

Legislators and their Constituencies: Representation in the 106th Congress*

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Abstract

The extent to which representatives “represent” the preferences of their district in roll call voting is fundamental to the endeavor of understanding the nature of electoral institutions. Although a great deal of work is devoted to this problem, previous work suffers from both an inability to measure sub-constituencies of the type identified by Fenno (1978) and problems resulting from the usage of ideal point *estimates*. Using survey data from a random probability sample of 39,000 respondents and a hierarchical Markov Chain Monte Carlo estimator, this paper addresses both of these limitations. I find that not only are legislators’ revealed preferences related to the preferences of both the geographic and party constituency, but also that there is some evidence that the ideology of the party constituency is more important to the representative. No evidence suggests that the nature of this relationship varies with respect to the electoral margin, tenure, or staff allocation decisions of the legislator.

Arguably one of the most important questions in political science concerns whether elected representatives “represent” their constituents. Broadly stated, the research program consists of determining the extent to which the policy preferences of constituents are realized in the voting behavior of their representative. The more limited issue this paper investigates is the relationship between constituency ideology and the voting behavior of representatives in the 1st session of the 106th House. Specifically, I answer the substantive questions of: who (if anyone) does a representative “represents” when casting a roll call vote, and does this vary with respect to characteristics of the representative?

Given the primacy of such questions to the enterprise of political science, it is not surprising that a copious body of work concerns itself with these (and related) questions. This paper distinguishes itself from prior investigations by first using new data to provide for a more expansive characterization of constituencies than previously possible, and second, presenting a new estimator for estimating and recovering the legislator-constituency relationship that escapes the statistical problems of previous estimators. A national random sample of 39,000 respondents permits the preference measurement of subgroups within every congressional district.

In summary form, the paper substantively demonstrates:

- That Fenno’s (1978) emphasis on the importance of multiple constituencies is important to understanding legislator-constituency relationships in the 106th Congress.
- That representatives are responsive to both geographic and party constituencies – although evidence suggests that they are more responsive to the preferences of the party constituency.
- The responsiveness of legislators to their geographic and party constituencies is invariant with respect to the electoral margin of the representative in the 1998 election, the length of time the representative has served in the House, or the percentage of staff members allocated to the district.

Methodologically, the paper:

- Presents data that enables scholars to characterize the preferences of both geographic and party constituencies.
- Shows that attempts to uncover the legislator-constituency relationship by regressing legislator ideal points estimates (e.g., interest group scores, NOMINATE (Poole and Rosenthal, 1997), Heckman-Snyder scores (Heckman and Snyder, 1997)) on covariates of interest produces problems for inference.

- Present a hierarchical Markov Chain Monte Carlo (MCMC) ideal point estimator which both escapes these problems and permits researchers to examine different specifications of the legislator-constituency relationship.
- Demonstrates that the statistical problems present in existing estimators of the legislator-constituency relationship can adversely affect the validity of recovered substantive conclusions.

The outline of the paper is as follows. Section 1 briefly recounts the description Fenno offers of the legislator-constituency relationship, as this description offers a useful framework for the analysis in subsequent sections. Section 2 reviews the means by which current assessments of the legislator-constituency relationship are made. I argue that there are several reasons as to why existing methods (and therefore results) are problematic. I also present new data that remedies the previous inability to measure the preferences of groups smaller than the district. Section 3 outlines a hierarchical MCMC estimator of legislative roll call voting that addresses the statistical shortcomings of existing estimators by simultaneously estimating the ideal point estimates and the specified relationship between constituency and legislator preferences. Section 4 uses this estimator and the data discussed in section 2 to examine several specifications of this relationship to both determine the importance of accounting for the possible influence of constituencies smaller than the district and to demonstrate the consequences of ignoring the statistical problems explored in section 2. Section 5 concludes. Appendix A presents a more rigorous description of the MCMC estimator of Section 3, and Appendix B provides the WinBUGS code used to estimate the models.

1 A Description of the Legislator-Constituency Relationship

Fenno’s 1978 exploration of the legislator-constituency relationship in the mid-1970’s provides a useful point of departure for this paper’s empirical examination. Although Fenno makes explicit his reluctance to generalize beyond the examined Congresses, given that applicability is an empirical question, this paper examines several facets of the description he offers.¹

Fenno describes the district as perceived by the representative as being composed of “concentric constituencies.” The largest population of interest

¹It is worth noting that there are (at least) two major differences between the periods. First, the average amount of money spent in contemporary campaigns far exceeds the average expenditure during the period that Fenno examines. Second, and related to the first difference, the national party is much more involved in contemporary races (Jacobson, 1997).

to the (re-election centered) representative is that of the geographic constituency – consisting of all likely voters in the district. The next most numerous grouping of constituents is the re-election constituency, which is comprised of all those voters whose support the representative thinks she won in the previous election. The re-election constituency’s impression of the representative is consequential to the representative because maintaining the support of those that elected the representative in the last election is (arguably) the surest way to win the next election.

Two smaller constituencies of considerable interest are the primary and personal constituencies. Fenno describes the primary constituency when he notes that “we shall think of these people as the ones the congressman believes would provide his last line of electoral defense in a primary contest” (Fenno, 1978:18). The final (and smallest) constituency of interest is that of the personal constituency. This group consists of the representative’s closest confidants and advisors, upon whom the representative relies for advice and support.

Although it may seem odd for the (re-election centered) representative to ever favor the views of a smaller group over those of larger groups, this apparent anomaly results from the means by which a political campaign is run in a largely disinterested electorate. In other words, the support of the primary and personal constituencies are critical because the organization and publicity provided by these motivated constituents are indispensable to the running of a successful campaign in the midst of a largely inattentive geographic constituency.

As Fenno notes and quotes: “The primary constituency, we would guess, draws a special measure of a congressman’s attention:

When I look around to see who I owe my career to, to see those people who were with me in 1970 when I really needed them and when most people thought I couldn’t win – these are the people that I owe.

And it should, therefore, draw a special measure of ours” (Fenno, p.19, 1978). A suggestive illustration of the importance of this relationship presents itself in the 106th Congress.

On July 17, 2000, Michael Forbes (R,NY-1) decided switch parties and join the Democratic party. Despite being a 3 term incumbent, and one of the most liberal Republicans, Forbes was defeated in the Democratic primary by 71 year-old librarian Regina Seltzer – whose previous office was a town council seat held more than two decades prior. Although Forbes had the backing of the Suffolk County Democratic Party and several “strong” Democratic candidates withdrew from the race under pressure from the National Democratic Party (who were eager to pick up the seat and thought the

election of Forbes was a certainty), Forbes was bested in the Democratic primary by Seltzer, who had only \$17,200 in cash-on-hand prior to the primary. (Dougherty, 2000)

The interesting aspect of the example is that not only did Forbes alienate his (former) primary constituency, but the extent of the alienation was sufficient so as to cause them to actively campaign for Seltzer, his *Democratic primary opponent*. As reported by the Washington Post (Eilperin, 2000):

Fourteen months ago, Jeff LaCourse was a loyal aide to then-GOP Rep. Michael P. Forbes (N.Y.). But then Forbes suddenly switched parties, and LaCourse vowed he would do everything possible to ensure the congressman did not win reelection in his Long Island district...Bolstered by an \$80,000 contribution from the House GOP campaign committee, New York Republicans sent eight mailings to the 1st District's 20,000 registered Democrats over the past 10 days. One included a report card bearing the header—"100% Great Work!"—which elaborated inside, "Congratulations, Mike Forbes! You received a perfect score from the Christian Coalition." Another splashed the image of someone gripping an assault weapon with the line, "If you want one of these in your home . . . then Congressman Mike Forbes is on your side."

