Do Senators Take Strategic Advantage of their Last Names?*

Mehdi Shakiba†

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Abstract

In this paper I develop a sequential voting model to study roll-calls in the United States Senate, and empirically test its implications. In this procedure, senators cast their votes in a sequence, exogenously determined by the alphabetical order of their last names. I categorize senators into multiple types whose utilities depend not only on the roll-call outcome, but also on the vote they personally cast. When, among certain types, preferences over the senator's personal vote and the roll-call outcome are not aligned, abstention emerges as a nontrivial choice. For example, on a specific Republican-sponsored bill, a Republican senator representing a moderate constituency may want the legislation to pass, but not to be pinned down by a vote for it. As a result, the senator may want to vote for the legislation if that vote is necessary for the legislation to pass, but to abstain or vote against it if the vote is unnecessary for victory, or if it is clear that it will not be passed. I prove that, in the sequential voting context, the opportunity to make such strategic decisions is not uniformly available to senators with different alphabetical ranks, which determines their positions in the voting queue. More specifically, the model predicts lower levels of abstention for those in the middle, implying a U-shaped relationship between rank and likelihood of abstention. Using the data from Senate roll-calls between 1867 and 2015, I find a significant U-shaped quadratic relationship between rank and likelihood of abstention, which provides empirical evidence that senators do indeed take strategic advantage of their last names.

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†Department of Economics, University of Illinois at Urbana-Champaign; 214 David Kinley Hall, 1407 W. Gregory, Urbana, IL 61801; shakiba2@illinois.edu.

1 Introduction

Inferring the ideological leanings of legislators has been a central topic of research for many decades. In their seminal work, Poole and Rosenthal (1985) formulated a spatial utility function to analyze political choice data. The latest iteration of their model, DW-NOMINATE (Carroll et al., 2009), is widely used as a quantitative measure of representatives' and senators' ideology across congressional chambers and across time. Another technique, developed by Clinton, Jackman, and Rivers (2004), uses a Bayesian procedure for estimation of spatial models.

In studying political choice data, most researchers have ignored abstention. Poole and Rosenthal (1997) claim there is very little policy-related abstention in the U.S. Congress. As a result, they treat abstentions as missing data. Using a slightly different approach, Clinton et al. (2004) generate multiple imputations for abstentions, essentially deeming the phenomenon random. Other researchers, however, have argued that abstention can be a political *choice,* and hence nonrandom.

The literature on nonrandom nonresponses covers a broad spectrum of explanations. Observing the significant decrease in absenteeism among members of U.S. Congress, starting in the 1980s, Fett (1996) argues that better public access to recorded decisions made politicians behave more responsibly. Rothenberg and Sanders (2000a) find low participation among a non-trivial number of members of Congress due to electioneering. Interestingly, in another work (Rothenberg and Sanders, 2000b), they show that exiting members also reduce their effort level by voting less[1]. Scully (1997) studies the European Parliment (EP), and documents high participation in votes on legislation where the EP's influence is greater. In a somewhat similar finding, Noury (2004) uses the decision-theoretic approach of Rational Choice theory to explain abstentions in the EP, that is, agents choose to abstain if the cost of voting is greater than its (expected) benefit. There is a common thread in these explanations: abstention is a choice insofar as the only other alternative is voting. In this paper, however, I focus on the concept of *strategic abstention,* taking into account the voter's preferences not only over abstention or the other two alternatives (voting Yea or Nay), but also over the vote's overall outcome (passage or failure).

Strategic abstention is usually considered a consequence of competing principals, namely, constituents and party. There is a large body of research on party influence over legislators, as well as the extent of legislators' adherence to their constituency. When a particular (Yea or Nay) vote will alienate one of these principals, the legislator may find a middle ground in abstention. Based on the U.S. Senate data from 1979 to 1996, Jones (2003) shows that some legislators avoid taking positions in an effort to conceal their issue preferences from constituents. On the other hand, based on the U.S. Senate data from 1873 to 1935, Forgette and Sala (1999) find higher turnouts due to party leadership signals. Abstention can also

[1]The distinction is that the latter is shirking, while the former cannot be characterized as such.

cater to both principals: Covington (1988) claims that, during the Kennedy and Johnson presidencies, some southern Democrats strategically absented themselves from votes in order to help the president, while avoiding disapproval from their constituents.

While some researchers have extended the spatial models to analyze abstention and voting processes simultaneously (Rosas and Shomer, 2008; Rosas et al., 2015), I use a different approach to test the existence of strategic abstention. Members of the U.S. Senate cast their votes sequentially in the alphabetical order of their last names, a procedure often referred to as roll-call. I develop a straightforward sequential voting model with multiple types of senators which predicts a greater likelihood of senators breaking with their party lines, which can manifest itself in abstention, if they vote earlier rather than later. The ingenuity of investigating strategic abstention in a sequential voting context is that it requires no information on the ideology of senators. First, the identification of nonrandom abstention in sequential votes is quite straightforward: abstention cannot be purely random if there is a statistically significant link between the likelihood of abstention and the order of voting, much less if such a conclusion is based on data spanning over 150 years. Secondly, nonrandom abstentions are, by definition, strategic *irrespective of ideological leanings.* Empirical strategies that ignore sequentiality would inevitably need additional information on ideologies to detect nonrandom abstentions (Rodriguez and Moser, 2015; Cohen and Noll, 1991).

To understand the logic of the model, consider the example in Figure 1, a Senate comprising 3 senators from party D, and 2 from party R. Assume that the party in majority (D) wants to pass a bill that the minority party (R) vehemently opposes. Unlike the minority, some in the majority are moderates, perhaps because they represent moderate constituencies, and hence would rather not support the bill. However, due to pressure from their party, moderate senators will only break with the party if they know the bill is going to pass anyway. More specifically, assume that the first and last senators are moderates. Assuming that, in the case of a tie, the majority has the Vice President's tie-breaking vote[2], only one moderate can abstain without jeopardizing the passage of the bill. The moderate senator voting first has a strategic advantage over her[3] peer voting last: she can abstain and put the pressure on those voting after her to make sure the bill will pass.

The example above relies on the complete-information assumption that the majority senators know with certainty that no one will put their "moderation" above the party. But what happens if there is a small chance that someone might abstain, regardless of its effect on the final outcome of the roll-call? More specifically, assume that the senator in the middle abstains as well–not caring that this essentially kills the bill[4]. Following that, the last senator, whose vote is rendered inconsequential, is free to abstain as well.

[2]In the U.S. Senate, in the case of a tie, the Vice President (president of the Senate) may cast the tie-breaking vote.

[3]For simplicity, throughout this paper, I only use female pronouns to refer to senators.

[4]Recall that the majority could only afford one member to abstain. Once the second member abstains the bill is certain to fail as there will not be as many Yeas as there are Nays.

Incorporating this uncertainty, the model predicts an uptick in abstention toward the end of the queue, predicting a more nuanced U-shaped relationship between the order of voting and the likelihood of breaking with the party.

Unlike this paper, most of the literature on sequential voting concentrates on sequential elections, such as presidential primaries in the U.S. Some address the bandwagon (momentum) effect (Dekel and Piccione, 2000; Callander, 2007)[5], while others focus on multicandidate scenarios (Messner and Polborn, 2007; Deltas and Polborn, 2016; Hummel, 2012). Beyond elections, Battaglini (2005) and Bognar et al. (2015) study sequential voting mechanisms, albeit only theoretically, when voting is costly. The assumption of costly voting does not apply to roll-calls in legislatures, since legislators are expected to vote as part of their duties. In fact, not voting can be costly, especially for those who are going to run for re-election.

The study of roll-calls in the context of sequential voting is almost entirely absent in the literature. Spenkuch, Montagnes, and Magleby (2018) are the only authors, to my knowledge, to have explicitly analyzed sequential voting behavior in the U.S. Senate. Even though they, similar to this paper, invoke the concept of competing principals to model strategic behavior, we differ fundamentally in both our theoretical and empirical findings.

Spenkuch et al. (2018) treat abstentions as random. In fact, they cite "within-Congress variation in the set of senators who participate in a given roll-call" as one of the two sources of quasi-random variation in their empirical analysis[6]. The nonrandomness of abstentions evidenced in this paper questions the validity of their approach. Furthermore, they assume a complete-information setting, which leads them to predict only a linear (decreasing) relationship between the order of voting and the likelihood of departure from party lines. I, on the other hand, allow for uncertainty and, as a result, predict a U-shaped relationship. In other words, allowing for greater heterogeneity across agents results in a more informative prediction.

The remainder of the paper proceeds as follows. Section 2 formalizes the model and its implications. Section 3 gives an overview of the voting data in the U.S. Senate from 1867 to 2015. Section 4 presents the empirical results, and Section 5 concludes.

2 Model

The model detailed in this section is consistent with the rules of a *roll-call* vote in the United States Senate. There are, in fact, two other ways of voting in the Senate. When a motion is

[5]Studying such aggregation of information has not been limited to sequential elections. Iaryczower (2007) investigates this phenomenon in a model of voting in sequential committees.

[6]The other being "changes in the alphabetical composition of the Senate over time," which is also exploited in this paper.

up for a vote, the Senate often votes by a *voice* vote. A voice vote occurs when the presiding officer states the question, then asks those in favor to say *Yea* and those against to say *Nay.* The presiding officer announces the results according to his or her best judgment. If a senator is in doubt about the outcome of a voice vote, she may request a division vote, whereby the presiding officer counts the senators voting Yea and those voting Nay, to confirm the voice vote. The other vote, which is the least common, is a *division* (or *standing*) vote.

In neither a voice vote, nor a division vote, are the names of the senators and the tally of votes recorded. The only vote for which the records are kept, and is very commonly used, is a roll-call vote. When a roll-call has been ordered, each senator votes as her name is called by the clerk, who records the votes on a tally sheet.

