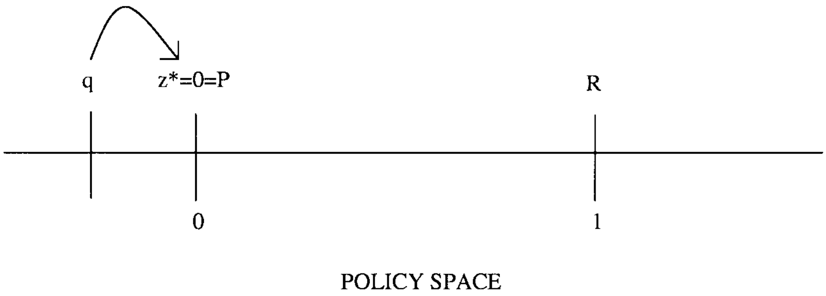

Figure 2. Equilibrium z^* when $q < 0$.

game, so that subgame will produce a policy outcome of $\hat{z}$. Next, consider the next-to-last period of the game. If no agreement is reached, players know that $x_T^* = \hat{z}$ will be the equilibrium policy outcome in the next period. The proposer wants to select the policy that maximizes his utility such that the receiver prefers to accept the proposal and receive the utility from it for this period and the next period versus taking the status quo in period $T-1$ and $x_T^* = \hat{z}$ in period T. Formally, this can be represented as

$$(1+\delta_R)U_R(x_{T-1}^*) \geq U_R(q) + \delta_R U_R(x_T^*).$$

Note that if $q \in [0, 1]$, then the proposer can do nothing but propose q, since any other offer would be rejected. For $q < 0$ or $q > R(0)$, the proposer can propose his ideal point 0, and the receiver will accept it, since it makes him better off than taking the status quo in period $T-1$ and 0 in the final period. For $q \in (1, R(0))$, the proposer can do no better than proposing $R(q)$, since the receiver would reject any offer less than that policy, by definition of the indifference point. This argument extends back to the first period of the game. The simplest way to prove the result is through induction.

Several interesting features of this result deserve mention. First, note that discount factors do not enter into the equilibrium, and the equilibrium holds for *all* discount factors including one. This implies that in a finite setting,

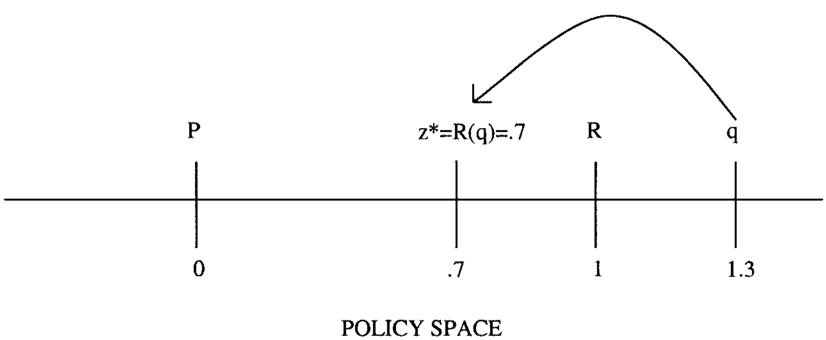

Figure 3. Equilibrium z^* when $1 < q < R(0) = z$.

a perfectly patient receiver or a perfectly patient proposer cannot gain any advantage over the other. Consider an example of absolute value utility where $q = -1.5$. Suppose that the proposer is very impatient while the receiver is very patient (e.g., $\delta_P = .1$ and $\delta_R = .9$). Intuitively one would expect the equilibrium policy to be pulled toward R (say, to .1 or .2). But the receiver cannot credibly threaten to reject the status quo because of subgame perfection; he is aware of P's equilibrium strategy and knows that he will be worse off if he acts on any threat.

Second, notice that the proposer's power does not depend on T. One might expect that adding additional periods to the game might advantage the receiver, since he can threaten to hold out for a better offer. For the same reason that discounting does not affect outcomes, the number of periods does not affect the outcome.