Even Forbes acknowledges the role his alienated primary constituency played when he noted that "This was a classic primary election, where what we call 'the true believers' turned out. My Democratic opponent had no resources and no ground troops to speak of. They [the alienated Republicans] picked the nominee" (Eilperin, 2000).² Although Forbes ran in the general election as a third party candidate, he performed miserably – getting only 3% of the vote.

Despite the clear description offered by Fenno, and the suggestive example above, it is difficult to examine the relative extent to which representatives respond to the constituencies Fenno describes. This is true not only because of their size (in the case of primary and personal constituencies), but also because they are defined in terms of the amount of support they provide the representative. In other words, given that they are defined as being constituents with influence, trying to determine if they influence representatives' voting behavior is tautological. However, there is another constituency of potential interest to the representative that is both easier to characterize and of theoretical interest.

²Of course, the Republicans were also acting strategically, as by enabling Seltzer to win, they arguably assured themselves of victory in the general election – which they won 56% to 41%.

[INSERT FIGURE 1 ABOUT HERE]

Figure 1 summarizes the relationship between the party constituency – which consists of every constituent in the district with the same partisan affiliation as the incumbent – and the constituencies discussed by Fenno. As Figure 1 shows, the party constituency contains most, if not all, of the primary and personal constituencies. Although outside of Fenno’s discussion, examining the possible relationship between the (revealed) preferences of a legislator and those of her party constituency is of interest not only because this determination examines Fenno’s basic point that a legislator is responsive to more than just the geographic (or re-election) constituency, but also because the investigation provides evidence as to whether political parties are important in an electoral context.

There are four reasons as to why the preferences of the party constituency may be important to the legislator. First, because the party constituency largely represents the set of constituents who provide the representative with the organization and resources with which to run re-election campaigns, representation of the party constituency’s policy preferences may be necessary in order to obtain this support. Second, given that representatives often possess very little information about the policy preferences of their district, the partisan affiliation of the party constituency may provide the representative with an informational cue that they can utilize in determining how to vote on a given roll call. Third, given that the party constituency represents the set of possible (closed) primary voters, representation of the party constituency may result from the fact that the representative faces both a primary and general election (Aldrich, 1995). Finally, given that the representative can be thought of as being drawn from the set of party constituents in the district, it may be that the preferences of the party constituency actually represent the representatives personal preferences (as would be true in expectation).

Given that any of the four reasons provided above represent sufficient (but not necessary) conditions as to why representatives would vote in accordance with the preferences of the party constituency, it is an empirical question as to the extent to which this occurs. However, the representative must be responsive to the preferences of the larger constituency, as winning the support of the party constituency will be of little use if so doing puts the legislator at odds with the beliefs of the larger constituency. Even so, it is unclear whether the legislator is more responsive to the preferences of the geographic or party constituency when casting roll call votes – although previous research into the relationship of the Senate suggests the latter (e.g., Fort et. al. (1993), Brady and Schwartz (1995), and Levitt (1996))). Before moving to an investigation of the form that the legislator-constituency relationship takes in the contemporary Congress, I first argue why existing attempts at this characterization are problematic.

An important caveat to the analysis that follows is that although it is

common to think of representation as a conscious decision by the representative to vote in accordance with the preference of the constituency (as suggested by Mayhew (1974)), an observationally equivalent possibility arises if the representative ignores the constituency's preference and votes her own preference so long as both have similar preferences.³ Given this causal indeterminacy, the empirical results cannot determine whether a representative consciously votes in accordance with the preferences of her constituency or if she only acts as if she does.

2 Problems with (and Solutions to) the Problem of Interest

A copious amount of research on the issue of relating legislator and constituency preferences exists. Although by no means an exhaustive account of the attempt, previous research has used: survey data from both the constituency and legislator on several issues (e.g., Miller and Stokes (1963), Achen (1977), Achen (1978), Erickson (1978)), on all issues (e.g., Ansolabehere et. al. (2001)), constituency opinion and an estimate of legislator ideology (e.g., Powell (1982), Page et al. (1984)), constituency characteristics and legislator roll call voting with respect to a specific issue (e.g., Jackson and King (1989), Bartels (1991), Bailey and Brady (1998), Bailey (2001)), constituency characteristics and a roll call derived measure of legislator ideology (e.g., Kau and Rubin (1979), Kau and Rubin (1982)) and constituency preference revealed through initiative voting and estimates of legislator ideology (e.g., Snyder (1996), Gerber and Lewis (2000)). The variety of methods employed is evidence of the difficulty associated with the problem.

Two statistical problems have hindered previous attempts at specifying the nature of the legislator-constituency relationship. The first, and most problematic, concerns Fenno (1978)'s observation/supposition that a district contains several constituencies of interest to the legislator. If true, failing to account for this possibility results in the statistical problems associated with omitted variable bias.

The second problem is highlighted by realizing that an answer to the question "who do legislators represent" involves recovering the relationship between three unobservable preferences – those of the legislator, the geographic constituency, and the party constituency. Although measures are arguably present for the latter two quantities, scholars are forced to use estimates of (revealed) preferences for legislators. This creates problems for statistical inference because the (heteroskedastic and autocorrelated) error variance of *any*

³In fact, there are good theoretical reasons to suspect that there are selection effects which favor the election of representatives whose ideology is highly correlated to that of the constituencies of importance (Zaller, 1998).

ideal point estimate is correlated with measures of constituency preference – resulting in incorrect standard error estimates when the typical approach to estimating the relationship is adopted.

2.1 Measuring Constituency Preference

That estimators of the legislator-constituency relationship should account for the possibility that representatives differentially respond to the preferences of the various constituencies is not a new observation (e.g., Goff and Grier (1993), Krehbiel (1993)). However, scholars have been limited in their ability to measure these preferences by a lack of available data.⁴

The most common measures of constituency preference are the percentage of two-party votes cast by the district for the Democratic (for example) presidential candidate, and the demographic composition of the district. Although using each requires making some (arguably strong) assumptions, the most significant limitation with either measure is that each provides for the recovery of only one “ideal point” per district.⁵ Such measures consequently provide no ability to determine the extent to which the representatives’ roll call behavior is consistent with their geographic and/or party constituencies. Absent such an ability, it is impossible to examine the possibility raised by Fenno of multiple constituencies within a district.