Typically, a simple majority is required for a measure to pass. In the case of a tie, the Vice President (president of the Senate) casts the tie-breaking vote. In a few instances, the Constitution requires a two-thirds vote of the Senate, including: expelling a senator; overriding a presidential veto; adopting a proposed constitutional amendment; convicting an impeached official; and consenting to the ratification of a treaty.[7]. For the theoretical model in this paper, I use the simple majority rule.

2.1 Set-up

Assume there are n, an even number of, senators in the Senate. A roll-call is a sequential voting mechanism in which senators are called in alphabetical order of their last names. Thus, there is an *exogenously* determined sequence of senators. Once a senator's name is called, she must *publicly* vote. There are three available alternatives to choose from: voting *Yea* to support the motion, *Nay* to go against it, or *Abstain*[8] from voting. Once the votes are tallied, the motion is passed if the Yeas are more than the Nays. In the case of a tie, the motion will pass if the Vice President casts a Yea vote.

On any motion up for a vote, by definition, there are two sides of the aisle: each senator is either in favor of or against the motion[9]. Thus, on a specific vote, there are two *parties* in the Senate: the party that supports the motion, and the party that is against it. Furthermore, the party with a greater number of senators is called the *Majority* party, and the other side the *Minority* party. If senators are equally split on both sides, the majority is determined

[7]The Senate rules were retrieved from `https://www.senate.gov/general/Features/votes.htm`.

[8]Or, to use the official term, voting *Present:* when a senator is present, but does not take any sides. It must be noted, however, that a senator could also miss a vote if she is absent from the Senate floor. The distinction between *Not Voting* and voting *Present* could prove useful in terms of empirical analysis. However, unfortunately, such a distinction is not easily available for all roll-calls. Nonetheless, in Section 4.2, I use a sensible approach to identify abstentions that are most likely *Present*, and show that the same patterns exist among them.

[9]It must be self evident that motions with bipartisan support are trivial in terms of analyzing senators' strategic behavior, which is why I do not specifically address them.

by the occupant of the White House, since the Vice President would be casting the deciding vote.

Without loss of generality, assume that the Majority is supportive of a motion that has been put to a vote. Furthermore, and without loss of generality, assume that the White House is also supportive of the motion. Therefore, the Majority would have the Vice President's tie-breaking vote if necessary. Since the Majority has the potential tie-breaker on its side, it needs to secure at least as many Yeas as there are Nays, to have the motion passed.

It is important to note that this notion of parties does not have to be consistent with senators' political affiliations. In other words, senators who typically caucus with one another do not have to be on the same side of all issues. This is quite intuitive. For example, a Southern Democrat, on a vote regarding civil rights in the 1960s, would most likely identify with Republicans, and not with fellow Democrats. In this model, and on a *specific vote,* a Democrat could belong to the same party with many Republicans, and vice versa. In fact, as far as the model is concerned, political affiliations are irrelevant. What matters is the public knowledge vis-á-vis a senator's preference on the outcome of the roll-call. For example, at the beginning of the 115th United States Congress, there were 52 senators that identified as Republicans, 46 as Democrats, and 2 as Independents. Now imagine that all Democrats, both Independents, and one Republican–given the public information–were believed to be against a specific bill, while the rest of the Republicans–also, given the public information–were believed to be in favor of it. In this example, and consistent with the model, I group all those against the bill together and call them the Minority party. Similarly, I call the 51 Republicans supportive of the bill the Majority party. It is important to remember that Majority and Minority can, and indeed do, change from one vote to another. Many of the 51 Republicans may join Democrats to form a Majority party on *another vote.*

When it comes to individual voting behavior, how senators in the Majority would vote is an interesting question to ask. Are there senators who might not want to follow the party line? Recall that all those in the Majority, by definition, are believed to prefer the motion to pass. However, voting Yea might not be the ideal personal choice for everyone in the Majority. For example, the best scenario for a moderate Majority senator, typically representing a swing state, could involve the passage of the motion while the senator herself is *not* voting Yea. That way, the senator gets to satisfy her moderate constituents[10] without angering her peers in the Majority.

To formalize preferences, I assume Majority senators, on a specific vote, are of four types:

[10] A moderate senator's desire to break with the party might also stem from genuine political beliefs on the issue, which may or may not be consistent with her median constituent's beliefs. However, distinguishing between a politician's personal belief versus that of her constituents would be immaterial in this setting. I am interested in analyzing situations when a senator's preference with regard to her personal choice does not perfectly align with her desired outcome of the roll-call. The true underlying reasons for such an unalignment do not have bearing on the senator's choice.

- *Typical:* a Typical Majority senator follows the party line, and votes Yea.
  Senator Ted Cruz is probably a good example of a Typical Majority senator. He has consistently voted with the Majority in recent congresses; and it is unlikely that he would politically benefit from breaking with the party.

- *Moderate:* a Moderate Majority senator would rather Abstain, and take a moderate position, than to vote Yea. However, if her vote is necessary for the passage of the motion, she will support it.

- *Swing:* a Swing Majority senator would rather join the other side of the aisle, and vote Nay. If that could risk the passage of the motion, she would then take a moderate position, and Abstain. Finally, if her vote is necessary for the passage of the motion, she would support it.
  Senator Susan Collins and Senator Lisa Murkowski are good examples of Moderate, or Swing, Majority senators. They have, on numerous occasions, broken with the Majority in recent congresses, either by abstention or voting Nay; it is very plausible that they would politically benefit from such opposition.

- *Fake:* a Fake Majority senator, is actually a Minority senator in disguise. She votes Nay.
  The late Senator John McCain is a good example of a Fake Majority senator. While McCain was a very conservative politician, it is plausible that, on certain votes, he had made up his mind to oppose the Majority while his peers did not know of that with certainty[11]. Note that, while Senator McCain might be a Fake Majority on *some* votes, he could be a Typical Majority on many other votes. Type assignments depend on the specific vote in question.

More specifically, let $u_{i,j}(P, \phi, V, O)$ denote the utility for Senator i, of type $\phi \in \{T, M, S, F\}$, from party $P \in \{\overline{m}, \underline{m}\}$, when vote j occurs, she votes $V \in \{Y, A, N\}$, and the outcome of the roll-call is $O \in \{1, 0\}$; where T stands for Typical, M for Moderate, S for Swing, $\overline{m}$ for Majority, $\underline{m}$ for Minority, Y for Yea, A for Abstain, N for Nay, 1 for the passage of the motion, and 0 for its failure. Then, the preferences for different types can be formalized as follows.

- For a Typical Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, T, Y, 1) &> u_{i,j}(\overline{m}, T, Y, 0) \\ &> u_{i,j}(\overline{m}, T, v, o) \text{ for } v \in \{A, N\}, o \in \{1, 0\} \end{aligned} \tag{1}$$

[11] For example, Senator McCain, to the surprise of many, voted Nay on the "skinny" repeal amendment to the Affordable Care Act.

- For a Moderate Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, M, A, 1) &> u_{i,j}(\overline{m}, M, Y, 1) \\ &> u_{i,j}(\overline{m}, M, A, 0) \\ &> u_{i,j}(\overline{m}, M, Y, 0) \\ &> u_{i,j}(\overline{m}, M, N, o) \text{ for } o \in \{1, 0\} \end{aligned} \tag{2}$$

- For a Swing Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, S, N, 1) &> u_{i,j}(\overline{m}, S, A, 1) \\ &> u_{i,j}(\overline{m}, S, Y, 1) \\ &> u_{i,j}(\overline{m}, S, N, 0) \\ &> u_{i,j}(\overline{m}, S, A, 0) \\ &> u_{i,j}(\overline{m}, S, Y, 0) \end{aligned} \tag{3}$$

- For a Fake Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, F, N, 0) &> u_{i,j}(\overline{m}, F, N, 1) \\ &> u_{i,j}(\overline{m}, F, v, o) \text{ for } v \in \{Y, A\}, o \in \{1, 0\} \end{aligned} \tag{4}$$

Since the passage of the motion would most importantly depend on how Majority senators vote, allowing Minority senators to also potentially break with their party would only cause insignificant details. That is why I assume all Minority senators are of one *Typical* type. A Typical Minority follows the party line, and votes Nay. More specifically,

$$\begin{aligned} u_{i,j}(\underline{m}, T, N, 0) &> u_{i,j}(\underline{m}, T, N, 1) \\ &> u_{i,j}(\underline{m}, T, v, o) \text{ for } v \in \{Y, A\}, o \in \{1, 0\} \end{aligned} \tag{5}$$

I assume that senators' party assignments are exogenously determined, and public knowledge. However, for a Majority senator, her type realization is private information. I further assume that Majority senators are *ex-ante heterogeneous:* Nature decides, neither independently, nor from identical distributions, the types for Majority senators. In other words, the collection of random variables determining Majority senators' types do not have to be IID. This allows for considerable flexibility in the model. Assume that a Majority senator i, in vote j, is of Moderate type with probability $\alpha_{i,j}$, of Swing type with probability $\beta_{i,j}$, and of Fake type with probability $\gamma_{i,j}$. More specifically:

$$\begin{aligned} \Pr\{\phi_{i,j} = T | P_{i,j} = \overline{m}\} &= 1 - \alpha_{i,j} - \beta_{i,j} - \gamma_{i,j} \\ \Pr\{\phi_{i,j} = M | P_{i,j} = \overline{m}\} &= \alpha_{i,j} \\ \Pr\{\phi_{i,j} = S | P_{i,j} = \overline{m}\} &= \beta_{i,j} \\ \Pr\{\phi_{i,j} = F | P_{i,j} = \overline{m}\} &= \gamma_{i,j} \end{aligned} \tag{6}$$

where $\alpha_{i,j} + \beta_{i,j} + \gamma_{i,j} \leq 1$. All Minority senators are of Typical type, and there is no uncertainty about it. More specifically, for a Minority senator i, in vote j, we have:

$$\Pr\{\phi_{i,j} = T | P_{i,j} = \underline{m}\} = 1 \tag{7}$$

Finally, assume the Majority has $n_{\overline{m}} \geq n/2$ seats in the Senate, leaving the Minority with $n_{\underline{m}} = n - n_{\overline{m}} \leq n/2$ seats. With Minority senators unanimously voting Nay, for the motion to pass, there needs to be at least an equal number of Majority senators, $n_{\underline{m}}$, voting Yea[12]. There are, potentially, $n - 2n_{\underline{m}}$ Majority senators who may be able to choose to break with the party, refraining from voting Yea. Which senators in the Majority will do so, in the equilibrium, is discussed in Section 2.2.