I now turn to the infinite-horizon case, which is more difficult to solve. I place no restrictions on the equilibrium, such as a stationarity refinement. The general result is the same, with one exception: when $\delta_R = 1$.

Proposition 3 (Infinite-Horizon Equilibrium). For $\delta_R \in (0, 1)$, $T = \infty$, and $\forall\, q$, $z^* = \hat{z}$ is the unique equilibrium policy outcome.

The strategy for solving this game is to make use of the fact that there are upper and lower bounds on the possible policies that can be enacted in equilibrium, given a status quo point. Showing that these upper and lower bounds are equal implies a unique policy equilibrium.[14]

The absence of multiple or infinite equilibrium policy outcomes may be surprising. However, upon closer reflection, we should not expect a Folk theorem to be operative. Intuitively, Folk theorem results emerge when there are credible punishment or reward strategies that can be invoked. This is not possible in this game, because each player (implicitly) has veto authority over the policy outcome, either by not proposing a particular policy, in the case of the proposer, or by rejecting a proposal, in the case of the receiver.

However, one can find other bargaining models in which punishment strategies are viable, because of the number of players. For example, a Baron–Ferejohn game has an infinite number of subgame perfect Nash equilibria (SPNE) (for sufficiently large n), because the ability to exclude members from a coalition allows for the formation of punishment strategies. In the single-proposer model, it is the number of players and the nature of the policy space that prevents punishment strategies from being implemented.

This result demonstrates that the equilibrium policy outcomes do not depend on discount factors, even in an infinite-horizon case. So even if the proposer and receiver know that there is a chance that the game could end at any time, the proposer cannot use this fact to gain at the expense of the

14. The proof's structure is similar to a proof for the Rubinstein bargaining game (see Fudenberg and Tirole, 1991).

receiver.[15] By the same token, the receiver cannot use this to his advantage either. There is an exception though: when the receiver is perfectly patient.

Proposition 4 (Special Case: $\delta_R = 1$). If $\delta_R = 1$ in an infinite-horizon model, the equilibrium policy outcomes are not necessarily unique.

In this knife-edge case, the receiver can obtain a lot of power and can turn the tables on the proposer. Specifically, if $\delta_R = 1$, then any θ s.t. $U_P(\theta) \geq U_P(q)$ and $U_R(\theta) \geq U_R(q)$ can be sustained as a policy outcome of the game. Because the proposer is perfectly patient, the average payoff criterion must be used in place of discounted utility. When the average payoff criterion is used, any given period of the status quo does not affect the receiver's average payoffs. Therefore he can credibly commit to rejecting offers, a situation not present in earlier cases. Note that this result holds only when δ_R is *exactly* equal to 1, and the result is driven for the most part by the fact that an infinite stream of payoffs is not well-defined when receivers are perfectly patient. Therefore this is the exception that proves the rule: only in a knife-edge case do time preferences affect the results, and this is for technical reasons, as practically speaking there is little distinction between $\delta = .99$ and $\delta = 1$.

5. Discussion

5.1 Main Results

In this article I demonstrate that a single-proposer model produces identical policy predictions, regardless of the number of periods, and that these results are identical to those presented by Romer and Rosenthal (1978). Further, the predictions do not depend on the patience of either party, and there are no end-of-game effects in the T-period case. The agenda setter is able to move policy away from the receiver's ideal point only in certain situations, suggesting that the agenda setter is not unrealistically advantaged in a single-proposer model. The fact that R gains no power as the game moves to multiple periods is surprising. Even more surprising is that the receiver gains power through time preferences only in a knife-edge case of perfect patience.

The intuition for the result is that in a spatial setting, the proposer can only move policy if it makes him better off without making the receiver worse off than the status quo. The receiver is comparing a stream of policy payoffs given an offer today versus settling with the status quo for this period and waiting until the next offer is made. Depending on the status quo point, delay may or may not harm the players. In a divide-the-dollar model, by comparison, delay is always harmful to at least one of the players.