The inability to measure the party constituency’s preferences results in a very well-known and severe statistical problem. Specifically, if the preferences of the party constituency is correlated with legislators’ roll call voting behavior, the estimated specification suffers from omitted variable bias – resulting in the biased estimation of *all* parameters of interest (Greene, 1997). Consequently, despite a large literature on the legislator-constituency relationship, it is unclear how much we know given that most previous estimators suffer from this problem.

A means of characterizing the preferences of constituencies smaller than the geographic constituency is potentially provided by survey data – as a scholar using survey data can exploit relationships between survey responses to construct measures of interest. Despite this promise, such an approach has previously been impossible because of the problems created by insufficient sample sizes, non-random sampling or both.

⁴The notable attempts that have been made typically focus on the Senate (e.g., Peltzman (1984), Ladha (1991), Fort et. al. (1993), Brady and Schwartz (1995) Levitt (1996)) rather than on the House (e.g., Powell (1982)).

⁵Using district presidential vote percentage assumes both that presidential voting is ideologically driven and either the same ideological issues are present in both the presidential and congressional elections, or that the mapping between the ideological issues for the two races is consistent. Using demographic measures necessarily introduces specification error, as the researcher is forced to summarize district ideology using available demographic characteristics.

Most survey based measures rely on data from the National Election Study (e.g., Miller and Stokes (1963), Page et. al. (1984)). Consequently, observations typically exist for only a quarter of the congressional districts and the average district is characterized by less than 20 observations. More troubling is the fact that because some of the samples used are not random probability samples because of either sampling issues (e.g., Miller and Stokes (1963)) or selection effects (e.g., Ansolabehere et. al. (2001)), producing valid estimates requires significant assumptions (and adjustments) for valid inference (Smith, 1983).

This paper addresses these shortcomings in survey based measures by using previously unavailable data. Although the preferences of the geographic constituency are characterized using the average Democratic two-party district presidential vote in the 1992 and 1996 elections and the preferences of the party constituency are constructed using the survey responses of 39,000 randomly selected respondents.⁶ Specifically, the average response to a standard ideological self-placement question for only those respondents in the district whose partisan affiliation is the same as the incumbent characterizes the party constituencies' ideology.⁷ In other words, the measure of a Republican congressman's party constituency's is given by the average ideological self-placement for only those respondents in the district who identify with the Republican party. The question used is:

There has been a lot of talk these days about liberals and conservatives. Would you say that you are...

Very Liberal
Liberal
Moderate
Conservative
Very Conservative
Don't know

The 39,000 respondents are distributed such that every congressional district contains at least 8 respondents. Since the average district contains 88 respondents – with the 1st district of Arkansas and the 3rd district of Iowa

⁶It might be argued that the geographic constituency should also be characterized by a survey measure. Given the error associated with this measure in citizens with low political engagement, there is reason to be wary of the validity of such a measure (Converse (1962, 1964)). In addition, it is not clear how informative such a measure would be given that the party constituency measure is comprised of a subset of these voters (and therefore highly co-linear) . Specifications using this measure confirm these concerns, as a survey based measure of the geographic constituency's ideology never obtains statistical significance.

⁷Note that further subsets such as only those partisans who indicate that they are registered to vote or only those partisans who describe their partisanship as “strong” produce the same qualitative conclusions.

characterized by the fewest number of respondents (8 and 9 respectively) and the 7th district of Florida and the 4th district of California containing the most respondents (209 and 211 respectively) – it is possible to measure the preferences of the party constituency in every congressional district.

[INSERT FIGURE 2 ABOUT HERE]

The upper and lower histograms in Figure 2 summarize the number of respondents in the geographic and party constituencies respectively. For purposes of comparison, the mean number of respondents Miller and Stokes (1963) and Powell (1982) use to summarize the preference of the geographic constituency (for only 116 and 108 of the districts respectively) is also denoted. As is immediately evident from Figure 2, this paper uses more data to characterize the preferences of *party* constituencies than previous survey-based studies use to measure the preference of *geographic* constituencies.

Before describing the relationship between the preference measures of the geographic and party constituencies, it is important to describe the data used. The survey data is from Knowledge Networks, which utilizes random probability sampling of the sampling frame consisting of all US households with a working telephone line. After sampling, those numbers for which it is possible to identify an address through reverse address matching are sent a letter informing them that they have been selected to participate in the Knowledge Networks Panel. In addition to describing the purposes of the Panel and the desired respondent commitment level, a small monetary incentive is provided to encourage cooperation.

All numbers sent a letter, and a fraction of those not sent a letter are then called to be recruited to join the Panel. During the call, which typically lasts 10-15 minutes, the head of the household is told that in return for members completing a short survey every week, the household will be provided with a free WebTV interactive television unit and free Internet access for the WebTV unit. If recruited, the entire household is enumerated. At the time that the surveys described in this paper were performed, the cooperation rate (i.e., total number of completes divided by the total number of completes and refusals) was around 56%. Although one might be concerned about the possibility of panel effects, not only does current research on the Knowledge Networks panel suggest that the bias is not large for the period examined (Clinton, 2000), but given that I rely on responses given in the second survey assigned to panelists, it is doubtful whether sufficient exposure has elapsed to induce such behavior.

Figure 3 depicts the relationship between the (assumed) ideal points of the geographic and party constituencies. Recall that the survey based measure described above is used to measure the preference of the party constituencies and the two-party Democratic presidential vote percentage is used to measure the preference of the geographic constituencies.

[INSERT FIGURE 3 ABOUT HERE]

Although correlated at .66, clear differences are immediately evident upon inspection. The vertical line segments in Figure 3 indicate the sample size used to summarize the ideology of the party constituency. The height of the segments is given by the reciprocal of the sample size used. Since the sample size varies from 2 to 88, the segments' length accordingly vary from .01 to .5.⁸

Having described both the first statistical problem confronting scholars interested in the nature of the legislator-constituency relationship and the solution I employ, I now turn to the second.

2.2 Ideal Point Estimates As A Dependent Variable

Since estimates of representatives' revealed preferences are readily available to scholars thanks to interest groups and the work of political scientists such as Poole and Rosenthal (1997), Groseclose et. al. (1999), and Heckman and Snyder (1997), a typical approach to recovering the legislator-constituency relationship consists of a variation of the following two-step process (e.g., Kau and Rubin (1979), McCarty et. al. (1997), Brady et. al. (2000), Rothenberg and Sanders (2000), Stratmann (2000)):⁹

1. Estimate (or find pre-existing estimates of) legislator i 's true ideal point x_i – denoted \hat{x}_i , where $x_i = \hat{x}_i + \omega_i$.
2. Regress the ideal point estimates \hat{x} on the covariates of interest \mathbf{Z} using the relationship $\hat{x} = \mathbf{Z}\gamma + \epsilon_2$ and make inferences about the resulting coefficient estimates $\hat{\gamma}$.

