

Testing Explanations of Strategic Voting in Legislatures: A Reexamination of the Compromise of 1790

Joshua D. Clinton Princeton University
Adam Meirowitz Princeton University

A difficult yet prevalent problem in legislative politics is how to assess explanations when observable actions may not represent true (and unobserved) legislator preferences. We present a method for analyzing the validity of theoretical/historical accounts that unifies theory, history, and measurement. We argue that approaches to testing accounts of legislative behavior which are theoretically and historically agnostic are not always best and present an approach which: (1) forms an explicit explanation of behavior (here a simple dynamic voting game) that yields estimable parameter constraints, and (2) tests these constraints using a customized empirical model that is as consistent as possible with the explanation. We demonstrate the method using legislative voting data from the first Congress (1789–1791). Using the idea of sophisticated equivalents from voting theory we subject the traditional account of the “Compromise of 1790” to a statistical test and find that there is reason to doubt the claim that legislators of the time believed the specified log roll was taking place. The results suggest that the capital location and assumption issues were resolved independently.

Great progress has been made advancing our theoretical understanding of strategic voting (e.g., Aldrich 1994; Austen-Smith 1987; Banks and Duggan 2000, 2003; Krehhbiel and Meirowitz 2002; McKelvey and Niemi 1978; Snyder 1991; Snyder and Groseclose 2000). Despite a wealth of theoretical contributions and Riker’s claim that “strategic voting is an ineradicable possibility in all voting systems . . . almost always present in legislatures” (1982, 167), our ability to test theories of strategic legislator behavior is quite limited given observable data.

Riker notes the fundamental problem: “to *identify* strategic voting requires that we know both the voter’s true values and the voter’s actual expression of the values in a vote. From direct observation we can know only the latter.

We must *infer the former from other and softer evidence*” (Riker 1982, 167; emphasis added). If we rely only on the observable actions (e.g., votes) of legislators to test theories of strategic behavior we cannot determine whether the observed behavior represents legislators’ true preferences or whether the legislators are acting strategically. Consequently, empirical projects that *identify* instances of legislative strategic voting are relatively scarce.¹

To highlight the problem, consider a typical investigation of strategic voting. “True preferences” are measured using an estimator of observed voting behavior (e.g., NOMINATE or ADA scores). Voting behavior on the votes where strategic voting is posited is then examined to see if the voting patterns differ from the measured “true preferences.” There are two key problems with this approach.

Joshua D. Clinton is Assistant Professor of Politics, Princeton University, Princeton, NJ 08544-1012 (clinton@princeton.edu). Adam Meirowitz is Assistant Professor of Politics, Princeton University, NJ 08544-1012 (ameirowi@princeton.edu).

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¹Notwithstanding this point, progress at investigating instances of strategic voting by using NOMINATE or ADA scores as measures of true preference (e.g., Calvert and Fenno 1994; Denzau, Riker, and Shepsle 1985; Enelow 1981; Enelow and Kochler 1980; Poole and Rosenthal 1996) has been made.

First, assuming legislators vote sincerely on the votes used to measure true preferences is not necessarily congruent with the assumptions underlying theoretical models of strategic voting, especially when the votes upon which strategic behavior may have occurred are included in the sample from which the initial estimates are estimated.² Second, even if the initial measures of preferences are untainted by strategic behavior, it is difficult (but necessary) to relate these estimates with legislator preferences relevant to the legislation upon which strategic voting may have occurred. It is quite possible that strategic voting occurs on a small set of votes which focus on issues that are orthogonal to the general dimensions that NOMINATE or ADA scores pick up.

In this article we address these problems and provide a means of testing historical accounts and/or theoretical predictions when legislators' observable actions may not represent their true preferences. It is ironic given Riker's contributions to formal modelling and historical analysis, that the "other and softer" evidence we use to estimate strategic behavior is historical information about the legislative agenda and implications from formal models of voting. We show that theoretically and historically interesting political accounts/explanations can sometimes be interpreted as a set of constraints on the relationship between certain nodes in an agenda tree. Testing the validity of the theoretical/historical explanation involves determining whether estimates of legislator perceptions about the consequences of different votes are consistent with the constraints imposed by sophisticated equivalence.

The roles of history and theory are quite complementary in our approach. Either history or theory may generate an explanation of legislative behavior that we wish to test. Given an account, ideas from voting theory such as agenda trees and equilibrium concepts provide a structure and means for incorporating historical information. Information about the substance of the proposals and the relationship between proposals provided by the legislative agenda yields the required information to identify the critical parameters upon which the test rests.

Although the approach is applicable to testing a broad range of theoretical/historical accounts, given the method's requirements for integrating theory and history we focus on one detailed application. We demonstrate the applicability of our approach by examining whether

an impasse reached in the First Congress was resolved by a log roll over funding of the states' Revolutionary War debts and the temporary and permanent location of the capital. The traditional version of the "Compromise of 1790" involves a log roll arranged by Jefferson, Hamilton, and Madison in mid-June at a dinner party at Jefferson's residence (Bowling 1971). Whether the account recalled by Jefferson in three letters was ever consummated is the subject of some controversy amongst both historians and political scientists (e.g., Aldrich, Jillson, and Wilson 2002; Bowling 1968, 1971; Cooke 1970; Kiewiet 2002; Risjord 1976; Wilson 1999). The lengthy legislative history and clear agenda of the traditional account make its investigation a good example of how substantive and theoretical information can be integrated to test accounts of legislative politics.

Substantively, we find that legislators did not anticipate that resolving the residence question would result in the assumption of state Revolutionary War debts at the final agreed-upon interest rate when voting on the residence proposal. This suggests that the most explicitly articulated version of the traditional account of the compromise is not supported by the roll-call data and the theory of spatial voting. Instead, the questions of residence and assumption seem to have been resolved independently in the summer of 1790 and a compromise between assumption and reduced interest payments settled the contentious funding question.

An overview of the article is as follows. The first section details the politics surrounding the Compromise of 1790 and the conflicting historical accounts, and the second summarizes existing methods of incorporating additional information and theory in roll-call analysis and presents our model of voting in the first Congress. The third section assesses the relative evidence for conflicting accounts of the compromise, and the fourth compares our approach with one that relies on NOMINATE estimates. Finally, we conclude.

The First House: 1789–1791

The stability of the union seemed to hang in the balance on every vote in the first Congress. President Washington describes two particularly troublesome issues in private correspondence to the Marquis de la Luzerne (Aug 10, 1790):

The two great questions of funding the debt (assumed by some states during the Revolutionary War) and fixing the seat of government have

²While the recovered estimates may be post hoc rationalizable (i.e., satisfy the constraints required by sophisticated equivalence) under some alternative agenda, there is no reason to suspect that they will satisfy the constraints under the actual agenda of interest.

been agitated, as was natural, with a good deal of warmth as well as ability. These were always considered by me as questions of the most delicate and interesting nature which could possibly be drawn into discussion. They were more in danger of having convulsed the government itself than any other points. (Bickford and Bowling 1989)

Although there was a consensus that the nation had to maintain a favorable credit rating for future economic prospects, the question of funding the debt involved two primary sources of disagreement. The first source of contention regarded the treatment of federal debts. By 1790 the federal debt was more than \$54,000,000, with foreign creditors owed \$11,710,37 and the remaining \$42,414,085 owed largely to domestic speculators who had bought the notes of debt for a fraction of their paper value from original creditors. Secretary of State Alexander Hamilton argued that speculators should be treated as the original creditors and paid full value while Rep. James Madison insisted that speculators should receive the notes' market value and the original creditors should receive the balance.