2.2 Subgame Perfect Equilibrium

The roll-call voting model described above is a *dynamic game with incomplete information.* Such games have at least one *subgame perfect equilibrium* that can be identified using *backward induction.*

First, I consider a simplified case without any Fake Majority senators.

Lemma 1. *Assuming $\gamma_i = 0$, for all i; the roll-call voting game specified in 2.1 has a unique subgame perfect equilibrium in which all Minority senators vote Nay, and the i-th Majority senator, according to her type, votes*[13]

$$V_i = \begin{cases} Y & \text{if} \quad \phi_i = T \\ A & \text{if} \quad \phi_i = M \quad \text{and} \quad \#Y \geq \#N - \#R + 1 \\ Y & \text{if} \quad \phi_i = M \quad \text{and} \quad \#Y = \#N - \#R \\ A & \text{if} \quad \phi_i = M \quad \text{and} \quad \#Y \leq \#N - \#R - 1 \\ N & \text{if} \quad \phi_i = S \quad \text{and} \quad \#Y \geq \#N - \#R + 2 \\ A & \text{if} \quad \phi_i = S \quad \text{and} \quad \#Y = \#N - \#R + 1 \\ Y & \text{if} \quad \phi_i = S \quad \text{and} \quad \#Y = \#N - \#R \\ N & \text{if} \quad \phi_i = S \quad \text{and} \quad \#Y \leq \#N - \#R - 1 \end{cases} \tag{8}$$

where $\#Y$ is the number of Yeas cast before the i-th senator has cast her vote, $\#N$ the number of Minority, $n_{\underline{m}}$, plus Nays cast by the Majority before the i-th senator has cast her vote, and $\#R$ the remaining number of Majority senators that have not voted yet, including the i-th senator.

[12]This, obviously, is due to the assumption that the Majority also controls the White House, and has the tie-breaker on its side. However, notice that relaxing this assumption would not change the problem dramatically. In fact, it would only be a trivial case: If the White House is controlled by the Minority party, then the Majority has to secure at least $n_{\underline{m}} + 1$ Yeas instead.

[13]The subscript j in equation (8) has been dropped for simplicity.

Appendix A details the proof of Lemma 1.

To see how senators vote *on the equilibrium path,* it is helpful to look at an example. Consider a Senate with 10 seats, comprising 4 Minority, and 6 Majority senators, with 2 of each type among the Majority. Recall that all Minority senators are, by design, of Typical type. Figure 2 illustrates such a Senate, with blue and red circles representing the Minority and the Majority, respectively. Types are indicated below the circles.

The votes, shown in Figure 2, are cast by each senator on the equilibrium path.The Minority unanimously votes Nay. Each Majority senator's vote is determined to be consistent with (8). The second Majority senator can cast her favorite vote without compromising the passage of the motion. She knows that Majority senators down the line, regardless of their types, will take care of ensuring that the motion will pass. However, when it comes to the third Majority senator, her vote is *pivotal.* When she is casting her vote, the Nays, including all Minority Nays, stand at 4, Yeas are at 1, and there are only 4 Majority senators left to vote, including herself. If she votes Nay, her favorite personal choice, the motion is doomed to fail[14]. Thus she chooses her less favored choice, and votes Abstain. Every other Majority senator that votes after the third Majority senator is pivotal with even more restrictions. They will have to vote Yea to secure the passage of the motion. In the end, there are 4 Nays and 4 Yeas. The Majority will pass the motion with the Vice President's tie-breaking vote.

A corollary of Lemma 1 is guaranteed passage. All members in the Majority, if necessary, will support the motion, and make sure that it will pass. Furthermore, the example above clearly exhibits the fundamental feature of the model when there are no Fake types: non-Typical Majority senators who vote earlier may have the opportunity to break with the party, and strategically coerce those later down the line to make sure the motion will pass. In the example in Figure 2, the third Majority senator is the first one to be in a pivotal position. Who ends up being the first pivotal Majority senator would obviously depend on the make-up of the Senate and type realizations. Nonetheless, the aforementioned feature remains the same.

Lemma 1 addresses the case without any Fake Majority senators. But what happens when the probability of such types is non-zero? Theorem 1 answers this question.

Theorem 1. *Assuming γ_i's, for all i, are small enough; the roll-call voting game specified in 2.1 has a unique subgame perfect equilibrium in which all Minority senators vote Nay, and*

[14] If she votes Nay, even if all the remaining 3 Majority senators vote Yea, there will not be enough Yeas to make up for the gap of 4 votes between Yeas and Nays.

the i-th Majority senator, according to her type, votes[15]

$$V_i = \begin{cases} Y & \textit{if} \quad \phi_i = T \\ A & \textit{if} \quad \phi_i = M \quad \textit{and} \quad \#Y \geq \#N - \#R + 1 \\ Y & \textit{if} \quad \phi_i = M \quad \textit{and} \quad \#Y = \#N - \#R \\ A & \textit{if} \quad \phi_i = M \quad \textit{and} \quad \#Y \leq \#N - \#R - 1 \\ N & \textit{if} \quad \phi_i = S \quad \textit{and} \quad \#Y \geq \#N - \#R + 2 \\ A & \textit{if} \quad \phi_i = S \quad \textit{and} \quad \#Y = \#N - \#R + 1 \\ Y & \textit{if} \quad \phi_i = S \quad \textit{and} \quad \#Y = \#N - \#R \\ N & \textit{if} \quad \phi_i = S \quad \textit{and} \quad \#Y \leq \#N - \#R - 1 \\ N & \textit{if} \quad \phi_i = F \end{cases} \tag{9}$$

where $\#Y$ is the number of Yeas cast before the i-th senator has cast her vote, $\#N$ the number of Minority, $n_{\underline{m}}$, plus Nays cast by the Majority before the i-th senator has cast her vote, and $\#R$ the remaining number of Majority senators that have not voted yet, including the i-th senator.

Before analyzing senators' voting behavior, it is important to discuss the assumption used in Theorem 1, which requires the probability of Fake types to be *small enough.* This is a reasonable assumption. Fake Majority senators, by definition, will definitely join the other side of the aisle; yet, from the standpoint of public information, no one is expecting this behavior. This has to be a rare occurrence[16]. Appendix B details the proof of Theorem 1, as well as the constraint on the probabilities for Fake types.

Given the assumption that Fake types are unlikely, the voting behavior of Moderate and Swing senators, described by (9), turns out to be identical to their behavior in the case without Fake types, described by (8). In other words, if the probability of Fake types is small enough, everyone else will play the game as if Fake types do not exist. But what happens if there is actually a Fake Majority senator in the voting queue? To see how senators, in this scenario, vote on the equilibrium path, let's look at the example illustrated in Figure 3. The make-up of the Senate and types in this example are identical to the example illustrated in Figure 2, except for the fourth Majority senator, who now is assigned a Fake type.

The votes are identical up to the fourth Majority senator. Like before, the second and third Majority senators get to break with their party, believing that their peers down the line will most likely ensure the passage of the motion. However, to the surprise of many, an

[15] The subscript j in equation (9) has been dropped for simplicity.

[16] Recall that political party affiliations are of no significance in this model. For example, a Republican senator, who is believed to be more in line with Democrats, is considered a Democrat in this model. However, if she herself is certain to vote with Democrats, and no one is expecting it, then she would be categorized as a Fake Republican. While the former happens often, the latter is quite rare.

unlikely Fake Majority senator, who happens to be in a pivotal position, votes Nay. Once it is the fifth Majority senator's turn to vote, she knows that the motion has already failed. Whether she votes Yea or not, there will not be enough Yeas for passage. Not being pivotal anymore, she can break with the party and Abstain, without taking the blame for the tanked roll-call. The same is true for the Majority senator that would go next. The last majority senator is not pivotal anymore and can vote according to her personal preference. In the end, the motion fails because a Fake majority senator in a pivotal position breaks with the party.

When Fake types are no longer impossible, the passage of the motion is not guaranteed. In fact, the motion will definitely fail if at least one Fake type is in a pivotal position. Among Moderate and Swing senators, who gets to break with the party? According to the example in Figure 3, those who get to vote early, similar to the case without Fake types, still have the opportunity to break with the party, and strategically coerce their peers down the line to vote Yea. However, if there is a Fake type in a pivotal position, then those who will vote after the Fake type will also feel free to break with the party, even though their departure from the party line is not as strategic[17].

2.3 Implications

The next step is to see whether the actual roll-call data from the Senate reflects the implications of the model. When studying the actual data, judging whether or not a Nay vote or a Yea vote is a strategic behavior becomes an incredibly difficult task that requires extensive research into every vote cast by every senator in the history of the Senate. Simply looking at party labels and identifying departures from one's party does not constitute strategic behavior[18].