As legislator ideal point estimates are estimates, measurement error necessarily results. Before demonstrating how statistical inferences are affected by the measurement error ω of the (step 1) ideal point estimates, I first

⁸It is well known that sampling error is introduced into the measure because the party constituency's preference is based on aggregated survey results (Achen (1977), Achen (1978), ?, Powell (1982), Jackson (1989)). The hierarchical estimator described in section 3 permits scholars to account for this variation by also incorporating a measurement error model for the preference of the party constituency. This work is currently underway and preliminary evidence suggests that the paper's substantive conclusions are robust to this sampling error.

⁹Although not discussed, it is clear that the “residual regression” approach of Kau and Rubin (1979) and Carson and Oppenheimer (1984) is subject to the same criticism outlined below. Specifically, and independent of the criticisms of Poole (1988) and Bender and Lott (1996), because of measurement error in the ideal point estimates, the error from the “purging” regression will reflect this measurement error. As this measurement error differs across legislators, one cannot simply interpret the regression error as “shirking”.

establish the characteristics of this measurement error. Specifically, the measurement error is: 1) heteroskedastic, 2) (spatially) autocorrelated, and 3) its variance is correlated with covariates of interest to the legislator-constituency relationship.¹⁰

As the top left graph of figure 4 makes clear, using the MCMC estimator of Clinton et. al. (2001) on the first session of the 106th House reveals that the ideal point estimates of extremist legislators are measured with more uncertainty than centrist legislators.¹¹

[INSERT FIGURE 4 ABOUT HERE]

This pattern occurs because of the (relative) lack of proposals with extreme cut-points – resulting in diminished ability to discriminate among extreme legislators (e.g., it does not often happen that Maxine Waters (D,CA-35) finds a bill too liberal for her liking). In other words, the variance of the measurement error is not constant across legislators because of the nature of the data generating process.

Given that the variance in the ideal point estimates is related to the ideological extremity of the legislator, it is clear that the variance of the estimates is related to any covariate that attempts to measure the ideological preference of the district. The top right graph of figure 4 confirms this intuition. It depicts the relationship between the standard errors of the MCMC ideal point estimates and the average two party percent Democratic presidential vote in the district. As the line summarizing the loess regression of the measurement error variance on the district’s Democratic presidential vote makes explicit, there is a (non-linear) relationship between the two quantities.

Finally, the fact that the measurement error is also (spatially) autocorrelated can be realized by observing that the spatial nature of the problem implies that ideologically similar legislators will possess similar amounts of uncertainty. This occurs because the spatial voting model underlying the ideal point estimator expects ideologically similar legislators to vote similarly. Thus, the same mistakes will be made for ideologically similar legislators conditional on the recovered cutpoint. In other words, since the location of the cutpoints is recovered with error, this will necessarily introduce error into the ideal point estimates – with ideologically proximate legislators being similarly affected. The bottom two graphs of Figure 4 confirm that this covariation exists. Uncorrelated measurement errors would result in a symmetric joint MCMC ideal point posterior distribution – as the fact that legislator i is more liberal than average on iteration t implies nothing about the location of legislator j on iteration t . This is precisely what we find in

¹⁰Note that the claim does not depend on the estimates being systematically biased.

¹¹A similar relationship results when using W-NOMINATE estimates and their (conditional) bootstrapped standard errors.

the lower right graph, which graphs the relationship between the most liberal member in the 1st session of the 106th Congress (Waters (D,CA-35)) and most conservative member (Stump (R,AZ-3)). This contrasts greatly to the pattern recovered in the lower left graph – which graphs Waters against the second most liberal in the session (Filner (D,CA-50)). These two graphs illustrate that the errors of the ideal point estimates covary depending on spatial proximity.

The intuition as to why the two-step procedure produces standard errors that are too small is provided by Figure 5.

[INSERT FIGURE 5 ABOUT HERE]

The top two graphs in Figure 5 depict the extent of measurement error in Y conditional on X when the truth is Y=X. In the top-left graph, the measurement error of Y is larger for extreme values of X. As Figure 4 makes clear, this is the case scholars face when using the two-step approach. The top-right graph depicts a case where the measurement error is invariant with respect to X.

The lower graphs depict the area in which the best linear predictor will be found given the measurement error in Y. The observation of interest is that the “band” in which the best linear predictor will be found is “taller” in the lower-left graph than the lower-right graph. This indicates that the uncertainty associated with the measure of Y introduces relatively more uncertainty into the recovered relationship between X and Y.

The (textbook) result can also be proven analytically. Assuming that the ideal point measurement error ω and the second stage regression errors ϵ_2 are uncorrelated (i.e., $E(\omega\epsilon_2') = E(\epsilon_2\omega') = 0$), it is straightforward to show:

$$\begin{aligned}
Var(\hat{\gamma}) &= E[(\hat{\gamma} - \gamma)(\hat{\gamma} - \gamma)'] \\
&= E[((\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'(\mathbf{Z}\gamma + \omega + \epsilon_2) - \gamma)((\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'(\mathbf{Z}\gamma - \omega + \epsilon_2) - \gamma)'] \\
&= E[(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'(\epsilon_2\epsilon_2' - \epsilon_2\omega' - \omega\epsilon_2' - \omega\omega')\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1}] \\
&= (\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'\sigma_{\epsilon_2}^2\mathbf{I}\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1} + (\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'\mathbf{W}\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1} \\
&= \sigma_{\epsilon_2}^2(\mathbf{Z}'\mathbf{Z})^{-1} + (\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'\mathbf{W}\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1} \\
&\neq \sigma_{\epsilon_2}^2(\mathbf{Z}'\mathbf{Z})^{-1}
\end{aligned}$$

where $\mathbf{W} = E(\omega\omega')$ represents the variance-covariance matrix of ideal point measurement errors. Thus, the standard errors of a regression which ignores the measurement error are too small by a factor of $(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'\mathbf{W}\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1}$ so long as $E(\mathbf{Z}'\mathbf{W}) \neq 0$ (i.e., the variance of the measurement error is correlated with the covariates of interest). An alternative characterization of the problem is to realize that the errors in the second stage errors are both heteroskedastic and autocorrelated, with the variance-covariance matrix given by: $(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'(\sigma_{\epsilon_2}^2\mathbf{I} + \mathbf{W})\mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1}$.

3 An Empirical Model of Roll Call Voting

It is (unfortunately) impossible to address this problem using widely-used estimators of legislator ideal points. Interest group scores and factor analytic measures such as Heckman-Snyder (1997) provide no uncertainty assessments by definition (although it is theoretically possible to derive the latter (Anderson and Amemiya, 1988)). Although NOMINATE and its derivatives can *theoretically* provide such measures because of their maximum-likelihood foundation, the recovery of the uncertainty assessments has proven to be *practically* impossible because of the computational inability to invert extremely large matrices. Consequently, the reported standard errors of NOMINATE are created by bootstrapping over the conditional likelihood (and cannot recover the covariance terms in \mathbf{W}).¹² As Poole and Rosenthal themselves warn: “the standard errors produced by the D-NOMINATE algorithm must be viewed as heuristic descriptive statistics” (Poole and Rosenthal 1997: 246).