A second, more divisive debate regarding the debt was whether the Revolutionary War debts of individual states would be assumed by the federal government. Representatives from states that had accrued large debts and possessed clear records (such as Massachusetts and South Carolina) strongly favored the settlement of national debts and the assumption of state debt. Representatives of states that did not owe much debt or who had already paid off their debt (such as Maryland, Virginia, North Carolina, and Georgia) adamantly opposed assumption (Bickford and Bowling 1989; Bowling 1968, Chapter 7).

A second major issue addressed by the first House was the determination of the permanent and temporary locations of the seat of government (which initially resided in New York City). This issue was considered by some observers to be the more significant challenge.

The second [session of the first Congress] will be more important and more delicate: it will decide about the money and the army. . . . A third object, *much less* interesting may give a *more* perceptible shock to the new confederation. It is the eternal discussion about the residence. (Louis-Guillaume Otto, the Charge d'Affaires of France; O'Dwyer 1964, 415)

One reason why the residence question was so contentious was the widely held belief that the capital would

generate significant revenue for the area surrounding it. Consequently, representatives favored a capital close to their constituency; northern representatives favored a location near Trenton on the Delaware River or in New York City, and southern representatives desired a location along the Potomac River. The location of the temporary seat was important because it was thought to affect the likely location of the permanent capital.³

Half of the recorded votes in the first House dealt with the issues of assumption and residence, and the two issues generated many failed policies on narrow margins. While considerable debate occurred in both chambers on these two issues, we restrict our attention to the House because "it was in the House, and not in the Senate, that the assumption vote arranged in the dinner bargain took place" (Bowling 1971). Historical scholarship argues that in June of 1790—in the midst of the first House—an impasse was reached. Divisions were so deep on the two issues that Hamilton considered resigning his post and Madison considered forcing an adjournment to allow passions to cool; "prominent men in both the North and the South began to question the viability of the Union and raise the possibility of a civil war" (Bickford and Bowling 1989).

The traditional account of how this impasse was resolved, often termed the Compromise of 1790, is "generally regarded as one of the most important bargains in American history" (Cooke 1970). Following the failure of Hamilton's *Report on Public Debt* which included the assumption of state Revolutionary War debts in April of 1790, Jefferson held a dinner party in mid-June at which Hamilton, Madison, and Jefferson supposedly arranged for a log roll between the passage of Hamilton's report and the location of the capital. The agreement called for Madison to weaken his opposition to assumption and persuade Virginia Representatives Alexander White

³Mitchell (1962) outlines how strategic legislators were in presenting the Southern calculus:

Hope of the Southern states was to have the capital ultimately placed on the Potomac. For this they required delay. "The only chance the Potomac has is . . . that the final seat may be undecided for two or three years, within which period the Western and S. Western population may enter more into the estimate." For this purpose the temporary location must be adroitly chosen. Their chief fears were of New York. It was clearly ineligible as the permanent capital, for there would be only 8 senators north (or "eastward" as they said) and 16 to the southward; 17 members of the House east, 42 south. . . . As a temporary location New York was equally a snare, "for . . . it tends to stop the final . . . seat short of the Potomac . . . and probably in . . . N. Jersey." Madison added, "I know this to be one of the views of the advocates of N. York." (quotations are Madison to Washington in 1788)

and Richard Bland Lee to switch their votes on assumption. Hamilton and/or Madison would convince Northern coalitions in the House not to block legislation locating the permanent capital on the Potomac. As Jefferson recounts in 1792:

It was observed, I forget by which of them, that as the pill [assumption of the state debts] would be a bitter one to the Southern states, something should be done to soothe them; and the removal of the seat of government to the Potomac was a just measure, and would probably be a popular one with them, and would be a proper one to follow the assumption. (Ellis 2000)

It is at this point that disagreement ensues. Some argue that the compromise discussed at the dinner was indeed enacted (Aldrich, Jillson, and Wilson 2002; Bowling 1968, 1971; Risjord 1976; Wilson 1999) while others argue that the solutions to the residence and assumption questions were unrelated (Cooke 1970; Kiewiet 2002).

Cooke (1970) notes that of the principals involved in the log roll, Jefferson alone recorded the deal in three separate exchanges all written at least two years after the summer of 1790. Furthermore, it is known that Jefferson was not directly involved in the affairs of the House at this time and was kept quite busy with his own work. Coupled with his desire for posthumous credit, this makes plausible the claim that Jefferson (inadvertently) inflated the account of his own involvement and influence in the questions of assumption and the seat of government.⁴ Cooke concludes that each policy question was independently resolved using separate bargains:

Thus, the bargain over the residence was arranged by Pennsylvania and Virginia congressmen before the famous dinner meeting; the crucial bargain over assumption did not involve the residence but a reallocation of the amount of state debts to be assumed and a compromise on the interest rate to be paid on the funded debt. (Cooke 1970, 525)

A heated exchange between Cooke and Bowling addresses whether the vote switches of White and Lee were sufficient, the extent to which Madison and Hamilton had the influence to change individual votes, and the possibility of additional coalitions/compromises. As historians

⁴As Cooke notes, “Jefferson had contributed to the success of assumption, it is true, but so, too, had others. His exaggerated account of the bargain may also be attributed, in Brant’s phrase to ‘Jefferson’s deep hunger for posthumous fame’” (Cooke 1970, 545).

are unable to resolve the debate using existing primary source material, we analyze the roll-call voting behavior to determine which account is best supported.⁵

Estimating Roll-Call Voting Behavior in the First House

The importance of roll-call analysis in assessing accounts of legislative behavior has not escaped historians. Bowling notes in his treatise on the politics of the first Congress:

The technique, when used in conjunction with the congressional debates, the letters to and from congressmen, and with a clear understanding of each of the votes involved in the analysis, can provide the historian with information and useful insights which do not readily occur to the human eye and mind. (1968, 365)

Roll-call analysis is a valuable complement to primary source material because “if one’s research is underpinned by acceptance of the traditional account [that the compromise occurred], his reading of contemporary letters and debates will seem to provide ample documentation. On the other hand, if one starts by questioning the account, he soon finds that available evidence renders it suspect” (Cooke 1970).

Previous analyses of roll-call voting behavior in the first House use cluster-block methods (Bowling 1968), multidimensional scaling (Aldrich, Jillson, and Wilson 2002; Hoadley 1980), NOMINATE (Aldrich 1995), and factor analysis (Aldrich and Grant 1993). No attempt is made to either account for the possibility that legislators may be voting strategically or to integrate the substance of the proposals being voted on. This makes assessing the conflicting accounts of the log roll between assumption and residence difficult for two reasons. First, it is unclear how to interpret estimates of legislator preferences that assume sincere voting when the account being tested assumes strategic voting.⁶

⁵The fact that no proposal explicitly considered both issues, and that assumption was ultimately resolved 17 days after deciding where to locate the capitol provides suggestive evidence against the traditional account. The fact that all of the Massachusetts delegation except for 1 voted to remove the capital from the Potomac and place in alongside the Delaware River immediately preceding the consideration of S.12 on July 9th also suggests that the log roll had not been fully consummated.