Luckily, there is a much more straightforward implication that can be tested: the occurrence of abstention. Unlike voting Yea or Nay, abstention is unquestionably a form of breaking with the party. The model's prediction with regard to abstention depends on whether or not Fake types are a possibility. More specifically, if there are no Fake types in pivotal positions, the model predicts that abstention is more likely to take place among senators who vote earlier[19]. However, if there are Fake types in pivotal positions, then there

[17]Those who break with the party early on do so without certainly knowing the fate of the roll-call. On the contrary, those who break with the party after the emergence of a Fake senator in a pivotal position do so knowing with certainty that the roll-call is going to fail. In this sense, those breaking with the party later are not behaving as strategically as those who do so earlier.

[18]For example, if a Democratic senator, in advance of the roll-call, publicly announces her support for a Republican-sponsored bill, she will be categorized as a member of the Majority (Republicans) on that vote, according to the model. In this scenario, although she will vote Yea, her Yea vote is not a departure from her party. In fact, her Yea vote is consistent with a Typical Republican.

[19]While the model specified in 2.1 does not allow strategic behavior for the Minority, it would be easy to see how a modified version, that would allow every senator to vote strategically, would also imply the same

might be an uptick in the rate of abstention toward the end of the voting queue. If the latter occurs more often than not, one should be able to identify a U-shaped relationship between positions in the voting queue and the corresponding abstention rates.

In section 4 I empirically test these predictions and show that there is indeed a U-shaped relationship. I also discuss how the pattern differs across different subsets of the data, and what that tells us about the likelihood of Fake types. But first, before discussing the results, I introduce the data in Section 3.

3 Data

Voteview (Lewis, Poole, Rosenthal, Boche, Rudkin, and Sonnet, 2018) is a widely used, publicly available[20] database for Congressional roll-call votes. To test the implications of the model, I use all roll-calls in the U.S. Senate from the 40th Congress (1867) through the 113th Congress (2015). The 40th Congress is the first congress after the end of the American Civil War in 1865. Since then, there has been a robust two-party system in the United States, which makes this time period specifically relevant to the model in this paper.

Appendix C details summary statistics for votes cast in each congress, as well as the number of unique roll-calls and senators.

To normalize positions in the voting queue, I define the (alphabetical) *rank* variable, for each roll-call[21], such that the first senator is given a rank of zero, and the last a rank of one. Table 2 gives the summary statistics for ranks of senators casting different types of votes. At first glance, these numbers appear consistent with the model's prediction. While Yeas and Nays, reassuringly, have the same average rank, abstentions seem to occur earlier.

There is significant heterogeneity in abstention rates both over time (across 74 different congresses) and between 1,363 unique senators. Figure 4 shows distributions of senator-specific abstention rates, in each congress, using boxplots. It is easy to notice the general downward trend in abstention over time. Nonetheless, even in contemporary congresses, there are senators with abstention rates much greater than most of their peers. To control for congress-specific and senator-specific variations, all regression results presented in Section 4 include congress and senator fixed-effects.

To include more nuanced controls, I also consider the following variables:

- *Lopsidedness* of each roll-call: the difference between Yeas and Nays, calculated as a

features with regard to abstention.

[20] The data is accessible at `https://voteview.com/`.

[21] It is important to calculate ranks for each roll-call separately. Not only can the number of senators change with new states joining the union, it can also change from time to time due to various vacancies.

ratio of the total number of votes (including abstentions). More specifically:

$$Lopsidedness = \frac{|\#Yea - \#Nay|}{n} \in [0, 1]$$

In extremely lopsided roll-calls, where the Senate is unanimously for or against a motion, lopsidedness is 1. In extremely close roll-calls, where the Senate is 50-50 split, lopsidedness is 0.

- A binary *swing* state variable, which is set to 1 if the two senators representing the same state, in a specific roll-call, are not in the same party.
- A binary *majority* party variable, which is set to 1 if a Senator, in a specific roll-call, is in the party with the most number of seats in the Senate[22].

Table 3 gives summary statistics for these variables.

4 Empirical Results

As discussed in Section 2.3, the model predicts a U-shaped relationship between alphabetical rank and probability of abstention. To test this hypothesis, I estimate the following linear probability model[23]:

$$A_{i,r,T} = \mu_i + \eta_T + \beta_1 R_{i,r,T} + \beta_2 R^2_{i,r,T} + \gamma_1 L_{r,T} + \gamma_2 S_{i,r,T} + \gamma_3 M_{i,r,T}$$

where $A_{i,r,T}$ is 1 if senator i abstains in roll-call r in congress T. Rank, lopsidedness, swing, and majority variables are denoted by R, L, S, and M, respectively. μ_i's and η_T's are senator-specific and congress-specific fixed-effects, respectively.

Table 4 summarizes the main results, showing statistically significant estimates for rank and rank^2 which confirm the expected U-shaped relationship. Additional control variables, in the second column, do not change the estimated coefficients of interest to any significant extent. Furthermore, positive estimation for swing coefficient and negative estimations for lopsidedness and majority coefficients, are all consistent with the model. Senators from swing states have more incentive to take moderate positions, thus they abstain more often than those representing more polarized constituencies. A lopsided roll-call, most likely on an uncontentious issue, attracts less strategic behavior, which can lead to lower levels of abstention. Finally, senators in the majority are probably under greater pressure from their party to help pass the legislative agenda. Hence, they abstain less than those on the other side of the aisle.

[22]Note that in defining swing and majority variables, I use senators' official political party affiliation, which is different from the notion of Majority and Minority parties used in Section 2.

[23]In Section 4.1 I show that results are not sensitive to the choice of model.

Figure 5 depicts predicted probability of abstention as a function of rank, according to the base model (column 1, Table 4)[24]. The first senator (ranked at 0) abstains with 23.3% chance, while the last senator (ranked at 1) does so with 21.6% chance. Given the U-shaped relationship, the minimum probability of abstention is calculated at 20.8% for the senator ranked at 0.65. A Fake type, on average, is likely to appear after almost two-thirds of the senators have voted.

To see whether or not the main results hold over time, I estimate the base model on multiple subsets of the data, dropping a certain number of earlier congresses and keeping more recent ones. Table 5 summarizes these estimates. Results are qualitatively the same, which means the U-shaped relationship between rank and likelihood of abstention is identifiable across different time periods. Most importantly, this relationship is not driven by old data: it is just as relevant to more recent congresses.

As mentioned before, strategic behavior arises from unaligned preferences over one's personal vote and the roll-call outcome. It is reasonable to believe such unalignment is more likely to occur on more controversial issues that are likely to result in closer roll-calls. Is the U-shaped relationship identifiable when the data is limited to close roll-calls? Table 6, in column 2, shows the results when the data is limited to roll-calls with lopsidedness less than 0.34. That is, roll-calls in which the Senate was split closer than 1/3–2/3. Comparing the estimates with column 1 (the full data), it is clear that the relationship is just as strong–if not stronger–in close roll-calls.

4.1 Linear vs. Generalized Linear Models

A linear probability model can be implemented effortlessly and provides easily interpretable coefficients. However, since the dependent variable (abstention) is a binary variable, I also estimate the probability of abstention via generalized linear regressions to make sure that the main results are not sensitive to the choice of empirical model. More specifically, I estimate the following models.

- Logit:

$$A_{i,r,T} = \frac{e^Y}{1+e^Y}$$

- Probit:

$$A_{i,r,T} = \Phi(Y) = \int_{-\infty}^{Y} \phi(z)dz$$

where $Y = \mu_i + \eta_T + \beta_1 R_{i,r,T} + \beta_2 R^2_{i,r,T}$, and Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution.

[24] The predictions are given for a representative agent (senator). In other words, the intercept is calculated by taking the average of senator, and congress, fixed-effects.

Table 7 shows the results from the estimated logistic and probit regressions in columns 2 and 3, respectively. Both coefficients in both models are significant and consistent with the linear model. Thus, the choice of empirical model does not affect the main findings. In terms of magnitude, the coefficients from the linear model must be compared to the average marginal effects from the logistic and probit regressions.

4.2 Revising the Definition of Abstention

In reality, senators may abstain by physically not being present on the Senate floor during a roll-call, for reasons completely unrelated to politics[25]. In fact, officially, abstentions are recorded in two different categories. If the senator is absent, she is recorded as *Not Voting* on the roll-call. However, if she is present and wishes to not take sides on a roll-call, she may vote *Present*[26]. Since strategic abstention is more likely to manifest itself as a Present vote, as opposed to Not Voting, it would be interesting to see if the results hold after excluding Not Voting records. Unfortunately, the distinction between Present and Not Voting is not robustly available in the data[27].

Although a perfect identification of Not Voting is near impossible, it is reasonable to claim that long consecutive abstentions are more likely to have been due to absenteeism than the senator continuously, and actively, abstaining on multiple roll-calls. More specifically, if a senator has abstained on three-or-longer consecutive roll-calls, I label those as Not Voting. On the other hand, if a single abstention (or two abstentions back to back) is (are) preceded, and followed, by non-abstention records, I label those as Present. Doing so, I identify 368,356 abstentions (71% out of the total 522,086) as Not Voting. Table 8, in column 2, shows results when Not Voting abstentions, according to the aforementioned method, are dropped. The estimates are similar to those of the full data in column 1. This exercise confirms that dropping a significant portion of abstentions that do not qualify as likely strategic behavior does not affect the results.

4.3 Identifying Pivotality

Given that the model in this paper does not rely on senators' political affiliations, determining a senator's "party" in a specific roll-call, and whether or not she actually is in a pivotal position, is near impossible. Nonetheless, it is worthwhile to make an effort to identify pivotal positions in a limited subset of roll-calls. Borrowing from the model's set-up in Section 2.1, I focus on roll-calls where the minority party (according to political affiliations)

[25]Specifically, weather conditions (Cohen, 2012), sickness, and family-related events, to name a few.