Given these problems, to account for the uncertainty in ideal point estimates I utilize a hierarchical MCMC estimator. As the posterior distribution of a Bayesian estimator is defined over all model parameters, uncertainty in the ideal point estimates will correctly propagate throughout the model (Draper, 1995). Thus, the coefficients of the regression of legislator ideal point estimates on constituency characteristics will account for the uncertainty of the ideal point estimates. The remainder of this section briefly describes the hierarchical MCMC estimator used to estimate the legislator-constituency relationship. Appendix A contains a more technical (and complete) derivation.

The parameterization of the problem of recovering ideal points from a matrix of “ones and zeros” using a Bayesian framework is well documented (e.g., Clinton et. al. (2001), Jackman (2000), Jackman (2001), Clinton and Meirowitz (2001)) – as is its formulation in item response models in the educational testing literature (e.g., Johnson and Albert (1999)). To incorporate covariates into the framework, instead of assuming that every ideal point has a common prior distribution (e.g., $x_i \sim N(0, 1)$), the hierarchical model allows the mean of the prior distribution to vary by legislator (e.g., $x_i \sim N(\mu_{xi}, \tau^2)$). In other words, the model is hierarchical because prior parameters μ_x and τ^2 (typically called “hyperparameters”) are estimated.

The prior mean for the legislators’ ideal points μ_x is assumed to be given as a linear function of the covariates of interest. In other words, the functional form of the relationship is given by: $\mu_x = \mathbf{Z}\gamma + \epsilon_2$, where \mathbf{Z} represents the $L \times k$ matrix of constituency/legislator covariates and γ denotes the k -length coefficient vector associated with the least squares solution of regressing μ_x

¹²Poole and Rosenthal bootstrap ideal point estimates assuming bill parameters are perfectly measured, and they (separately) bootstrap the bill parameter estimates assuming the ideal points are perfectly measured.

on \mathbf{Z} .¹³ The estimation of τ^2 permits the variance of the ideal point prior to depend upon the fit of the hierarchical structure for $\boldsymbol{\mu}_x$. Estimating a hierarchical structure permits the simultaneous recovery of both legislator ideal points and the relationship between the covariates of interest and the legislator ideal points by maximizing the joint likelihood function of the ideal point problem (step one) and the linear regression problem (step two).

That the hierarchical MCMC estimator accounts for the heteroskedastic and autocorrelated measurement error present in the legislator ideal point estimates can be seen by considering the fact that at each iteration the ideal point estimates of the previous iteration are regressed on the covariates of interest. Thus, as the ideal point estimates fluctuate between iterations (reflecting the uncertainty associated with their estimation), so too will the coefficient values for the regression.

4 Estimation of the Legislator-Constituency Relationship

This section uses the estimator developed in section 3 and the preference measures described in section 2 to estimate the legislator-constituency relationship of the 106th House during the 1st session.¹⁴ As a complete investigation of which district preferences the legislator is responsive to and why is beyond the scope of this paper, the investigations of this section aim to: determine whether the preferences of the party constituency are influential (because of any one of the four reasons advanced in section 1), demonstrate the consequences of ignoring the statistical problems described in section 2, and begin to characterize the extent to which legislators' (revealed) preferences are responsive to constituency preferences.

To examine the possibility that legislators in the 1st session of the 106th House are responsive to both their party and geographic constituencies, I operationalize the relationship using the following specification of μ_{xi} :¹⁵

$$\begin{aligned} \mu_{xi} = & \gamma_1 \text{Geographic Constituency Ideology (mean-deviated)} \\ & + \gamma_2 \text{Party Constituency Ideology (mean-deviated)} + \epsilon_{2i} \end{aligned} \quad (1)$$

with $\epsilon_{2i} \sim N(0, \tau^2)$. This specification assumes that a legislator's preference can be decomposed into a portion due to each constituency. Note that

¹³Due to the iterative nature in which these tasks are performed, this statement is not quite precise enough. Appendix A clarifies this point.

¹⁴Estimating the examined specifications using the 2nd session produce substantively identical results.

¹⁵Note that the covariates are mean deviated to improve the mixing of the Gibbs Sampler (Gilks and Roberts, 1996).

because the constituency preferences are measured using different scales, estimating a separate personal preference for the legislators is unidentified (in contrast to the approach of Levitt (1996)).

The specification of equation 1 is estimated four ways to provide for a robust comparison: using ordinary least squares (OLS) with the non-hierarchical MCMC ideal point estimates of Clinton et. al. (2001), using (non-hierarchical) Bayesian linear regression, using generalized least squares (GLS) and weighting by the standard error of the ideal point measurement error (Greene, 1997), and using the hierarchical MCMC estimator of section 3. As Table 1 shows, because the priors of the estimators are identical where applicable, the only difference between the estimators is the hierarchical structure.¹⁶ Consequently, any resulting differences not due to sampling error can be attributed to the absence of this structure.

Table 1: Priors for the hierarchical and non-hierarchical estimators

Parameter	Hierarchical Estimator	Two-Step Estimator (Bayes)	Two-Step Estimator (OLS/GLS)
γ	$\sim N(0, 4^2)$	$\sim N(0, 4^2)$	NA
τ^2	$\sim \Gamma(.05, .05)$	NA	NA
\mathbf{X}	$\sim N(\mathbf{Z}\gamma, \tau^2)$	$\sim N(0, 1^2)$	$\sim N(0, 4^2)$
α	$\sim N(0, 4^2)$	$\sim N(0, 4^2)$	$\sim N(0, 4^2)$
β	$\sim N(0, 4^2)$	$\sim N(0, 4^2)$	$\sim N(0, 4^2)$

Although multiple chains and thinning is employed so as to maximize the parameter space examined by the estimator, parameter estimates of the 453 non-lopsided roll calls and 435 legislators stabilize quickly.¹⁷ For purposes of interpretation, recall that negative ideal point estimates represent liberal voting behavior.

Interpreting the results is less than straight-forward because several observationally equivalent interpretations are possible (using any estimator). First, it could be that the representative consciously votes according to the preferences of the geographic and party constituencies (i.e., direct representation occurs). It is also possible that the legislator votes her own ideal point – which happens to covary with the preferences of the constituencies (e.g., indirect representation occurs).¹⁸ Third, it could be that the representative votes according to the preferences of a third agent (e.g., interest groups), but

¹⁶The priors for \mathbf{X} , α and β for the two-step estimators are the priors from the ideal point estimation of the first step.

¹⁷Although assessing stochastic convergence is more of an art than a science (roughly equivalent to determining whether one has obtained a local or global minimum in a maximum-likelihood framework), nothing suggests that the reported estimates have not converged.

¹⁸Of course, given that representatives face continually re-election, there is every reason to suspect that selection effects produce this covariation.

that the resulting votes happen to produce an “ideology” that covaries with the preferences of the constituencies. Finally, it could be the case that the preferences of the party constituencies are irrelevant and the districts’ median voter is actually an (identical) combination of the measures employed (and not the measure I use as the geographic constituencies’ preferences). Thus, despite the ability to recover the covariation between the legislators revealed ideal point and the (assumed) preferences of the geographic and party constituencies, this model is unable to address the long standing question of whether the findings represent evidence of direct, indirect or accidental representation.