⁶While it is true that ideal point estimation procedures do not explicitly assume sincere voting, strategic voting theory imposes

Second, interpreting the recovered estimates in terms of legislator induced preferences on the residence and assumption questions is difficult. Aldrich notes the basic problem when, in discussing NOMINATE estimates of the First House, he states: “estimated dimensions are not interpreted, and a part of this exercise will be to demonstrate that their first dimension is, or can be inferred as, the ‘great principle dimension’” (Aldrich 1995). It is not clear what issues comprise the “great principle dimension,” nor how to extract legislator preferences on assumption and residence from such generic estimates. The problem becomes particularly difficult if the issue space for the first House contains 20 dimensions as Aldrich and Grant (1993) argue.

We remedy these difficulties by integrating history and theory directly into an estimator of roll-call voting. In so doing we depart from the traditional random utility model approach (see Heckman and Snyder 1997; Poole and Rosenthal 1996) in several ways.⁷

First, we use voting theory to translate the historical account of the log roll into an agenda tree. Equilibrium concepts and the notion of strategic equivalents provide testable constraints on estimable parameters. Examining whether legislators’ perceptions about proposal locations are consistent with the sophisticated equivalents implied by a log roll constitutes a test. We do not assume that legislators vote sincerely on the votes involved in the log roll. Instead, estimating legislator perceptions allows the data to determine whether legislators vote strategically as the examined account suggests. To our knowledge, this is the first attempt at understanding legislative politics by examining estimates of *legislators’ perceptions* of the relationships between aspects of a legislative agenda.

The second departure is that we integrate information about the legislation being voted upon into the analysis. Implementing the test requires accounting for two types of historical information. Including information about proposals’ issue content recovers substantively identified policy dimensions. In contrast to existing methods which are agnostic as to the issues addressed by the proposals being analyzed, including information about whether a proposal dealt with residence or assumption enables us to directly interpret the estimates in terms of the assumption and residence issue dimensions (as opposed to a

additional constraints to ensure that sophisticated equivalents are *equivalent*. Typically, estimation procedures recover parameters that do not satisfy these constraints.

⁷For other departures from the standard approach see Londregan (2000), McCarty, Poole, and Rosenthal (2001), Martin and Quinn (2002), Clinton, Jackman, and Rivers (2004), and Clinton and Meirowitz (2003).

more ambiguous “northern-southern” (for example) issue dimension).

We also account for information contained in the legislative agenda. Existing estimates of roll-call behavior treat amendments and proposals identically—ignoring the logical relationship between the two. We use the legislative agenda to integrate information we know about how proposals relate to one another in the estimation. Relational constraints are important because they provide a means for identifying the multidimensional legislator proposal perceptions used to test the predictions of the log-roll accounts provided by voting theory.

The Model

Roll-call estimation techniques utilize a roll-call matrix \mathbf{H} . Entry h_{lt} denotes the vote by legislator l on roll call t , with $h_{lt} = 1$ if legislator l votes for the proposal being considered in roll-call t and 0 otherwise. Abstentions and absences are treated as missing data. The matrix \mathbf{H} is of dimension $L \times T$, where L denotes the number of legislators casting votes in the first House (66) and T is the number of roll-call votes. While the first House recorded 109 roll-call votes, only 46 involve either the residence or assumption questions. Since our interest lies in the possibility of a log roll between these two issues, we consider only those votes that deal with either the location of the capital or the federal government’s assumption of the states’ Revolutionary War debt. Under the standard assumption that preferences are separable, this does not affect our ability to characterize roll-call voting on these two issues because the omitted votes have no obvious relationship to the included votes.⁸ We assume that the issues of assumption and residence are orthogonal; there is no necessary relationship between the location of the capital and the amount of state debt that the federal government assumes.⁹

⁸Following standard practice (Enelow and Hinich 1984) we assume that legislators have Euclidean preferences over some finite dimensional policy space \mathbb{R}^n , and we estimate the projection of legislator ideal points on the two policy issues (dimensions) of interest: the amount of state Revolutionary War debt assumed by the federal government and the temporary and permanent location of the capital. We focus only on these two dimensions because a proposal not dealing with either the residence or assumption question provides no information about legislator ideal points defined in the assumption \times residence issue space. This may result in inefficiencies if the coordinates of legislators ideal points are correlated across dimensions.

⁹Assuming that the *issues* are orthogonal does not require that *preferences* on the issues are orthogonal (i.e., ideal points on each issue may be correlated. Even though it may be the case that a northern capitol does not also require assumption (for example), it

Legislator l 's ideal point in the (assumption, residence) subspace is denoted by $\mathbf{x}_l \in \mathbb{R}^2$. The elements of this row vector are: (x_l^1, x_l^2) —denoting the ideal point of legislator l in the first (assumption) and second (residence) dimensions, respectively. By $\boldsymbol{\theta}_t \in \mathbb{R}^2$ we denote the location of a policy proposal in the space—consisting of both an assumption solution and a residence solution. We use the notation $\boldsymbol{\theta}_t^1$ when referring to only the assumption coordinate and we use $\boldsymbol{\theta}_t^2$ to refer to the residence coordinate. We assume that the nonstochastic component of legislator utility functions are quadratic, meaning that:

$$u_{lt}(\boldsymbol{\theta}_t) = -(\mathbf{x}_l - \boldsymbol{\theta}_t)(\mathbf{x}_l - \boldsymbol{\theta}_t)'$$

Let $\boldsymbol{\theta}_{y(t)}$ denote the spatial location associated with passage of “yea” on vote t and let $\boldsymbol{\theta}_{n(t)}$ denote the location that results from the rejection of $\boldsymbol{\theta}_{y(t)}$ (i.e., voting “nay”). Legislators vote for proposal t if the utility resulting from the proposal under consideration is greater than that resulting from its rejection. Specifically:

$$\text{prob}(h_{lt} = 1) = \text{prob}(u_{lt}(\boldsymbol{\theta}_{y(t)}) - u_{lt}(\boldsymbol{\theta}_{n(t)}) > \varepsilon_{lt}).$$

where ε_{lt} is an idiosyncratic error term.

Letting $\Lambda(\varepsilon_{lt})$ denote the distribution function of the iid noise term (which we assume to be logistic), the probability of observing a roll-call vote by legislator l in favor of proposal $\boldsymbol{\theta}_{y(t)}$ in roll call t is given by:

$$\text{prob}(h_{lt} = 1) = \Lambda(u_{lt}(\boldsymbol{\theta}_{y(t)}) - u_{lt}(\boldsymbol{\theta}_{n(t)})).$$

Although assuming independent errors (conditional on \mathbf{x} and $\boldsymbol{\theta}$) may seem inappropriate in a model that considers interdependence across votes, the interdependence applies to the first moment of *latent utilities*, not the idiosyncratic noise. The dependence implied by a log roll is completely captured and controlled for in the estimated proposal parameters.¹⁰

is likely that legislators who prefer a northern capital also prefer assumption.