[26]For example, on the confirmation of Brett Kavanaugh to be an Associate Justice of the Supreme Court of the United States, Senator Lisa Murkowski voted Present.

[27]For example, in 80th–88th Congresses, there are zero Not Voting records, which is simply impossible. For more details refer to the last column in Table 1 (Appendix C).

unanimously votes Nay. Looking at the majority voting queue, I can identify senators in pivotal positions. That is, those whose Yea votes are absolutely needed, or the motion will fail. I then further limit the data to roll-calls where there have been at least one pivotal position in the majority. There are 98 roll-calls in which every member in the minority votes Nay, and at least one senator in the majority finds herself in a pivotal position. Assuming that the minority's strong opposition was (ex-ante) public knowledge at the time of each of these roll-calls, the model predicts that senators in pivotal positions are less likely to break with their own party, compared to their peers in the majority. To test this hypothesis, I estimate the following linear probability model:

$$B_{i,r,T} = \mu_i + \eta_T + \beta P_{i,r,T}$$

where $B_{i,r,T}$ is a binary variable indicating whether or not senator i, in roll-call r in congress T, breaks with her party (votes Nay or Abstain), and P is a binary variable indicating whether or not she is in a pivotal position. μ_i and η_T are senator and congress fixed-effects, respectively.

Table 9 summarizes the results. Column 1 shows the estimation from all 98 roll-calls, and confirms that those in pivotal positions are less likely to break with the party. Focusing on a subset of roll-calls that are close (where the Senate was split closer than 1/3–2/3), I still can find lower chances of breaking with the party for those in pivotal positions. It is noteworthy that the coefficient in column 4 is not as statistically significant (with a p-value = 0.12) due to a small sample size[28].

5 Conclusion

Most analyses of voting behavior in legislature have dismissed abstentions as random. On the other hand, some have argued that abstention can be the optimal *choice* for a legislator who faces competing principals. Simply put, when a legislator's party demands her to vote in a way that is at odds with her constituency, abstention can be her best alternative. Employing a unique approach, I prove the existence of strategic abstention without any reliance on ideological measurements.

This paper is the first to study abstention in the United States Senate in the context of sequential voting. This particular setting makes it possible to measure strategic abstention in an almost perfectly randomized experiment. Given that senators cast their votes in the alphabetical order of their last names, non-strategic abstentions must not be correlated with alphabetical rank, especially if the data encompasses millions of votes cast by well over 1,300 senators over one and a half centuries.

[28]In column 4, there are 565 fixed-effects on a sample with only 2,705 observations. In fact, many senators are associated with only one observation in this sample. Thus, removing senator fixed-effects would not be unreasonable.

The established U-shaped relationship between rank and likelihood of abstention proves two things: *(i)* when registering a Yea or a Nay is politically costly, forward-looking senators take advantage of early voting and strategically abstain, and *(ii)* when an unlikely defection renders a roll-call certain to fail, subsequent senators find the freedom to also strategically abstain if it is in their best political interest.

These findings are robustly found in more recent sub-periods (e.g., 1967–2015), as well as in roll-calls when the chamber is split closer than 1/3–2/3. Additionally, when abstentions that are likely random are dropped, the U-shaped relationship remains intact, which further confirms that the relationship is driven by nonrandom abstentions. Finally, I also show that majority senators in pivotal positions, whose vote is required for legislation to pass, assuming that subsequent senators vote along party lines, are less likely to break with the party than their non-pivotal peers.

References

Marco Battaglini. Sequential Voting with Abstention. *Games and Economic Behavior*, 51 (2):445–463, 2005.

Katalin Bognar, Tilman Börgers, and Moritz Meyer ter Vehn. An Optimal Voting Procedure When Voting Is Costly. *Journal of Economic Theory*, 159(B):1056–1073, 2015.

Steven Callander. Bandwagons and Momentum in Sequential Voting. *The Review of Economic Studies*, 74(3):653–684, 2007.

Royce Carroll, Jeffrey B. Lewis, James Lo, Keith T. Poole, and Howard Rosenthal. Measuring Bias and Uncertainty in DW-NOMINATE Ideal Point Estimates via the Parametric Bootstrap. *Political Analysis*, 17:261–27, 2009.

Joshua Clinton, Simon Jackman, and Douglas Rivers. The Statistical Analysis of Roll Call Data. *American Political Science Review*, 98(2):355–370, 2004.

Alexander Cohen. Sweating the Vote: Heat and Abstention in the US House of Representatives. *PS: Political Science and Politics*, 45(1):74–77, 2012.

Linda R. Cohen and Roger G. Noll. How to Vote, Whether to Vote: Strategies for Voting and Abstaining on Congressional Roll-Calls. *Political Behavior*, 13(2):97–127, 1991.

Cary R. Covington. Building Presidential Coalitions Among Cross-Pressured Members of Congress. *The Western Political Quarterly*, 41:47–62, 1988.

Eddie Dekel and Michele Piccione. Sequential Voting Procedures in Symmetric Binary Elections. *Journal of Political Economy*, 108(1):34–55, 2000.

George Deltas and Mattias K. Polborn. Candidate Competition and Voter Learning in Sequential Primary Elections: Theory and Evidence. 2016.

Patrick J. Fett. Vote Visibility, Roll Call Participation, and Strategic Absenteeism in the U.S. House. *Congress the Presidency: A Journal of Capital Studies*, 23(2):87–101, 1996.

Richard Forgette and Brian R. Sala. Conditional Party Government and Member Turnout on Senate Recorded Votes, 1873–1935. *The Journal of Politics*, 61(2):467–484, 1999.

Patrick Hummel. Sequential Voting in Large Elections with Multiple Candidates. *Journal of Public Economics*, 96(3):341–348, 2012.

Matias Iaryczower. Strategic Voting in Sequential Committees. California Institute of Technology Social Science Working Paper No. 1275, 2007.

David R. Jones. Position Taking and Position Avoidance in the U.S. Senate. *The Journal of Politics*, 65(3):851–863, 2003.

Jeffrey B. Lewis, Keith Poole, Howard Rosenthal, Adam Boche, Aaron Rudkin, and Luke Sonnet. Voteview: Congressional Roll-Call Votes Database. 2018. URL `https://voteview.com/`.

Matthias Messner and Mattias K. Polborn. Strong and Coalition-Proof Political Equilibria under Plurality and Runoff Rule. *International Journal of Game Theory*, 35(2):287–314, 2007.

Abdul G. Noury. Abstention in Daylight: Strategic Calculus of Voting in the European Parliament. *Public Choice*, 121(1):179–211, 2004.

Keith T. Poole and Howard Rosenthal. A Spatial Model for Legislative Roll Call Analysis. *American Journal of Political Science*, 29(2):357–384, 1985.

Keith T. Poole and Howard Rosenthal. *Congress: A Political-Economic History of Roll Call Voting*. New York: Oxford University, 1997.

Abel Rodriguez and Scott Moser. Measuring and accounting for strategic abstentions in the U.S. Senate, 1989–2012. *Journal of the Royal Statistical Society*, 64(5):779–797, 2015.

Guillermo Rosas and Yael Shomer. Models of Nonresponse in Legislative Politics. *Legislative Studies Quarterly*, 33(4):573–601, 2008.

Guillermo Rosas, Yael Shomer, and Stephen R. Haptonstahl. No News Is News: Nonignorable Nonresponse in Roll-Call Data Analysis. *American Journal of Political Science*, 59 (2):511–528, 2015.

Lawrence S. Rothenberg and Mitchell S. Sanders. Legislator Turnout and the Calculus of Voting: The Determinants of Abstention in the U.S. Congress. *Public Choice*, 103(3): 259–270, 2000a.

Lawrence S. Rothenberg and Mitchell S. Sanders. Severing the Electoral Connection: Shirking in the Contemporary Congress. *American Journal of Political Science*, 44(2):316–325, 2000b.

Roger M. Scully. Policy Influence and Participation in the European Parliament. *Legislative Studies Quarterly*, 22(2):233–252, 1997.

Jörg L. Spenkuch, B. Pablo Montagnes, and Daniel B. Magleby. Backward Induction in the Wild? Evidence from Sequential Voting in the U.S. Senate. *American Economic Review*, 108(7):1971–2013, 2018.

Appendix A Proof of Lemma 1

Using backward induction, I prove that the i-th Majority senator to vote must do so according to (8). However, notice first that, given (7) and (5), every Minority senator votes Nay. There are $n_{\underline{m}}$ Minority senators, so the number of Nays is at least $n_{\underline{m}}$.

Consider the last Majority senator. If her type is Typical, according to (1), and regardless of the votes tallied, she votes Y. If her type is Moderate, according to (2), she votes A, unless her vote is pivotal in determining the outcome of the roll-call. Thus, she votes Y only if Yeas are behind Nays by *exactly* one vote. Finally, if she is of the Swing type, according to (3), she votes N, unless her vote can change the outcome from the failure of the motion to its passage. Thus, she votes A if the number of Yeas and Nays are *equal*, and votes Y if the number of Yeas is *exactly* one less than the number of Nays. Recall that $n_{\overline{m}}$ denotes the number of the Majority. The following summarizes the last, $n_{\overline{m}}$ -th, Majority senator's optimal voting choice[29].

$$V_{n_{\overline{m}}} = \begin{cases} Y & \text{if} \quad \phi_{n_{\overline{m}}} = T \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \geq \#N \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y = \#N - 1 \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \leq \#N - 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \geq \#N + 1 \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N - 1 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \leq \#N - 2 \end{cases} \tag{10}$$

Moving backward, now consider the second to last, $(n_{\overline{m}} - 1)$-th, Majority senator. Given (10), she knows how the next Majority senator in line will vote. Thus, she votes:

$$V_{n_{\overline{m}}-1} = \begin{cases} Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = T \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y \geq \#N - 1 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N - 2 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y \leq \#N - 3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y \geq \#N \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 1 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y \leq \#N - 3 \end{cases} \tag{11}$$

[29] Note that $\#Y$ is the total number of Yeas that have been cast by the Majority that went *before* the senator in question. $\#N$ is the number of the Minority, $n_{\underline{m}}$, plus the total number of Nays that have been cast by the Majority that went *before* the senator in question. This is because the Minority unanimously votes Nay, hence $\#N \geq n_{\underline{m}}$.