This article makes both a theoretical and a substantive contribution to the literature: On a theoretical note, I present a result that can be used to solve

15. The discount factor in bargaining games is sometimes interpreted as a measure of uncertainty over when the game will end.

other models. On a substantive note, this result suggests that impatience and time preferences may not be key features of political bargaining. Admittedly this is a controversial claim, but it is an empirically testable one. If it is supported empirically, then it represents a rather major finding in the political bargaining literature, since there are few if any models that would predict that the time horizon or the impatience of the players does not affect political outcomes. If it is falsified, then it suggests that the spatial model needs to be modified to better account for time preferences and time horizons. Either way, this article provides the groundwork for considering how time preferences and time horizons affect bargaining in a two-player, unidimensional framework, and the results presented here represent a challenge for theorists seeking to understand political bargaining. In the remainder of this article I show how the model can be applied to an understanding of the effect of constitutional, statutory, and other bargaining rules on policy outcomes, and I suggest theoretical extensions to the model.

5.2 Empirical Applications

There are several empirical applications which flow from the model. The first involves term limits and elections. The fact that discount rates do not matter suggests that a longer term for an executive (and hence presumably a higher discount rate) should not give him any additional bargaining power. This could be tested by looking at cases where the length of terms was changed, or by comparing the relative power of governors with different terms across the states.

This model is particularly appropriate for examining presidential appointments. For example, Snyder and Weingast (2000) show that a single-proposer model predicts appointments to the NLRB better than other theories in the literature. It may also offer part of an explanation for why certain types of appointments are less likely to be challenged than others. In some cases, when there exists a dispute over a political appointment, the president can fill the position, albeit temporarily, with the candidate of his choice. Contrast this to judicial vacancies. When a judicial vacancy emerges, courts generally still function in the interim. So if the Senate prefers the new composition of the court in question, it may stall in filling the appointments. Therefore, when he can in essence "create" his own status quo point through interim appointments, the president is able to pick ideologically aligned subordinates with far less scrutiny than, say, in the selection of judges.[16]

This model could be extended to periods with more than two decision nodes. Along these lines, I conjecture that Krehbiel's (1998) pivotal politics model, in which a period consists of an offer, a potential veto, and a potential override, produces an identical equilibrium if bargaining can continue. This can be applied to state budget negotiations. In some states, if a budget agreement is not reached by the beginning of the fiscal year, spending reverts

16. See McCarty and Razaghian (1999) for the argument that presidents engage in strategic anticipation of Senate opposition when timing and selecting appointments.

to zero automatically and cannot be overturned by a continuing resolution. In other states, a continuing resolution can be passed. A modified version of the single-proposer model predicts that the legislature should be advantaged in negotiations when the reversion point is mandated at zero.

The theme of Romer and Rosenthal's (1978) article is initiatives, and this model applies to that area also. It suggests that the ability to continue placing initiatives on the ballot does not change the equilibrium outcome. Further, an interesting extension to the model would be to allow the proposer to have different ideal points from period to period, or to allow there to be multiple proposals in a given period, with the one receiving the most votes being enacted.

5.3 Theoretical Extensions

Theoretical work remains as well. For instance, one could model the risk of electoral defeat or term limits to ascertain the effects of electoral turnover on bargaining. Another possibility is to add the costs of bargaining to the model directly, or to make it a game of incomplete information over political bargaining costs or time preferences.[17] These models are likely to generate interesting testable predictions about political bargaining. A model of incomplete information over bargaining costs might explain the government shutdown of 1995–1996, as well as other breakdowns in bargaining. A model with bargaining costs could explain why the same proposal is made repeatedly, with little chance of success, in publicly observed bargaining.[18] Ordinarily, if the status quo is in the Pareto set, both sides know that the policy is immovable. Yet if the proposer knows that the pivotal voter has high public opinion costs, he may be able to shift the policy toward his ideal point.