¹⁰The relationship between strategic voting and uncorrelated errors in the likelihood function is complicated and has been treated differently in the literature. Stratmann (1992) uses an alternative test for log rolls by estimating probit models in which the latent utility of one policy depends on the latent utility of another. Omitting votes involved in the log roll or the fact that only a subset of the legislators care about the log roll results in correlated errors. In our approach, we directly estimate perceived policy locations and test whether they satisfy the constraints implied by voting theory. The fact that we know which votes are part of the potential log roll and frame the test in terms of perceived locations—not latent utilities—differentiates our approach from Stratmann's. We reestimate the model allowing subsets of the legislators to have different perceptions of the key policy locations. This robustness check may be viewed as a way to explicitly model particular correlations in the error terms.

The probability of observing the $L \times T$ matrix of roll-call votes \mathbf{H} is:

$$\begin{aligned} L(\mathbf{H}; \mathbf{x}, \boldsymbol{\theta}) &= \prod_{l=i}^L \prod_{t=1}^T \Lambda((u_{lt}(\boldsymbol{\theta}_{y(t)}) - u_{lt}(\boldsymbol{\theta}_{n(t)}))^{h_{lt}} \\ &\quad \times (1 - \Lambda(u_{lt}(\boldsymbol{\theta}_{y(t)}) - u_{lt}(\boldsymbol{\theta}_{n(t)})))^{1-h_{lt}}) \end{aligned}$$

where the only observable portion of the likelihood function is \mathbf{H} .

Integrating History

As scholars, we know much more about the legislative process than is summarized in the roll-call matrix \mathbf{H} . Specifically, congressional records reveal the substantive content of proposals begin voted on and the legislative agenda that produces \mathbf{H} . In assessing whether voting is consistent with the traditional account we integrate both kinds of information.

We incorporate proposal information through the use of parameter constraints (see Jackman (2001) for a similar approach). Prior to Jefferson's dinner party, and consistent with the fact that all proposals and amendments explicitly dealt with either assumption or residence (*House Journal* 1977), we assume legislators view proposals addressing one issue as not affecting the other issue. If legislators vote sincerely prior to the supposed log roll—an assumption which is not inconsistent with the traditional account—and compare only the random utility associated with the yea and nay outcomes at each vote then the yea and nay coordinates of any roll-call vote can only differ in a single dimension. In other words, prior to the compromise, if roll call t involves the residence question we constrain $\boldsymbol{\theta}_{y(t)}^1 = \boldsymbol{\theta}_{n(t)}^1$ and if t involves the assumption question we constrain $\boldsymbol{\theta}_{y(t)}^2 = \boldsymbol{\theta}_{n(t)}^2$. We call such constraints *substantive constraints*. Following the compromise we permit proposals to change the status quo in both dimensions.¹¹

By constraining how legislators evaluate proposals prior to the log roll depending on the proposals' issue content, we recover estimates that are directly interpretable in terms of the assumption and residence questions. Because of the normalizations we employ, positive values in the

¹¹Since parametric assumptions identify the proposal locations in a unidimensional item response model (Rivers 2003), we have some ability to test the extent to which the relational constraints are binding. To check robustness we estimate a model that contains only substantive constraints prior to the log roll and only relational constraints subsequent to the log roll. Although Clinton and Meirowitz (2001) discuss the difficulty associated with interpreting this approach, the results are encouraging. First, the substantive results reported in the third section are unchanged. Second, despite estimating 36 additional parameters, the classification rate increases only fractionally from 83.5% to 84.2% (relative to a baseline of 51%).

first dimension represents a pro-assumption preference and positive values in the second dimension represents a preference for a northern capitol.¹²

The second source of information is provided by the legislative agenda (Clinton and Meirowitz 2001). To see why, consider the substance of the first two proposals with recorded votes in the agenda. The resolution under consideration was proposed by Goodhue (VA) on September 3, 1789 and read:

Resolved: That the permanent seat of the general government, ought to be on some convenient place on the east bank of the river Susquehanna, in the state of Pennsylvania, and that until the necessary buildings be erected for the purpose, the seat of government ought to continue at the city of New York. (Legislative History VI, 1863)

The first roll call involves Lee's (VA) amendment on September 7, 1789 to strike the words "east bank of the river Susquehanna, in the state of Pennsylvania" and insert "banks of the river Potomac in the state of Maryland" in its place (Legislative History VI, 1863). In terms of the above notation, $\theta_{y(1)}^2$ represents the location in the residence dimension associated with a resolution that places the Capital in Maryland alongside the Potomac. A vote against the amendment was a vote for the original Goodhue resolution. Consequently, $\theta_{n(1)}^2$ represents the location in the residence dimension for a resolution placing the permanent capital in Pennsylvania alongside the Potomac. Lee's resolution failed 21–29.

The second roll-call vote was also on September 7th. Vining (DE) proposed an amendment to: strike "permanent" in the first line, strike "on some convenient place on the east bank of the river Susquehanna, in the state of Pennsylvania, and that until the necessary buildings be erected for the purpose, the seat of government ought to continue at the city of New York," and insert "the borough of Wilmington, in the state of Delaware" (Legislative History VI, 1863). This implies that $\theta_{y(2)}^2$ represents the location of the amended resolution (i.e., establish Wilmington as the permanent and temporary location of the Capitol) and $\theta_{n(2)}^2$ represents the location of the unamended Goodhue resolution.

¹²Several normalizations are required to identify the model (Rivers 2003). We assume that the initial status quo $\theta_1 = \theta_{n(1)} = (0, 0)$ (the first 10 votes were all amendments to a proposal). We also assume that James Madison is located at $(-1, -1)$. To fix the scale and direction in the assumption (i.e., first) dimension, we assume that the location of the proposal to pay off the debt at a given rate on May 26, 1790 is located at 1. In the residence (i.e., second) dimension, we assume that location of the amendment to move the proposed capitol location to VA on Sept. 7, 1789 is located at -1 .

Note that a vote against either the first or second proposals is a vote for Goodhue's original resolution. In other words, whereas the location associated with voting "yea" differs (representing the fact that the Lee and Vining amendments differed), the location associated with voting "nay" in each roll call was identical—representing a vote for the unamended Goodhue resolution. This implies that $\theta_{n(1)}^2 = \theta_{n(2)}^2$. We call such a constraint a *relational constraint*.

Standard estimators of roll-call behavior do not utilize this information; they allow for $\theta_{n(1)}^2$ and $\theta_{n(2)}^2$ to differ even though the agenda reveals that they represent the same point in the ideological space.¹³ Failure to impose relational constraints is consequential—leading to parameter estimates that are not interpretable in terms of the spatial model and an inability to determine the dimensionality of the policy space (Clinton and Meirowitz 2001).

Since we know the legislative agenda from the historical record, we identify the proposal associated with failure for each vote using primary source material aggregated in the *Documentary History of the First Federal Congress* (1972, 1986). This enables us to equate the location $\theta_{n(t)}$ associated with voting "nay" on roll call t with some other policy—typically the last successful "yea" policy (and often several locations are identical).¹⁴

To illustrate our treatment of the relationship between nay locations and previous successful yea locations, consider the 5th and 6th recorded roll-call votes on the residence question. The 5th roll-call vote involved the fifth proposed amendment to the Goodhue resolution on September 7th. The previous four (including those by Lee and Vining noted above) were unsuccessful. The fifth amendment was by Stone (MD) to strike "east bank" and insert "banks." $\theta_{y(5)}^2$ therefore represents the amended Goodhue resolution and $\theta_{n(5)}^2 = \theta_{n(1)}^2$ represents the original unamended Goodhue resolution. The amendment passed 26–25. The 6th roll-call vote was on an amendment by Lee (VA) to insert "or Maryland" after "in the state of Pennsylvania." Since the Stone amendment passed, a vote against the Lee amendment is a vote for the (once) amended Goodhue resolution. In other words, $\theta_{n(6)}^2$ represents the location in residence dimension of the resolution that permits the permanent Capitol to be in Pennsylvania on either bank of the Susquehanna River and $\theta_{y(6)}^2$ represents the location of the resolution that also permits the

¹³Only in a unidimensional cutpoint model are the proposal parameters identified (because of second order parametric assumptions). However, the standard model does not constrain $\theta_{n(1)}^2 = \theta_{n(2)}^2$ (for example) when estimating the cutpoint parameters.