The backward induction can continue to the first Majority senator. However, the similarity of the vote tally conditions in (10) and (11) hints how these conditions depend on the number of remaining Majority senators that have not yet voted in each case: the senator in question and those Majority senators voting *after* her. Denoting this number by $\#R$, one can rewrite (10) and (11) to look just like (8).

Moreover, because each Majority senator, regardless of the vote tally at her turn, has a definitive choice[30], the *equilibrium path* is unique. Hence, the subgame perfect equilibrium in Lemma 1 is indeed the only one that exists.

■

Appendix B Proof of Theorem 1

The following proof is tedious, but not complicated. Similar to the proof in Appendix A, I use the straightforward logic of backward induction.

When the probability of a Fake type is non-zero, Moderate and Swing types, sometimes, will have to choose between alternatives that are accompanied by different probabilities of the roll-call outcome. To be able to compare such *lotteries*, we need to have numerical values associated with each level of utilities in (2) and (3). Even though the specifics of such quantification dictate the constraint on probabilities for Fake types, they will not affect the fundamental features of the model.

I assume that senators are indifferent between an alternative a_k, and a coin toss between the very next better, a_{k+1}, and the very next worse, a_{k-1}, alternatives[31]. More specifically, using some $\xi > 0$ and $\zeta > 0$, (2) and (3) can be rewritten as follows.

- For a Moderate Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, M, A, 1) &= 4\xi \\ u_{i,j}(\overline{m}, M, Y, 1) &= 3\xi \\ u_{i,j}(\overline{m}, M, A, 0) &= 2\xi \\ u_{i,j}(\overline{m}, M, Y, 0) &= \xi \\ u_{i,j}(\overline{m}, M, N, o) &= 0, \text{ for } o \in \{1, 0\} \end{aligned} \tag{12}$$

[30] In other words, she would never be indifferent between any two or three vote choices.

[31] This means that senators would be, in a sense, *risk neutral.* However, one must be careful about using such a term since the outcomes in this model are not monetary.

- For a Swing Majority:

$$\begin{aligned} u_{i,j}(\overline{m}, S, N, 1) &= 6\zeta \\ u_{i,j}(\overline{m}, S, A, 1) &= 5\zeta \\ u_{i,j}(\overline{m}, S, Y, 1) &= 4\zeta \\ u_{i,j}(\overline{m}, S, N, 0) &= 3\zeta \\ u_{i,j}(\overline{m}, S, A, 0) &= 2\zeta \\ u_{i,j}(\overline{m}, S, Y, 0) &= \zeta \end{aligned} \tag{13}$$

Using backward induction, I now proceed to solve for Majority senators' optimal vote choices. Starting with the last Majority senator, it is easy to see that her optimal voting choice, if she is of a non-Fake type, is identical to (10). On the other hand, if she is a Fake type, she will vote Nay in accordance with (4). The following summarizes the last, $n_{\overline{m}}$ -th, Majority senator's optimal voting choice[32].

$$V_{n_{\overline{m}}} = \begin{cases} Y & \text{if} \quad \phi_{n_{\overline{m}}} = T \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \geq \#N \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y = \#N - 1 \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \leq \#N - 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \geq \#N + 1 \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N - 1 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \leq \#N - 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = F \end{cases} \tag{14}$$

Moving backward, now consider the second to last, $(n_{\overline{m}} - 1)$-th, Majority senator. If her type is Typical or Fake, she will vote Yea or Nay, respectively. However, if her type is Moderate or Swing, then her optimal voting choice can depend on the probability that the next Majority senator in line is a Fake one. For example, if she is a Moderate type, and $\#Y = \#N$, then she faces two alternatives[33]: vote Yea and the roll-call will certainly pass, or vote Abstain (her ideal personal choice) and the roll-call will fail if the next Majority senator is a Fake type (which, according to (6), happens with a probability denoted by $\gamma_{n_{\overline{m}}}$)[34]. More specifically, if she votes Yea, her payoff is 3ξ; and if she votes Abstain, her *expected* payoff is $(1 - \gamma_{n_{\overline{m}}})(4\xi) + (\gamma_{n_{\overline{m}}})(2\xi)$. Therefore, she votes Yea if $\gamma_{n_{\overline{m}}} > 1/2$, and Abstain otherwise.

[32]Notation in this proof is consistent with the proof in Appendix A. Refer to footnote 29 for details.

[33]Recall that a Moderate type will never vote Nay, thus her two alternatives are voting Yea or Abstain.

[34]If she votes Yea, then even if the next Majority senator votes Nay, the roll-call will still pass with the Vice President's tie-breaking vote. However, if she votes Nay, according to (14), the roll-call will only pass if the next Majority senator is a non-Fake type.

This result makes sense: if there is a large chance that the last Majority senator is going to be a Fake type, then the (second to last) Moderate senator will be more cautious, and votes Yea. The following summarizes the second to last, $(n_{\overline{m}} - 1)$-th, Majority senator's optimal voting choice in all possible scenarios[35].

$$V_{n_{\overline{m}}-1} = \begin{cases} Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = T \\ \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y \geq \#N + 1 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 1/2 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 1/2 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N - 1 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N - 2 \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 1/2 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y = \#N - 2 \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 1/2 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = M \quad \text{and} \quad \#Y \leq \#N - 3 \\ \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y \geq \#N + 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N + 1 \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 1/3 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N + 1 \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 1/3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 2/3 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 2/3 \\ A & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 1 \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 2/3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 1 \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 2/3 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 2 \quad \text{and} \quad \gamma_{n_{\overline{m}}} < 1/3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y = \#N - 2 \quad \text{and} \quad \gamma_{n_{\overline{m}}} > 1/3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}-1} = S \quad \text{and} \quad \#Y \leq \#N - 3 \\ \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = F \end{cases} \tag{15}$$

Now, assume that the probability of the last Majority senator being a Fake type ($\gamma_{n_{\overline{m}}}$) is smaller than 1/3. Or, equivalently:

$$1 - \gamma_{n_{\overline{m}}} > \frac{2}{3} \tag{16}$$

Applying the above constraint, (15) can be simplified to look just like (11)[36]:

[35]For simplicity, scenarios in which a senator would be indifferent between two alternatives are ignored.
[36]Of course, with the exception that Fake types are possible in (17).

$$V_{n_{\overline{m}}-1} = \begin{cases} Y & \text{if} \quad \phi_{n_{\overline{m}}} = T \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \geq \#N - 1 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y = \#N - 2 \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = M \quad \text{and} \quad \#Y \leq \#N - 3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \geq \#N \\ A & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N - 1 \\ Y & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y = \#N - 2 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = S \quad \text{and} \quad \#Y \leq \#N - 3 \\ N & \text{if} \quad \phi_{n_{\overline{m}}} = F \end{cases} \tag{17}$$

The similarity between (17) and (11) makes sense: if the second to last senator believes there is a large chance that the last senator is a non-Fake type, she will then behave as if the last senator is going to be a non-Fake type.

The backward induction can continue to the first Majority senator. In each step, it can be proved that the senator in question will behave as if there are no Fake types ahead of her, as long as she believes the probability that *all remaining senators* are non-Fake types is large enough. More specifically, just like (16), such probability must be greater than 2/3. Furthermore, note that the constraint for the i-th senator satisfies that of the $(i+1)$-th senator, as well as all those that go after her[37]. Therefore, the only relevant constraint is that of the first Majority senator:

$$\prod_{i=2}^{n_{\overline{m}}}(1-\gamma_i) > \frac{2}{3} \tag{18}$$

Assuming γ_i's, for all i, are small enough to satisfy (18), one can rewrite (14) and (17) to look just like (9). Moreover, because each Majority senator, has a definitive choice, the *equilibrium path* is unique. Hence, the subgame perfect equilibrium in Theorem 1 is indeed the only one that exists[38].

■

It is important to point out that the constraint imposed on γ_i's, in (18), is quite reasonable. For example, consider a Senate with 100 senators, 51 of which form the Majority party. Also assume homogeneous probabilities over types. More specifically,

$$\gamma_i = \gamma, \quad \forall i \in \{1, 2, ..., n_{\overline{m}}\}$$

[37]The constraint for the i-th senator, $(1-\gamma_{i+1})(1-\gamma_{i+2})(1-\gamma_{i+3})...(1-\gamma_{n_{\overline{m}}}) > 2/3$, implies the constraint for the $(i+1)$-th senator: $(1-\gamma_{i+2})(1-\gamma_{i+3})...(1-\gamma_{n_{\overline{m}}}) > 2/3$.

[38]Of course, assuming (18) is satisfied.

Then, (18) implies $\gamma < 0.8\%$. This is a realistic number. What are the chances that an average senator in the Majority, in almost 3.5 million voting records, is actually Fake? Probably not more than 0.8%. Nevertheless, remember that the model does not require homogeneity. The probability of being Fake could be zero for many, and significantly greater than 0.8% for a few.