In addition, one could consider a repeated, dynamic version of the single-proposer model, with endogenous reversion points and electoral turnover. It is straightforward to establish that the equilibrium results I present hold for a repeated version of this model without electoral turnover. With electoral turnover, the results would be affected to the extent that decision makers anticipated large shifts in the location of the proposer or the receiver. Policies would be chosen with an eye toward constraining the behavior of future legislators. Research on these models is wide open, and this article serves as a basis for further work in this and other areas involving one proposer.

Appendix

A.1 Proof of Proposition 2: Finite Horizon Game

Proof. The proof proceeds by induction. Proposition 1 proves the case for $T = 1$. Now, assume that the proposition is true for finite T. By showing that this implies the proposition is true for $T + 1$, I am done.

17. The results could be compared to those in Rubinstein (1985). See Cameron (2000a:68) for a brief discussion of these models. See Cameron and Elmes (1994) and Cameron (2000b) for models in which there is incomplete information about the president's ideal point.

18. For an alternative explanation, see Groseclose and McCarty (2001).

Consider a game with $T+1$ periods. By subgame perfection, the equilibrium to the last T-period subgame of the $T+1$-period game must be the same as the equilibrium to the T-period game (i.e., $\hat{z}$). But then this reduces the game to a one-period decision. Given this, all I need to show is that P's optimal proposal in period $T+1$ is $\hat{z}$ and it is optimal for R to accept it. Let x_1 be P's offer to R in period 1. The value to R from rejecting in period 1 is $U_R(q)+\sum_{t=2}^{T+1}\delta_R^{t-1}U_R(\hat{z})$, where $\hat{z}$ is the equilibrium policy outcome in the one-period and, by hypothesis, T-period game. Subgame perfection requires R to accept if and only if

$$U_R(x_1)+\sum_{t=2}^{T+1}\delta_R^{t-1}U_R(x_1)\geq U_R(q)+\sum_{t=2}^{T+1}\delta_R^{t-1}U_R(\hat{z}). \tag{A1}$$

The equilibrium is for P to choose x_1 that maximizes $U_P(x_1)$ subject to Equation (A1). To solve for x_1, I consider cases and show that $x_1^*=\hat{z}$ for all cases.

First, consider $q\in(-\infty,0]$. Here $\hat{z}=0$. Note that $x_1=0$ satisfies Equation (A1). Since $x_1=0$ gives the proposer his ideal point and satisfies Equation (A1), it is the equilibrium policy.

Next, consider $q\in(0,1]$. Here $\hat{z}=q$. Note that $\hat{z}=q$ satisfies Equation (A1). Further note that Equation (A1) binds and is never satisfied for $x_1<q$. By the definition of the indifference point and single peakedness, this implies that Equation (A1) is satisfied iff $x_1\in[q,R(q)]$, where $R(q)>1$. From this set of policies, q clearly maximizes P's problem.

Next, consider $q\in(1,R(0)]$. Here $\hat{z}=R(q)$. Algebraic manipulation reduces Equation (A1) to $U_R(x_1)\geq U_R(q)$, which is satisfied iff $x_1\in[R(q),q]$. Since $R(q)>0$, P's optimal proposal is $R(q)$.

Finally, consider $q\in(R(0),\infty)$. Here $\hat{z}=0$. Note that 0 maximizes P's problem without the constraint, and that the constraint does not bind when $x_1^*=0$. Thus $x_1^*=0$.

I have now shown for the entire policy space that $x_1^*=\hat{z}$. This implies that if the proposed equilibrium outcomes obtain for the T-period game, then they must also obtain for a $T+1$-period game, and hence that $z^*=\hat{z}$ for any finite T. By induction, the proposition follows. ■

A.2 Proof of Infinite Horizon Game

Before beginning the proofs, it is useful to define the following notation. Let Σ^* be the set of (potentially history-dependent) equilibrium strategy profiles, and let X be the set of policies enacted in any equilibrium represented by Σ^*. X is used extensively in the proofs. While I do not specifically refer to history-dependent strategies in the proof, they are incorporated in the definition of X.

Proposition A.1. For $\delta_R\in(0,1)$, $q\in[0,1]$, and $T=\infty$, q is the unique equilibrium policy outcome.