¹⁴Note that there are also several votes for which the yea location $\theta_{y(t)}$ is either identical to some previous location $\theta_{y(t-k)}$ or unique.

Capitol to locate in Maryland. Note that the status quo in the 6th roll-call $\theta_{n(6)}^2$ is identical to the location of the successful “yea” proposal in the fifth roll-call $\theta_{y(5)}^2$.

Including information about the agenda requires constructing two mappings: $y(t) : \{1, 2 \dots, 46\} \rightarrow \{1, 2 \dots, 47\}$ and $n(t) : \{1, 2 \dots, 46\} \rightarrow \{1, 2 \dots, 47\}$.¹⁵ These mappings determine the index of the yea and nay locations relevant for roll-call t . Thus if $n(t) = y(t')$ then $\theta_{n(t)} = \theta_{y(t')}$. Table 1 summarizes the 46 votes and the $y(t)$ and $n(t)$ mappings.

Integrating Voting Theory

While there is some question as to the exact date of the dinner at Jefferson’s, it is clear that the first vote in the house on legislation that would have been covered by the Compromise was on the passage of S.12 on July 9, 1790. S.12. located the temporary capital in Philadelphia and the permanent capital alongside the Potomac River ($\theta_{y(37)} = \theta_{39}$). The second piece of legislation was the passage of a funding proposal that did not provide for assumption on July 19 ($\theta_{y(38)} = \theta_{40}$). An amendment to the funding proposal providing for assumption was passed 10 days later on July 29 ($\theta_{y(42)} = \theta_{42}$). The final proposal involved with the log roll was passed later that same day and reduced the interest rate paid to state debt creditors to 3% ($\theta_{y(44)} = \theta_{44}$).

The traditional account of the Compromise of 1790 can be represented by the agenda tree depicted in Figure 2.

Cooke’s alternative account argues that the issues were resolved independently and that assumption was resolved by a compromise on the interest rate that would be paid. Consequently, the final two votes in Figure 2 are relevant for assessing Cooke’s claim.

If legislators believed that a compromise was reached then they would be able to predict the consequences of each vote. Voting theory uses the term “sophisticated equivalent” to denote the anticipated outcome following

¹⁵ 47 proposals are required to account for the location of the initial status quo and the fact that we permit the location of the status quo to change after the dinner party. Although the first House decided to consider all proposals *de novo* in the second session—even though they had already agreed to a solution of the residence question—we use a the proposal offered by Boudinot (NJ) in the first and second sessions to orient the first and second sessions by assuming that the spatial location of Boudinot’s proposals are identical. The use of substantive and relational constraints reduces the number of proposal parameters from $46 \times 2 \times 2 = 184$ (46 roll calls and a yea (θ_y) and nay (θ_n) location for each of two dimensions) to 54—as (at least) one location of every roll call prior to the compromise is determined by some other roll call and roll calls do not have two free locations.

any given vote (McKelvey and Niemi 1978). If the traditional account of the compromise is true, the sophisticated equivalent of voting for S.12 is a world where the temporary capital is in Philadelphia, the permanent capital is on the Potomac River, and the states’ Revolutionary War debt is assumed at the reduced interest rate. If Cooke’s claim is correct, then although there is no necessary relationship between S.12 and the subsequent assumption votes, a vote for the assumption amendment is a vote for assumption at a reduced interest rate. We examine whether legislators’ perceptions of the votes match those implied by sophisticated equivalents.

The relationships implied by sophisticated equivalents constitute an explicit statement of the compromise account, not auxiliary assumptions of our procedure. For example, if the traditional account of the log roll is correct, Hamilton and Madison would have brokered the appropriate deals by the time of the vote on S.12 and legislators would have known that passing S.12 would initiate a chain of events that would result in the passage of assumption at a low-interest rate. In the above notation this means that the yea locations of each of these votes are identical: $\theta_{39} = \theta_{40} = \theta_{42} = \theta_{44}$.¹⁶

Testing for the equivalence of these parameters represents a test of the following explicit account of the compromise.¹⁷ Prior to voting on S.12 legislators were publicly aware that a deal had been struck and they believed the deal would hold together. Legislators voted strategically acting as if they were pivotal at any vote (i.e., voting is consistent with a subgame perfect Nash equilibria in weakly undominated strategies). To evaluate Cooke’s alternative account we also examine if $\theta_{42} = \theta_{44}$.¹⁸

¹⁶ Although many proposal locations may be consistent with an observed roll-call voting pattern, any ambiguity is accounted for in the precision of the estimates. If many spatial locations are consistent with a voting pattern, the recovered proposal estimates will be estimated imprecisely. When testing for spatial equivalence in the third section we account for this uncertainty.

¹⁷ Krehbiel and Rivers’ (1988) investigation of strategic voting in a small amendment agenda shares some similarities with our approach, although their approach is limited to agendas involving only a few votes and a natural metric on the policy space (see also Dietz and Rothenberg 2003).

¹⁸ Associated with failure of the critical legislative components of the deal is some (unmodelled) continuation game whose location is given by θ_{47} . Interpreting this parameter is problematic because its value as a policy location varies if legislators either face uncertainty about what will happen in the continuation game or are impatient. To allow for the possibility that legislator perceptions about the sophisticated equivalent associated with failure of S.12 (and therefore failure of the log roll) changed after the dinner party we allow the parameter $\theta_{n(37)} = \theta_{47}$ to be unconstrained by previous policy decisions. Constraining $\theta_{n(37)} = \theta_{23}$ produces qualitatively similar results.