Appendix C Summary Statistics

Table 1: Per-Congress Summary Statistics for Roll-Call Votes in the U.S. Senate, 1867–2015

Congress	Num. of Unique		Num. of Votes Cast				Pct. Present (Out of Abstentions)
	Roll-Calls	Senators	*All*	Yea	Nay	Abstain	
40	716	69	41,138	14,939	14,922	11,277	0.00
41	742	80	52,599	18,003	18,207	16,389	0.00
42	803	75	58,580	19,150	19,303	20,127	0.00
43	420	79	30,510	10,513	10,505	9,492	0.00
44	434	82	31,699	11,287	9,762	10,650	0.00
45	585	82	44,159	16,117	15,104	12,938	0.00
46	570	81	43,287	14,279	14,442	14,566	0.00
47	986	83	74,879	24,441	25,197	25,241	0.00
48	428	78	32,528	10,974	10,734	10,820	0.00
49	461	81	34,943	12,709	11,255	10,979	0.00
50	389	76	29,564	9,560	9,022	10,982	0.00
51	526	91	44,467	14,357	13,577	16,533	0.00
52	209	93	18,334	5,898	5,360	7,076	0.00
53	561	96	47,831	15,351	16,132	16,348	0.00
54	197	90	17,546	6,180	5,074	6,292	0.00
55	381	96	33,872	11,689	11,392	10,791	0.00
56	169	94	14,697	5,025	5,266	4,406	0.00

Table 1 Continued

Congress	Num. of Unique		Num. of Votes Cast				Pct. Present (Out of Abstentions)
	Roll-Calls	Senators	*All*	Yea	Nay	Abstain	
57	118	94	10,383	3,647	4,258	2,478	0.00
58	92	93	8,260	2,970	2,881	2,409	0.00
59	128	95	11,423	4,439	3,722	3,262	0.00
60	84	95	7,698	2,835	2,345	2,518	0.00
61	268	103	24,552	9,472	9,277	5,803	0.00
62	396	109	36,906	13,343	12,570	10,993	1.15
63	572	101	54,643	17,580	18,246	18,817	0.02
64	406	100	38,868	12,765	13,476	12,627	0.06
65	384	111	36,724	13,359	13,105	10,260	0.00
66	407	101	38,946	14,455	14,647	9,844	0.00
67	751	107	72,004	23,523	25,105	23,376	0.00
68	235	102	22,519	10,962	7,163	4,394	7.40
69	236	105	22,575	10,057	8,248	4,270	0.07
70	191	102	18,006	7,151	7,244	3,611	0.00
71	436	109	41,721	16,705	16,473	8,543	0.00
72	280	103	26,877	11,134	10,190	5,553	6.01
73	228	101	21,815	9,638	9,023	3,154	0.00
74	193	100	18,419	8,021	7,499	2,899	33.22
75	174	102	16,643	7,578	6,227	2,838	22.27
76	266	104	25,508	11,694	10,096	3,718	29.96
77	192	108	18,367	8,723	6,427	3,217	24.56
78	220	104	21,084	9,585	7,801	3,698	15.55
79	244	109	23,865	9,543	9,576	4,746	89.72

Table 1 Continued

Congress	Num. of Unique		Num. of Votes Cast				Pct. Present (Out of Abstentions)
	Roll-Calls	Senators	*All*	Yea	Nay	Abstain	
80	248	97	23,575	10,993	10,330	2,252	100.00
81	455	109	49,595	18,872	19,998	10,725	100.00
82	313	99	30,041	12,713	13,331	3,997	100.00
83	271	110	26,002	12,607	10,977	2,418	100.00
84	217	99	20,787	11,273	8,621	893	100.00
85	307	101	29,367	16,040	11,951	1,376	100.00
86	422	103	41,835	24,689	15,118	2,028	100.00
87	428	105	42,781	22,133	18,816	1,832	100.00
88	534	102	53,328	23,245	27,348	2,735	100.00
89	497	103	49,697	25,379	20,642	3,676	0.11
90	596	101	59,506	30,792	22,616	6,098	0.02
91	666	102	66,590	35,931	23,129	7,530	0.11
92	955	102	95,532	49,685	33,696	12,151	0.15
93	1,138	102	114,299	63,366	38,083	12,850	0.75
94	1,311	101	130,724	71,127	43,414	16,183	0.24
95	1,156	104	115,570	64,348	38,935	12,287	0.12
96	1,054	101	105,358	59,509	34,799	11,050	0.22
97	966	101	96,572	57,252	34,480	4,840	0.79
98	663	101	66,300	38,663	22,607	5,030	0.91
99	740	101	74,000	45,278	25,369	3,353	1.46
100	799	101	79,899	53,558	21,221	5,120	0.12
101	638	101	63,765	42,446	20,013	1,306	0.23
102	550	102	54,969	34,259	18,617	2,093	1.53

Table 1 Continued

Congress	Num. of Unique		Num. of Votes Cast				Pct. Present (Out of Abstentions)
	Roll-Calls	Senators	*All*	Yea	Nay	Abstain	
103	724	102	72,400	45,326	25,124	1,950	0.62
104	919	103	91,758	56,219	33,763	1,776	2.53
105	612	100	61,200	39,714	20,273	1,213	1.98
106	672	102	67,137	42,458	23,036	1,643	0.00
107	633	102	63,300	42,894	18,790	1,616	0.00
108	675	100	67,500	42,550	22,174	2,776	0.00
109	645	101	64,500	40,123	22,619	1,758	0.06
110	657	102	65,653	40,123	22,084	3,446	0.35
111	696	111	69,328	41,057	26,072	2,199	0.00
112	486	102	48,594	30,064	16,982	1,548	1.36
113	657	105	65,694	42,982	20,309	2,403	1.04

Figure 1: The Logic of Sequential Voting

Order:	*1*	*2*	*3*	*4*	*5*
Party:	D	R	D	R	D
Moderate:	Yes	No	No	No	Yes
Vote:	A	N	Y	N	Y

Figure 2: A Senate Comprising 4 Minority and 6 Majority Senators Without Fake Types

Party:	$\underline{m}$	$\overline{m}$	$\overline{m}$	$\overline{m}$	$\overline{m}$	$\underline{m}$	$\overline{m}$	$\overline{m}$	$\underline{m}$	$\underline{m}$
Type:	**T**	**T**	**M**	**S**	**T**	**T**	**M**	**S**	**T**	**T**
Vote:	N	Y	A	A	Y	N	Y	Y	N	N

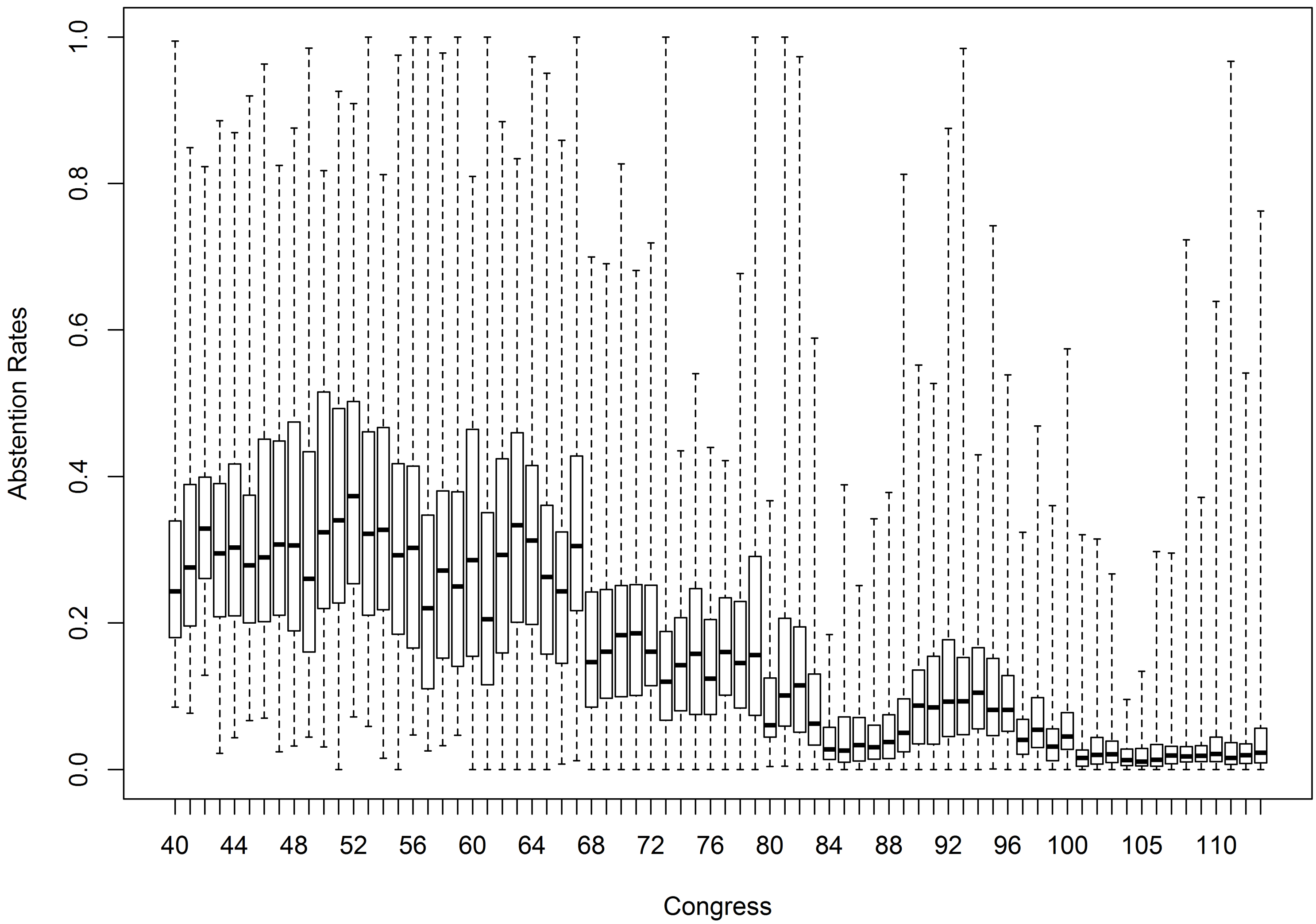
The circled votes are in pivotal positions. A full circle means anything but Yea would result in Fail.