Proof. First, it is trivial to show that q is an equilibrium outcome to the game. Consider an SPNE where q is proposed by P in every period, and where R accepts all offers $x \in [q, R(q)]$, and rejects all others. Neither player has an incentive to defect in any subgame.

To show uniqueness, suppose that there exists another equilibrium with a policy outcome different than q. Call it $\tilde{x}$. There are two cases: $\tilde{x} < q$ and $\tilde{x} > q$. Consider the first case, and suppose that R defects and rejects $\tilde{x}$. Let v be R's continuation value of the game upon rejection. Denote V as the set of continuation values in this game. Since R always has the option of rejecting a policy and receiving q, this implies that $\inf V \geq \frac{U_R(q)}{1-\delta_R}$.

Defection is rational if and only if

$$U_R(q) + \delta_R v > \frac{U_R(\tilde{x})}{1-\delta_R}. \tag{A2}$$

Notice that Equation (A2) is satisfied $\forall\, v \in V$, given the lower bound on the infimum of V. This implies defection, a contradiction. Now, say $\tilde{x} > q$. Notice that P can always do better by proposing q. So this can never be an equilibrium, which is a contradiction. ■

Proposition A.2. For $\delta_R \in (0, 1)$, $q < 0$, and $T = \infty$, 0 is the unique equilibrium policy outcome.

Proof. Recall that X is the set of equilibrium policies enacted as part of some equilibrium strategy profile Σ^*. Define $\bar{x} = \sup X$ and $\underline{x} = \inf X$. The strategy of the proof is to show that $\bar{x} = \underline{x} = 0$, which implies that $X = \{0\}$.

First, note that $\bar{x} \geq 0$, since the following is an SPNE: $\{P$ proposes 0 in every period, and R accepts all offers $x \in [x_0, R(x_0)]$ in every period, where x_0 satisfies $\frac{U_R(x_0)}{(1-\delta_R)} \geq U_R(q) + \frac{\delta_R}{(1-\delta_R)} U_R(0)\}$. Also, $\bar{x} \leq R(q)$, since R can always reject offers that make him worse off than the status quo.

To show that $\bar{x} = 0$, suppose instead that $\bar{x} \in (0, R(q)]$. By the continuity of $U_R(\cdot)$ and the fact that $\delta_R < 1$, $\exists\ \tilde{x} \in (0, \bar{x})$ such that

$$\frac{U_R(\tilde{x})}{1-\delta_R} > U_R(q) + \frac{\delta_R U_R(\bar{x})}{1-\delta_R}. \tag{A3}$$

Note that the right-hand side of Equation (A3) represents the upper bound on the payoff R can receive after rejecting a proposal by P. Therefore R would accept $\tilde{x}$ if offered. Since P prefers $\tilde{x}$ to $\bar{x}$, he would propose it. This shows that there is a profitable defection. Thus $\bar{x}$ cannot be an equilibrium, which is a contradiction. It follows that $\sup X = 0$.

Next, let's show that $\inf X = 0$. To do this, suppose not. This implies that $\exists\, \tilde{x} \in [R(q), 0)$ proposed in some period t. But suppose that P defects in that period and proposes 0. R clearly accepts this, since I have just shown that he can never do any better. Therefore this cannot be an equilibrium. This implies that $\inf X = 0$.

I have now shown that $\inf X = \sup X = 0$, which implies $X = \{0\}$. ■

Proposition A.3. For $\delta_R \in (0, 1)$, $q > R(0)$, and $T = \infty$, 0 is the unique equilibrium policy outcome.

Proof. The proof is virtually identical to the proof of Proposition A.2, except that q is substituted for $R(q)$ when establishing bounds on $\bar{x}$ (i.e., $\bar{x} \in [0, q]$). ■

Proposition A.4. For $\delta_R \in (0, 1)$, $1 < q < R(0)$, and $T = \infty$, $R(q)$ is the unique equilibrium policy outcome.