FIGURE 1 Relational Constraints

t	Date	ICPSR	Issue	Pass?	n(t)	y(t)	Description of y(t)
1	9/7/89	24	capital	fail	2	3	Amendment (A) to put perm. capital in MD
2	9/7/89	25	capital	fail	2	4	" in Wilmington, DE
3	9/7/89	26	capital	fail	2	5	" on Potomac, Delaware or Susquehanna (Susq.) Rivers
4	9/7/89	27	capital	fail	2	6	" on Delaware R. near lower falls
5	9/7/89	28	capital	pass	2	7	" on either side of Susq. R. in PA
6	9/7/89	29	capital	fail	7	8	" as above or in MD
7	9/7/89	30	capital	fail	7	9	A to put temp. capital in Wilmington, not NYC
8	9/7/89	31	capital	fail	7	10	" in Philadelphia, not NYC
9	9/7/89	32	capital	fail	11	12	A to address navigational obstructions at potential location
10	9/7/89	33	capital	pass	7	11	A to authorize a commission to select site
11	9/22/89	38	capital	pass	1	11	Pass H.R.25 (perm. capital on Susq. R.)
12	9/23/89	43	capital	pass	1	13	Accept H.R.25 & A that cap under PA law
13	9/24/89	48	debt	pass	13	14	To hear <i>Report on Support of Public Debt</i>
14	4/15/90	49	debt	pass	14	15	Discharge assumption portion of the report from CoW
15	5/26/90	53	debt	pass	15	16	A to A on reducing payment of specie from \$100 to \$75
16	5/26/90	54	debt	fail	16	17	A to call for interest payments from the year 1781
17	5/31/90	58	capital	pass	16	18	Meet next session in Philadelphia
18	5/31/90	59	capital	fail	18	19	A to specify "& permanent seat on Delaware R."
19	5/31/90	60	capital	fail	18	20	Meet next session in NYC
20	5/31/90	61	capital	fail	18	21	Meet next session in Philadelphia or Baltimore
21	5/31/90	62	capital	pass	18	22	Meet next session in Philadelphia
22	6/11/90	66	capital	pass	22	23	A to replace Philadelphia with Baltimore
23	6/11/90	67	capital	pass	24	23	Pass move to Baltimore
24	6/21/90	71	debt	fail	23	25	A to H.R.69: support state war debts
25	7/9/90	73	capital	fail	38	26	A to S.12: replace "Potomac R." with "Delaware R. near falls"
26	7/9/90	74	capital	fail	38	27	A to S.12: locate temp. capital in Germantown, PA
27	7/9/90	75	capital	fail	38	28	" between Susq. and Potomac R.
28	7/9/90	76	capital	fail	38	29	" to Baltimore, not Potomac R.
29	7/9/90	77	capital	fail	38	30	A to S.12: strike the phrase "purchases or"
30	7/9/90	78	capital	fail	38	31	" to limit commissioners spending on capital construction
31	7/9/90	79	capital	fail	38	32	" to limit spending on capital construction
32	7/9/90	80	capital	fail	38	33	" Philadelphia as temp. capital 12/1790 to 12/1800
33	7/9/90	81	capital	fail	38	34	Philadelphia as temp. capital 12/1790 to 12/1792
34	7/9/90	82	capital	fail	38	35	Philadelphia as temp. capital 12/1790 to 5/1792
35	7/9/90	83	capital	fail	38	36	To not constrain Congress to meet in a particular location
36	7/9/90	84	capital	fail	38	37	A to S.12: move upon completion of construction
37	7/9/90	85	capital	pass	47	39	Pass S.12 (on location of capital)
38	7/19/90	86	debt	pass	47	40	Pass Public Debt Bill (without assumption provisions)
39	7/24/90	88	debt	fail	41	47	To disagree with Senate assumption amendment
40	7/26/90	89	debt	fail	41	47	A to Sen A: original holders do not have exclusive rights
41	7/26/90	90	debt	fail	41	47	A to Sen A: Pay states even if not subscribed by time limit
42	7/26/90	91	debt	pass	47	42	Agree to amended Sen assumption amendment
43	7/27/90	92	debt	pass	47	43	Agree to 3rd part of Sen A: interest starts to accrue in 7 yrs
44	7/29/90	93	debt	pass	47	44	Agree to 5th part of Sen A: interest rate set at 3%
45	8/5/90	95	capital	fail	44	45	To put main question to repeal part of Senate residency bill
46	3/1/91	115	debt	pass	44	46	Agree with Sen. A to residency bill

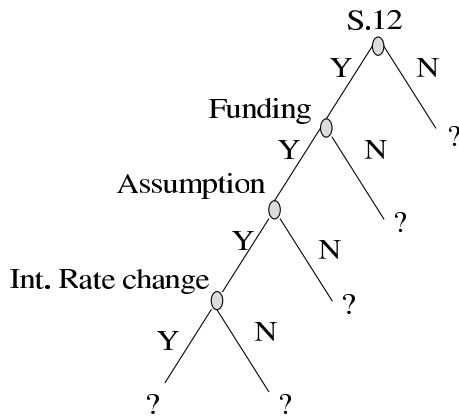
The table indicates: the roll-call number (and the ICPSR number of the vote), whether the vote dealt with the residence or assumption question and whether the proposal passed. In addition to a brief description of the yeas proposal associated with the roll-call, the index associated with the relevant yeas and nay locations are also listed. For example, on roll-call 10 (ICPSR 33), a yeas vote indicates a preference for θ_{11} over θ_7 .

While attributing an ability to predict outcomes to legislators might seem strong, the logic of a log roll requires that legislators see the first vote as the first step in reaching the final agreed upon outcome. Furthermore, there are several reasons why the assumption is reasonable. First, newspaper accounts of the time explicitly reference

the possible existence of a log roll. The *New York Journal* on July 27, 1790 (i.e., after the vote on S.12 but before the votes on assumption) writes:

The true reason of the removal of Congress from this city will be explained to the people in the

FIGURE 2 Agenda Tree for Traditional Account of the Log Roll



course of a very few days. To the lasting disgrace of the majority in both houses it will be seen, that the Pennsylvania and Potomac interests have been purchased with twenty one and an half millions of dollars, and that the good people of this state will have to pay about one eighth part of that enormous assumption, merely to remove Congress from their capital.

The debates upon the funding proposal, as sent down by the Senate, will be well worth the attention of the citizens: it will be curious to see all the reasoning against the assumption done away: even the powers of Mr. Madison are to be silent on the subject, but to perceive a consilience of character, he must vote against it, his mouth is to be shut, his silent negative is to satisfy his new friends, and he is to prove “that every man may be purchased, if his price is offered:” his price is the Potomac. . .

Second, in clarifying the traditional account of the compromise Bowling names the delegations of Virginia, Maryland, Georgia, Pennsylvania, Massachusetts, New Hampshire, and New York as participating in the various side-deals to the compromise (Bowling 1968, Chapter 7; Bowling 1971, 632–34). Involvement by such a large group of delegates suggests that if the log roll was set, it was no secret.

Even though scholars disagree about which legislators were involved in the traditional explanation, our method does not require us to identify the legislators involved. So long as legislators believed that a log roll existed they

would perceive the legislative environment identically despite preference differences over the possible alternatives. Consequently, the estimated proposal locations will satisfy the sophisticated equivalents constraint if the traditional account is true even if we cannot be sure as to who was involved in the log roll.¹⁹

As with any attempt at formalizing a particular account, our approach has limitations. First, we focus only on the most popular account of the compromise. Since the methodology is particular to a given account (i.e., agenda tree) of legislative politics, it cannot test alternative accounts (unless the alternative account is nested in the account being tested as Cooke’s compromise on the interest rate is). Although investigating well-specified alternative accounts following the same logic is possible, a sufficient number of roll calls on the relevant issues must be possible.