Figure 3: A Senate Comprising 4 Minority and 6 Majority Senators with a Fake Type

Party:	$\underline{m}$	$\overline{m}$	$\overline{m}$	$\overline{m}$	$\overline{m}$	$\underline{m}$	$\overline{m}$	$\overline{m}$	$\underline{m}$	$\underline{m}$
Type:	**T**	**T**	**M**	**S**	**F**	**T**	**M**	**S**	**T**	**T**
Vote:	N	Y	A	A	N	N	A	N	N	N

The circled votes are in pivotal positions. A full circle means anything but Yea would result in Fail.

Figure 4: Boxplots of Senators' Abstention Rates in Different U.S. Congresses, 1867–2015



Boxplots depict quartiles with whiskers from minimum to maximum.

Figure 5: Predicted Likelihood of Abstention in the U.S. Senate, 1867–2015

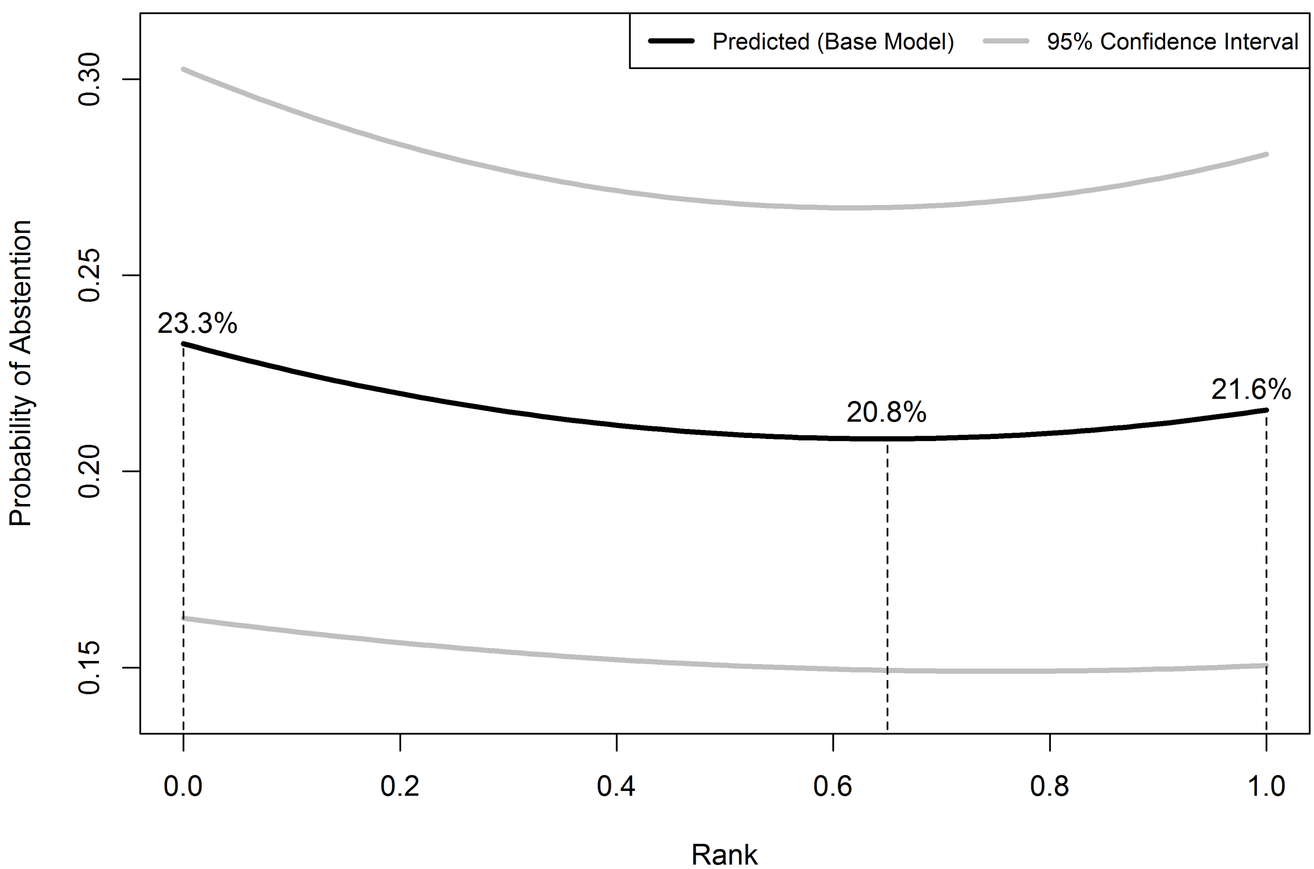


Table 2: Summary Statistics for Roll-Call Votes in the U.S. Senate, 1867–2015

Vote Cast	Num. of Obs.	Pct. of Obs.	*Rank*		
			Mean	Median	SD
Yea	1,747,319	50.0	0.501	0.505	0.292
Nay	1,226,190	35.1	0.501	0.495	0.292
Abstain	522,086	14.9	0.494	0.495	0.289
All	3,495,595	100.0	0.500	0.500	0.292

Table 3: Summary Statistics for Control Variables

Variable	Mean	Median	SD
Lopsidedness	0.34	0.24	0.29
Swing	0.33	0.00	0.47
Majority	0.57	1.00	0.49

Table 4: Likelihood of Abstention as a Function of Rank

	Abstention	
	(1)	(2)
Rank	-0.08^{***}	-0.07^{***}
	(0.02)	(0.02)
Rank^2	0.06^{***}	0.06^{**}
	(0.02)	(0.02)
Lopsidedness		-0.02^{***}
		(0.00)
Swing		0.01^{***}
		(0.00)
Majority		-0.02^{***}
		(0.00)
Senator FE	Yes	Yes
Congress FE	Yes	Yes
Num. of Obs.	3,495,595	

Standard errors in parentheses.

Significance codes: 0.001 *** 0.01 ** 0.1 *

Table 5: Likelihood of Abstention in Different Time Periods

	Abstention					
Congresses Included:	50–113 (1887–2015)	60–113 (1907–2015)	70–113 (1927–2015)	80–113 (1947–2015)	90–113 (1967–2015)	100–113 (1987–2015)
	(1)	(2)	(3)	(4)	(5)	(6)
Rank	−0.14***	−0.13***	−0.06**	−0.24***	−0.11***	−0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Rank^2	0.13***	0.12***	0.03	0.20***	0.08***	0.21***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Senator FE	Yes	Yes	Yes	Yes	Yes	Yes
Congress FE	Yes	Yes	Yes	Yes	Yes	Yes
Num. of Obs.	3,051,273	2,814,896	2,459,461	2,227,156	1,860,148	935,697

Standard errors in parentheses. Significance codes: 0.001 *** 0.01 ** 0.1 *

Table 6: Likelihood of Abstention in Close Roll-Calls

	Abstention	
Roll-Calls Included:	All	Close†
	(1)	(2)
Rank	−0.08***	−0.09***
	(0.02)	(0.03)
Rank^2	0.06***	0.07**
	(0.02)	(0.02)
Senator FE	Yes	Yes
Congress FE	Yes	Yes
Num. of Obs.	3,495,595	2,152,337

† Roll-calls with lopsidedness less than 0.34.

Standard errors in parentheses.

Significance codes: 0.001 *** 0.01 ** 0.1 *

Table 7: Likelihood of Abstention Using Different Empirical Models

	Abstention				
Model:	Linear	Logit	Probit	*Avg. Marginal Effects*	
	(1)	(2)	(3)	Logit	Probit
Rank	−0.08***	−0.43*	−0.27**	−0.05	−0.05
	(0.02)	(0.17)	(0.10)		
Rank^2	0.06***	0.28*	0.19*	0.03	0.03
	(0.02)	(0.15)	(0.08)		
Senator FE	Yes	Yes	Yes		
Congress FE	Yes	Yes	Yes		
Num. of Obs.		3,495,595			

Standard errors in parentheses. Significance codes: 0.001 *** 0.01 ** 0.1 *

Table 8: Likelihood of (Alternatively-Defined) Abstention

	Abstention	
Definition of Abstention:	Original	Alternative†
	(1)	(2)
Rank	−0.08***	−0.06***
	(0.02)	(0.01)
Rank^2	0.06***	0.04**
	(0.02)	(0.01)
Senator FE	Yes	Yes
Congress FE	Yes	Yes
Num. of Obs.	3,495,595	3,127,239

† Abstentions that are *not* part of three-or-longer consecutive abstentions.

Standard errors in parentheses. Significance codes: 0.001 *** 0.01 ** 0.1 *

Table 9: Likelihood of Breaking with the (Majority) Party

	Breaking with the (Majority) Party			
Roll-Calls Included[†]:	All	Close[††]		
	(1)	(2)	(3)	(4)
Pivotal	−0.14***	−0.07*	−0.07*	−0.05
	(0.03)	(0.03)	(0.03)	(0.03)
Senator FE	Yes	No	Yes	Yes
Congress FE	Yes	Yes	No	Yes
Num. of Obs.	5,383	2,705		
Num. of Unique Roll-Calls	98	50		
Num. of Unique Senators	547	515		

[†] Roll-calls with the minority unanimously voting Nay, and the majority reaching pivotality.

[††] Roll-calls with lopsidedness less than 0.34.

Standard errors in parentheses. Significance codes: 0.001 *** 0.01 ** 0.1 *