Table 2: **Parameter Estimates for Four Estimators**

	Hierarchical Estimator	Two-Step Bayes	Two-Step OLS	Two-Step GLS
Geographic Const. (Std. Err.)	-1.53 (.12)	-2.06 (.15)	-2.06 (.15)	-2.06 (.15)
T-statistic	-12.75	-13.78	-13.73	-13.73
Party Const. (Std. Err.)	.68 (.04)	.92 (.04)	.92 (.04)	.79 (.03)
T-statistic	17	23	23	26
R^2	.84	.83	.84	.79

The parameter point estimates (and posterior means) reported in Table 2 are both substantively and methodologically informative. Methodologically, they demonstrate that both of section 2’s statistical concerns are consequential to scholars interested in the legislator-constituency relationship. The fact that the party constituency’s preference is statistically significant indicates that its omission will indeed produce the consequences of omitted variable bias.

In addition, inspecting the relative magnitude of the t-statistics of the four estimators confirms the analytical argument that the standard errors are too small in the non-hierarchical estimators. For example, the t-statistic for the mean deviated party constituency ideology in the hierarchical MCMC model is 70 % of that of the OLS regression. The GLS estimates are similarly affected because although GLS accounts for the heteroskedasticity of the ideal point measurement error, it does not account for their covariation (i.e., it incorrectly assumes that \mathbf{W} is a diagonal matrix).

These differences are not due to differences in the ideal points estimates that are used as the dependent variable. As Figure 6 shows, the ideal point estimates from the hierarchical and non-hierarchical estimators correlate in excess of .99.

[INSERT FIGURE 6 ABOUT HERE]

Note that scale differences in the ideal point estimates (which accounts for the differences in the coefficient point estimates) result because whereas the MCMC ideal point estimator “shrinks” legislators towards the common prior mean (of 0), the hierarchical model “shrinks” legislator ideal points towards their predicted ideal points (which is recovered using the covariate information).¹⁹

Substantively, legislators’ revealed ideal points covary with the preferences of both the geographic and party constituencies. Thus, although there are no necessary reasons as to why legislators ought to vote in a manner related to the preferences of the party constituency, such responsiveness exists. For example, districts with a higher support for Clinton than average (i.e., a positive geographic constituency measurement) or with party constituencies more liberal than average (i.e., a positive party constituency measurement) both predict a more liberal (i.e., negative) revealed ideal point. The specification is an extremely good fit, as the OLS specification is able to explain 84 % of the observed variation in the ideal point estimates.

Although the finding that the revealed legislator ideal point covaries with the preference of both the geographic and party constituencies is an important and novel finding, it is also of interest as to which constituency is “more important” to the representative. As noted by Powell (1982) and Levitt (1996), determining which constituency is more important is very difficult given that the preferences of the geographic and party constituencies are measured using different scales. A measures of the relative influence of each constituency is possible despite this difficulty.

Specifically, I consider the extent to which a constituency’s preferences must change to offset a one-standard deviation shift in the preferences of the other constituency. In other words, if the (mean-deviated) Clinton two-party vote increases by 1 standard deviation in the district (i.e., Clinton’s vote percentage increases by 12.5 %), the preference of the party constituency has to become more conservative by .28 (on a 5 point integer scale) to offset this change. This is equivalent to around half of a standard deviation change in party constituency ideology. Conversely, if the party constituency becomes 1 standard deviation more liberal (i.e., the average ideology falls by .49) Clinton’s two party vote percentage has to increase by 22% (around 2 standard deviations) to offset the change. The fact that a two standard deviation change in the preferences of the geographic constituency is required to offset a one standard deviation change in the preference of the party constituency provides evidence that the legislator is more responsive to the preferences of the party constituency.

¹⁹The result is also not due to an overly informative prior distribution for γ . Tightening the prior variance from 17 to 1 recovers a posterior mean (standard deviation) of -1.51 (.12) for the geographic constituency and .68 (.04) for the party constituency.

4.1 The Legislator-Constituency Relationship detailed

The previous section assumes every legislator has an identical ideological relationship with her constituencies (i.e., the only source of variation in the relationship is the actual preferences). This section examines whether characteristics of the legislator affect the relationship. Specifically, the question of interest is – although the revealed preferences of legislators appears to be responsive to the preferences of both geographic and party constituencies, does this relationship vary across different types of legislators? Due to the novelty of the measures (and method) being employed, this analysis attempts to establish the importance of party constituency and accounting for the measurement error inherent in roll call analysis rather than determining why the observed relationships occur. In letting the legislator-constituency relationship vary, I examine the possibility that the relationship depends on: the legislator’s electoral margin in the 1998 election, whether or not the legislator is in the youngest or eldest quartile, and how the legislator allocates her staff between the district and the capitol.

First consider the possibility that the relationship varies depending upon the percentage of votes received by the legislator in the previous (1998) election. Of the 427 legislators elected in 1998, 301 were elected by more than 60 %. Note that any finding is theoretically plausible *a priori*. It could be the case that: the large electoral margin is indicative of legislators being particularly responsive to their constituencies, being elected by such a wide margin provides the legislator with the ability to vote contrary to the preferences of her constituencies, or it could be the case that no difference is evident because all legislators are “running scared.” Table 3 presents the results.

Accounting for the uncertainty of the ideal point estimates has a dramatic effect on the standard errors of the covariates of interest. However, in contrast to the previous specification, ignoring the measurement error in this specification is substantively consequential. Whereas the non-hierarchical estimators all suggest that the elasticity of the relationship between the party and geographic (in the OLS case) constituencies’ preference and the legislator’s roll call voting depends on the representatives vote percentage in the 1998 election, these statistically significant findings vanish once the measurement error of the ideal point estimates is accounted for. In other words, the hierarchical estimator provides no evidence that legislators respond (or act as if they respond) to their constituencies differently depending on the previous election results.²⁰

Although the legislator-constituency relationship does not depend on the electoral margin of the representative, it is also plausible that the relationship depends on the tenure of the legislator. This could be the case not only

²⁰Measurement error is so consequential for this specification because the variance of the measurement error is correlated with the measures of constituency preference.

Table 3: **Responsiveness by Electoral Margin**

	Hierarchical Estimator	Two-Step Bayes	Two-Step OLS	Two-Step GLS
Geographic Const. (Std. Err.)	-1.34 (.29)	-2.61 (.18)	-2.61 (.18)	-2.27 (.17)
T-statistic	-4.62	-16.17	-16.17	-13.35
Party Const.	.41 (.06)	.88 (.04)	.88 (.04)	.78 (.03)
T-statistic	6.83	22	22	26
98 Margin	.0007 (.001)	.0016 (.0009)	.0016 (.001)	.0009 (.0009)
T-statistic	.7	1.77	1.6	1
98 Margin \times Geographic Const.	.02 (.02)	.02 (.01)	.02 (.01)	.009 (.01)
T-statistic	1	2	2	.9
98 Margin \times Party Const.	.0004 (.0004)	-.007 (.002)	-.007 (.002)	-.006 (.002)
T-statistic	1	-3.5	-3.5	-3
R^2	.33	.84	.85	.80

because senior legislators may be more aware of the preferences of their district (and therefore respond to the preferences in a different manner), but also because seniority may provide legislators with an ability to vote contrary to district preferences (for example). To investigate this possibility, legislators are classified based upon the number of years served in the House and I examine if the relationship of the upper quartile differs from that of the lower quarter (or those in neither quartile).²¹ The lower quartile contains the 119 members who have served less than 4 years in the House and the upper quartile consists of the 114 members who have served more than 14 years in the House. Table 4 presents the results.