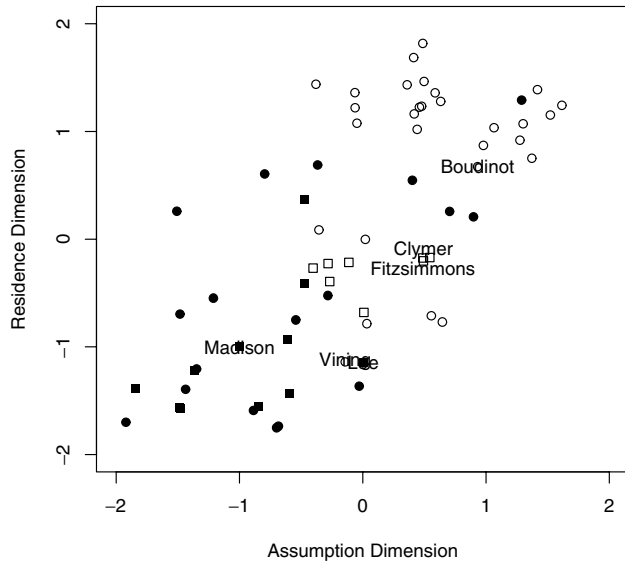
Second, we cannot rule out the possibility that a multitude of side-deals—all resulting in the final observable outcome of locating the permanent seat of government on the Potomac and providing for assumption—may be responsible for the observed outcome. If alternative accounts predict identical constraints than we have no ability to determine which account is more consistent with observed behavior. We can only determine if the sophisticated equivalence constraints of the traditional account of the Compromise of 1790 are satisfied. For example if the result of the dinner party were a few well-placed secret bribes then our test would likely miss the resulting strategic behavior (unless knowledge of the bribes and the expectation that they would be effective were publicly held).

Finally, our test has no power in the presence of extreme position taking by legislators on the key votes. If legislators are concerned with how their vote may be perceived by constituents unfamiliar with the strategic nature of the politics then it may be incorrect to view the recovered proposal locations as measures of legislator perceptions. We find this criticism lacking given the number of legislators involved in Bowling’s account. The presses’ public speculation also suggests that the public were likely aware of the subtle politics and the possibility of strategic behavior.

As an alternative approach, one might speculate that evidence of the compromise would more likely be reflected in changes in legislators’ revealed preferences following Jefferson’s dinner party. Determining whether the

¹⁹Alternative models relaxing this assumption and allowing only the delegations from Pennsylvania and Virginia (see Bowling 1971, 632) (or alternatively Massachusetts and Virginia) to share different perceptions from the other (less involved) delegations yield the same substantive conclusion.

FIGURE 3 Substantive and Relational Constrained Ideal Point Estimates



The figure depicts the estimates by region: northern (southern) representatives are indicated by open (solid) circles, with legislators belonging to the Pennsylvania and Virginia delegations plotted by open and solid boxes, respectively.

induced preferences of the critical legislators Bowling identifies change following the compromise is problematic because there are not enough roll-call votes following the dinner party to estimate new ideal points over the relevant issues with any great precision. However, in some sense our approach does adopt this research strategy since a log roll can be interpreted either as shifting the perceptions of legislators with fixed preferences or shifting the preferences of legislators with fixed perceptions.²⁰ We fix legislator preferences and allow policy location perceptions to vary in response to a log roll because we can more precisely estimate a few proposal parameters using all of the delegates' votes than we can estimate an ideal point for each legislator using a handful of votes.

Assessing the Evidence

To provide a context for interpreting the proposal location estimates, Figure 3 presents the substantively and relationally constrained ideal point estimates. Recall that impos-

²⁰These are not equivalent if nonpolicy transfers such as bribes are involved. The traditional account contains no discussion of this possibility.

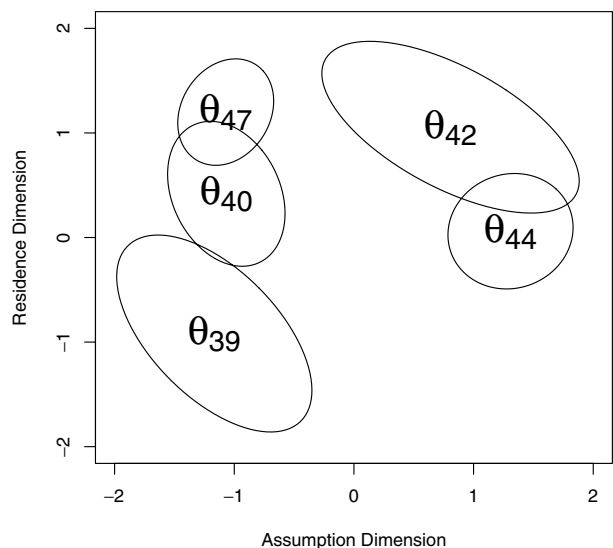
ing substantive constraints permits the interpretation of the estimates in terms of policy outcomes—positive (negative) values in the first dimension represent an induced preference for more (less) assumption and positive (negative) values in the second dimension represent an induced preference for a northern (southern) capital.

The estimates are reassuringly similar to the historical understanding. Clymer (PA) and Fitzsimmons (PA) are centrally located in both dimensions—consistent with the historical record indicating that they were critical deal-makers in the log roll. Lee (VA), a pivotal member in the vote for assumption, is centrally located with respect to assumption, but with clear preferences for a southern capitol. Vining (DE), an active supporter of a Southern capitol, and Boudinot (NJ), an active proponent for assumption, are both extreme in the relevant dimensions.

Figure 4 depicts the posterior estimates of the yea and nay locations for the critical four votes.

It is clear that S.12 should affect the location of the Capital, and it does indeed move in a southern direction (evidenced by the fact that $\theta_{39}^2 < \theta_{39}^1$). However, contrary to the traditional account, the passage of S.12 does not affect the status quo in the assumption dimension (i.e., θ_{39}^1 is not statistically distinct from θ_{47}^1). The passage of the funding proposal (θ_{40}) does not change the status quo in assumption—consistent with the fact that the

FIGURE 4 Posterior Estimates for Key Proposals



The labels indicate the location of the posterior mean. The ellipses denote the 95% (normal) posterior confidence intervals for the posteriors.

funding proposal neglected the contentious question of assumption—but it strangely enough influences the perceived location of the capital. As is clear from Figure 4, and consistent with the substance of the amendment, the assumption amendment (θ_{42}) represents a dramatic pro-assumption move (i.e., $\theta_{42}^1 > \theta_{40}^1$). The assumption amendment is not statistically distinct at conventional levels for the subsequent amendment lowering the interest rate paid to state debt creditors (θ_{44}).

As argued in the previous section, evidence supporting the traditional account of the compromise would involve a southeasterly (i.e., toward a southern capital and the assumption of state debts) move from θ_{47} to θ_{39} and then no movement when θ_{40} , θ_{42} and θ_{44} pass. This pattern would account for the fact that once the public log roll had been galvanized, legislators perceive a vote for S.12 as equivalent to a vote for the funding proposal amended to include assumption at an interest rate of 3%. Figure 4 does not reveal this pattern.

Figure 4 reveals instead that when legislators resolved the residence question by passing S.12 on July 9, they did not view the log roll as being galvanized. The fact that S.12 and the final outcome on assumption (θ_{39} and θ_{44} , respectively) are distant indicates that passage of the assumption amendment was unanticipated at the time legislators were voting on S.12. Since the support of the two posterior distributions is disjoint, the posterior probability of the compromise is 0 (or at least very close to it). In light of this finding, and given the delay and the numerous legislative maneuvers between the passage of S.12 on July 9 and the eventual passage of the assumption amendment on July 26, the correct conclusion seems to be that the traditional story is incorrect.