Proof. Recall that X is the set of equilibrium policies enacted as part of some equilibrium strategy profile Σ^*. Define $\bar{x} = \sup X$ and $\underline{x} = \inf X$. The strategy of the proof is to show that $\bar{x} = \underline{x} = R(q)$, which implies that $X = \{R(q)\}$.

First, I show that $\underline{x} = R(q)$. Notice that by definition no equilibrium can have a policy outcome $z^* < R(q)$, since R would reject it because he prefers the status quo. Next, the following is an SPNE: $\{P$ proposes $R(q)$ in every period, and R accepts all offers $\in [R(q), q]$, and rejects all others, in every period$\}$. This implies that $\inf X = R(q)$.

Next, I show that $\bar{x} = R(q)$. First, note that if $\bar{x} > 1$, P could defect, propose 1, and know that R will accept. This implies that $R(q) \leq \bar{x} \leq 1$. To show that $\bar{x} = R(q)$, suppose instead that $\bar{x} \in (R(q), 1]$. By the continuity of $U(\cdot)$ and the fact that $\delta_R < 1$, $\exists\ \tilde{x} \in (R(q), \bar{x})$ such that

$$\frac{U_R(\tilde{x})}{1-\delta_R} > U_R(q) + \frac{\delta_R U_R(\bar{x})}{1-\delta_R}. \tag{A4}$$

Note that the right-hand side of Equation (A4) represents the upper bound on the payoff R can receive after rejecting a proposal by P. Therefore R would accept $\tilde{x}$ if offered. Since P prefers $\tilde{x}$ to $\bar{x}$, he would propose it. This shows that there is a profitable defection. Thus $\bar{x}$ cannot be an equilibrium, which is a contradiction. It follows that $\sup X = R(q)$.

I have now shown that $\inf X = \sup X = R(q)$, which implies $X = \{R(q)\}$. ■

Proposition A.5 (Special Case: $\delta_R = 1$). If $\delta_R = 1$ in an infinite horizon model, the equilibrium policy outcomes need not be unique.

I demonstrate this result through an example, since one case proves the result. Note that when $\delta_R = 1$, some of the steps in the prior proofs do not hold, since they contain terms with $1 - \delta_R$ in the denominator. This means that continuation values and utilities are undefined for R. I adopt the average payoff criterion to address this problem, and I assume that $\delta_R = 1$.

First, consider an absolute value utility function: $U_P = -|z|$ and $U_R = -|z-1|$. Let $q = 1.5$. Consider the following strategies for P and R. P proposes $.5 + \epsilon$ and R accepts all offers in $[.5 + \epsilon, 1.5]$, and rejects all others.

To see that this is a subgame perfect equilibrium, suppose that P deviates by proposing $.5+\alpha$, where $\alpha \in [0, \epsilon)$. By the average payoff criterion, R's decision rule now is to accept if and only if

$$U_R(.5+\alpha) > U_R(.5+\epsilon),$$

which can be rewritten as

$$-.5+\alpha > -.5+\epsilon.$$

Since by construction $\alpha < \epsilon$, this implies rejection of the offer. Therefore P cannot improve his payoff by defecting, and this equilibrium can be sustained.

Note that the proposer's discount rate is still irrelevant. All that is required is that the receiver is perfectly patient. On the other hand, if the proposer is perfectly patient, but the receiver is not, then Proposition 3 holds. And it is clear that if both the receiver and the proposer are perfectly patient, Proposition 3 breaks down.

To show that the above could not be an equilibrium if $\delta_R < 1$, note that in the proposed equilibrium, R accepts a (deviating) offer of $.5+\alpha$ if and only if

$$\frac{-.5+\alpha}{1-\delta_R} > -.5+\frac{-.5+\epsilon}{1-\delta_R}$$

which reduces to

$$\alpha+.5(1-\delta_R) > \epsilon.$$

Because $\delta_R < 1$, it is straightforward to show that for any ϵ there is an α that satisfies this relation. This means that P has an incentive to defect, which implies that the equilibrium breaks down. ■

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