As is immediately evident from Table 4, none of the estimators suggest that the legislator-constituency relationship depends upon the tenure of the legislator.

Finally, I consider whether the responsiveness of the legislator depends on the percentage of staff (in the Summer of 2000) the legislator allocates to the district (*Congressional Quarterly Staff Directory*, 2000). This is of interest to determine if the relationship of a service-based representative (i.e., majority of staff allocated to district office(s)) differs from that of a policy-based representative (i.e., majority of staff allocated to Washington D.C. office). Empirically, it is of interest because it permits the determination whether

²¹Restricting the examination to freshman representatives reveals no systematic difference in the relationship between freshman and non-freshman representatives.

Table 4: **Responsiveness by Tenure**

	Hierarchical Estimator	Two-Step Bayes	Two-Step OLS	Two-Step GLS
Geographic Const. (Std. Err.)	-1.38 (.18)	-1.77 (.39)	-1.79 (.23)	-1.72 (.22)
Party Const.	.72 (.05)	1.00 (.10)	.99 (.06)	.86 (.05)
Young	-.02 (.03)	.02 (.03)	.02 (.03)	-.003 (.03)
Old	-.05 (.03)	-.03 (.03)	-.03 (.03)	-.04 (.03)
Young \times Geographic Constituency	-.22 (.27)	-.39 (.46)	-.38 (.33)	-.37 (.37)
Young \times Party Constituency	-.06 (.07)	-.11 (.11)	-.11 (.08)	-.08 (.08)
Old \times Geographic Constituency	-.21 (.26)	-.36 (.46)	-.34 (.37)	-.56 (.36)
Old \times Party Constituency	-.04 (.07)	-.08 (.11)	-.11 (.09)	-.09 (.08)
R^2	.86	.83	.84	.80

allocating more staff members to district offices (thereby making the legislator more easily accessible to constituents) results in the legislator being more responsiveness to the preferences of the party or geographic constituencies (or both).

The average representative employed 16 staff members, with the first and third quartiles defined by those legislators employing 14 and 18 staffers respectively. The representative with the fewest staffers was Virgil Goode, Jr. (D-I,VA-5) with 7. Elijah Cummings (D,MD-7) had the most staffers with 23. In terms of staff allocation, the average legislator distributed their staff equally between Washington D.C. and district office(s). A quarter of the legislators assigned 6 % more of the staff to Washington D.C. and a quarter assigned 6 % more of the staff to district offices. Edolphus Towns (D,NY-10) and James Traficant (D,OH-17) had the highest percentage of staffers assigned to district offices (around 25 % more than average) and Brian Baird (D,WA-3) and Jim McDermott (D,WA-7) had around 38 % fewer staffers assigned to the district than average (both had only a district administrator employed in the district offices). Allowing the legislator-constituency relationship to be conditional on the allocation of the legislators' staff recovers the estimates reported in Table 5. Using a mean-deviated measure of the percentage of staff allocated to district office(s) enables one to interpret the results in terms of whether the legislator allocates more or less of her staff

to the district than average.²²

Table 5: **Relationship by Staff Allocation**

	Hierarchical Estimator	Two-Step Bayes	Two-Step OLS	Two-Step GLS
Geographic Constituency (Std. Err.)	-1.54 (.12)	-2.11 (.16)	-2.11 (.15)	-2.12 (.15)
Party Constituency	.67 (.04)	.91 (.04)	.92 (.04)	.78 (.03)
Staff Allocation	-.04 (.11)	-.06 (.16)	-.06 (.15)	-.06 (.14)
Staff Allocation \times Geographic Constituency	1.79 (1.03)	2.73 (1.358)	2.94 (1.45)	4.01 (1.47)
Staff Allocation \times Party Constituency	.55 (.30)	.70 (.39)	.74 (.41)	.83 (.35)
R^2	.84	.83	.84	.79

As in previous specifications, ignoring the measurement error of the ideal point estimates and using OLS leads one to (incorrectly) conclude that the relationship between the legislator and her geographic constituency depends on the relative percentage of staff allocated to the district.²³ The results of the hierarchical estimator indicates that the roll call behavior of legislators identically covaries with the preferences of the geographic and party constituencies irrespective of how legislators allocate their staff.

The fact that all legislators respond to (or act as if they respond to) the preferences of both constituencies while giving priority to the preferences of the party constituency indicates that Fenno is exactly right to stress the importance of constituencies smaller than the geographic constituency. That the legislator-constituency relationship for the 1st session of the 106th Congress is invariant with respect to the three examined legislator characteristics suggests that (at least in terms of the characteristics examined) the observed relationship represents an optimal response to the (identical) selection pressures facing representatives (i.e., repeated primary and general elections). That being said, it is important to recall that it is impossible to determine whether legislators consciously cultivate this relationship or if selection effects created by repeated primary and general elections self-selects those legislators who unconsciously form this ideological relationship.

Furthermore, the recovery of identical ideological legislator-constituency relationships does not imply either that representatives' "home styles" are in-

²²The results are also robust to using the number of district offices or the number of district staffers.

²³Using GLS would lead one to believe that the relationship with both the party and geographic constituency are affected.

consequential or that all representatives employ an identical home style. The results instead suggest that legislators are able to maintain identical ideological relationships despite differences in the manner in which they interact with their constituencies (e.g., the percentage of staff that they allocate to the district). In other words, there are multiple ways for a representative to respond to the ideological preferences of her district.

One might also wonder how a representative ever loses given the result that all legislators adopt the identical and (inferred to be) optimal ideological relationship with their constituencies. Two explanations of this apparent contradiction suggest themselves. First, reasons/circumstances apart from the general ideological relationship of the legislator and her constituents may sometimes be decisive. For example, a scandal may deleteriously affect the electoral fortune of a representative even if the representative maintains the optimal relationship. Second, despite maintaining the optimal relationship on average, a legislator’s “incorrect” votes on a handful of highly salient issues may prove to be more important to constituents than the general ideological agreement of the legislator and her constituents (the fate of Marjole Margolies-Mezvinsky (D,PA-13) in the 1994 election is often used as the prototypical example) (e.g., Brady et. al. 2000)).

5 Conclusion

The task of recovering the legislator-constituency relationship is both fundamental to political science and extremely difficult. Answering the question involves uncovering the relationship between unobservable quantities using crude measures. Consequently, making inferences about the general nature of the legislator-constituency relationship is exceedingly difficult.