Although the traditional account modelled by the agenda in Figure 2 is not well supported by observable roll-call behavior, there is some support for Cooke's alternative story. The fact that S.12 was not perceived as affecting assumption is consistent with Cooke's contrary account that the two issues were resolved independently. In addition, the proximity of θ_{42} and θ_{44} provides strong evidence that a compromise over assumption and the interest rate occurred *after* both the residence question was resolved and the funding proposal excluding assumption was passed.²¹ Consistent with Cooke's (1971) claim that a compromise on the interest rate enabled the assumption amendment to pass, the interest rate change seems to have been anticipated at the time that assumption was approved.

²¹The posterior means of locations θ_{43} and θ_{45} are statistically indistinguishable in either dimension using conventional levels.

Conducting roll-call analysis with substantive and relational constraints and determining whether estimated proposal locations are consistent with the sophisticated equivalents implied by the application of voting theory to the traditional account of the Compromise of 1790 reveals little evidence to support the traditional account. When voting on the residence question legislators did not perceive the eventual outcome on assumption. Instead, the contentious issues appear to have been resolved independently, with the assumption question being settled by a compromise on the interest rate paid to creditors.

Comparison with NOMINATE

To highlight the methodological contribution it is instructive to compare our estimates to those resulting from applying NOMINATE to the voting behavior of the 66 legislators on the 46 proposals.²² To fix the orientation of NOMINATE in a manner congruent with our procedure we fix Rep. James Madison to lie in the fourth quadrant. No other constraints are used. Figure 5 graphs the ideal points estimates from NOMINATE as well as the estimated cutting lines for the votes on S.12, the Public Debt Bill, the assumption amendment to the Public Debt Bill and the amendment on the interest rate of assumption for the Public Debt Bill.

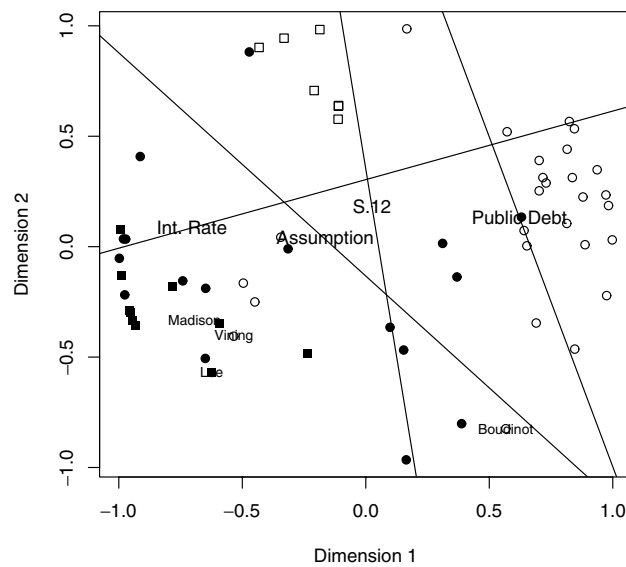
Comparing the ideal point estimates in Figure 5 with Figure 3 reveals several important differences. First, the recovered estimates of induced preferences are not very similar (correlation of .72 in dimension 1 and .14 in dimension 2). This discrepancy results because although NOMINATE and our procedure analyze the same set of votes, NOMINATE ignores additional information contained in substantive and relational constraints.²³

Second, although it is possible to interpret the dimensions resulting from our estimator with some confidence, it is difficult to interpret NOMINATE's policy dimensions. NOMINATE seeks to recover the best-fitting space while remaining agnostic about the substance of the proposals being voted on. Interpreting the recovered dimensions requires using the angle of estimated cutting

²²We use NOMINATE because of its prevalence in the literature. There is no reason to suspect that alternative estimators of roll-call voting using only H (e.g., QN [Poole 2000; Heckman and Snyder 1997] or IDEAL [Clinton, Jackman, and Rivers 2004]) would yield substantive different conclusions.

²³Although it may certainly be possible to modify NOMINATE in such a way, such an endeavor is beyond the scope of this article.

FIGURE 5 NOMINATE Estimates



Northern (southern) representatives are indicated by open (solid) circles, and legislators belonging to the Pennsylvania and Virginia delegations are plotted by open and solid boxes, respectively. Cutting planes for the four critical votes in Figure 2 are also depicted and labeled.

planes and substantive knowledge about the proposals to make postestimation inferences about what was recovered.²⁴

Third, NOMINATE suggests that the second dimension explains very little (a two dimensional NOMINATE fit only increases the percentage of correct classifications by 4% to 89%, and the aggregate proportional reduction of error only increases by .1 to .72). However, Figure 5 demonstrates that the cutting lines of the interest rate amendment and S.12. are largely orthogonal, suggesting that an investigation of the assumption and location choices requires more than a one dimensional policy space. To be fair to NOMINATE, the fact that the cutting planes on these two votes have such different slopes is also suggestive that the traditional account is not correct. However, interpreting the cutting plane slopes in a model that does not constrain bill locations to satisfy relational constraints is more difficult than interpreting policy location estimates.

²⁴In this sense our approach is similar to confirmatory factor analysis and standard approaches are similar to exploratory factor analysis. The latter seeks to find patterns in data and the former investigates the extent to which a particular systematic relationship fits the data.

Discussion

The possibility that observable legislative behavior does not always transparently reflect true (induced) preferences is a source of difficulty for scholars. Since we can observe actions but not true preferences, testing accounts of strategic voting and legislative compromises is difficult.

We offer a method that uses historical information and theoretical concepts to increase our analytical leverage on such problems. History provides us with information about the identify of the critical votes, the substance of the proposals being voted upon, and the relationship between the proposals themselves. Voting theory provides the needed link between the proposals and the relevant status quo for each vote and isolates a set of relationships between proposal locations which must be satisfied if the account in question is true.

Applying our approach to the Compromise of 1790 exposes weaknesses in the traditional account that passing the residence proposal resolved the assumption question. Inconsistent with the notion of sophisticated equivalence, when voting on the residence question legislators seemed to be voting for a world that did not include the eventual outcome on assumption. Instead, the results suggest that the two issues were independently resolved on their own merits; the assumption seems to have passed because of a compromise made on the interest rate paid to creditors.

Our approach is by no means a panacea. Historical accounts must be reducible to testable constraints on estimable parameters. This may be challenging if a simple agenda tree cannot capture the account at hand. In addition, multiple votes must be taken on each issue of interest. The desirability of the approach also depends on the cost of gathering information about the substance of the proposals being voted upon and the relationships imposed by the legislative agenda. The data demands are quite high as a long (and sometimes unclear) sequence of votes must be reduced to a set of constraints on proposal locations. For large projects (e.g., assessing the prevalence of strategic voting in Congress) the approach may be prohibitively costly. Finally, customizing the likelihood function can also result in a less well-behaved computational problem.

Another limitation which is highlighted by, but not limited to, our approach is that testing hypotheses requires making assumptions. In constructing the likelihood function and the hypothesis test we focused on the most prevalent account of the Compromise of 1790. Testing alternative accounts requires different statistical models and tests.

Although the approach has its limitations, this is unsurprising given the difficulty and nature of the problem

we address. Determining how unobservable concepts such as true preferences relate to observable behavior such as voting necessarily entails making some assumptions. To the extent that the assumptions rely on historical and theoretical insights we believe this approach represents a valuable means of addressing this difficult yet prevalent problem.

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