Previous attempts at quantifying the legislator-constituency relationship have been limited by statistical problems resulting from both an inability to measure the preferences of constituencies smaller than the geographic constituency and the consequences of using ideal point estimates as the dependent variable of interest. Both of these concerns are addressed using new data and a new estimator.

Substantively, I am able to utilize the survey responses of 39,000 respondents to determine whether Fenno’s observations that i] within any district, several constituencies exist, and ii] some constituencies (i.e., the party constituency) appear more important to the representative than others are applicable to the contemporary Congress. Using a hierarchical MCMC ideal point estimator, I determine that in the 1st session of the 106th Congress, Fenno is right on both accounts. There is also no evidence that the ideological basis of the legislator-constituency relationship varies with respect to the electoral margin of the representative in the previous election, the tenure of the representative, or the percentage of staff the representative allocates to

district offices(s) relative to Washington D.C..

These substantive insights are possible because of the two methodological contributions made by the paper. Specifically, I demonstrate that inference based on estimators which fail to address these two concerns will produce both biased estimates (as a consequence of omitting the preferences of the party constituency) and standard errors which are too small (as a consequence of the ideal point measurement errors). Consequently, it is unclear how valid the inferences from prior examinations are given that most fail to account for these concerns.

Despite these insights, understanding the relationship between constituency preferences and the roll call behavior of the legislators requires not only a characterization of what the relationship is, but also why it is. Although this paper only sketches the latter, it provides scholars with a foundation with which to conduct the former. Specifically, the findings paper suggest that the relationship is more nuanced than simply voting the preferences of the district's "median voter." Instead, and in terms of the analysis conducted thus far, the representative appears to balance the demands of the party and geographic constituencies. The (obvious) next step is to use the advances in this paper to conduct a characterization of the relationship in concert with derived theoretical implications so as to permit an understanding of why it is that the observed relationship between constituency and legislator preferences obtains.

6 Appendix A

Associated with each roll call vote t is a pair of locations in the policy space – one associated with a successful roll call vote (i.e., if the proposal fails to pass, the policy location θ_t obtains), and one associated with an unsuccessful roll call vote (ψ_t). Assume that the utility for legislator i with ideal point x_i is given by:

$$\begin{aligned} U_i(\theta_t) &= -(x_i - \theta_t)^2 + \eta_{it} \\ U_i(\psi_t) &= -(x_i - \psi_t)^2 + \nu_{it} \end{aligned} \quad (2)$$

where η_{it} and ν_{it} represent the stochastic portion of the utility function.

Thus, the statement of the latent utility differential for legislator i in roll call t is:

$$\begin{aligned} y_{it}^* &= U_i(\theta_t) - U_i(\psi_t) \\ &= -(x_i - \theta_t)^2 + \eta_{it} - (-(x_i - \psi_t)^2 + \nu_{it}) \\ &= -(x_i - \theta_t)^2 + (x_i - \psi_t)^2 + \epsilon_{it} \end{aligned} \quad (3)$$

where $\epsilon_{it} = (\eta_{it} - \nu_{it})$. Expanding the square and defining $\alpha_t = \theta_t^2 - \psi_t^2$ and $\beta_t = 2(\theta_t - \psi_t)$ yields:

$$y_{it}^* = \beta_t x_i - \alpha_t + \epsilon_{it} \quad (4)$$

Assuming sincere voting and $\epsilon_{it} \sim N(0, 1)$ yields:

$$\begin{aligned} \Pr(y_{it}^* = 1 | x_i, \theta_t, \psi_t) &= \Pr(y_{it}^* > 0) \\ &= \Pr(x_i \beta_t - \alpha_t + \epsilon_{it} > 0) \\ &= F(x_i \beta_t - \alpha_t) \end{aligned} \quad (5)$$

Conditional on \mathbf{x} and the T -length vectors of roll call parameters $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$, assume that legislators vote independently with respect to both indexes. This yields the probability of observing the $L \times T$ matrix of roll call votes \mathbf{Y} as:

$$L(\boldsymbol{\alpha}, \boldsymbol{\beta}, \mathbf{x}) = \prod_{i=1}^L \prod_{t=1}^T F(x_i \beta_t - \alpha_t)^{Y_{it}} (1 - F(x_i \beta_t - \alpha_t))^{1 - Y_{it}} \quad (6)$$

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

Letting the joint (proper) prior density be defined as $p(\boldsymbol{\alpha}, \boldsymbol{\beta}, \mathbf{x})$, then the expression for the posterior is:

$$g(\mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta} | \mathbf{y}) \propto L(\boldsymbol{\alpha}, \boldsymbol{\beta}, \mathbf{x}) p(\boldsymbol{\alpha}, \boldsymbol{\beta}, \mathbf{x}) \quad (7)$$

with priors $\boldsymbol{\alpha} \sim N(\mu_\alpha, \sigma_\alpha^2)$, $\boldsymbol{\beta} \sim N(0, \sigma_\beta^2)$ and $\mathbf{x} \sim N(\boldsymbol{\mu}_x, \tau^2)$. Note that the parameters are identified as a result of the proper priors.²⁴

Direct incorporation of covariates involves treating $\boldsymbol{\mu}_x$ and τ^2 as “hyper-parameters” to be estimated within a hierarchical framework. Let \mathbf{Z} be the $L \times d$ matrix of d characteristics used by the researcher to summarize the covariates of $\boldsymbol{\mu}_x$. Assume $x_i \sim N(\mathbf{Z}_i \boldsymbol{\gamma}, \tau^2)$, where \mathbf{Z}_i denotes the covariates

²⁴Alternatively, one could also constrain \mathbf{x} to have a mean of 0 and a variance of 1.

associated with legislator/district i and γ denotes the d -length coefficient vector associated with the least squares solution of regressing $\boldsymbol{\mu}_x$ on \mathbf{Z} .

The prior distribution $p(\boldsymbol{\gamma}, \tau^2)$ is given by $p(\boldsymbol{\gamma}|\tau^2)p(\tau^2)$ where $p(\boldsymbol{\gamma}|\tau^2)$ is assumed to be distributed $N(\boldsymbol{\gamma}_0, \tau^2 \boldsymbol{\sigma}_{\gamma_0}^2)$ and $\tau^2 \sim IG(a, b)$. Given this standard formulation, the Bayesian regression solutions for the full conditional posterior distribution of $\boldsymbol{\gamma}|\tau^2$ and τ^2 attains. In other words, the full-conditional distributions at iteration k are:

$$\begin{aligned}\boldsymbol{\gamma} &\sim MVN([\mathbf{Z}'\mathbf{Z} + (\boldsymbol{\sigma}_{\gamma_0}^2)^{-1}]^{-1}[\mathbf{Z}'\boldsymbol{\mu}_x^{(k-1)} + \boldsymbol{\gamma}_0], \tau^2[\mathbf{Z}'\mathbf{Z} + (\boldsymbol{\sigma}_{\gamma_0}^2)^{-1}]^{-1}) \\ \tau^2 &\sim IG(a + L/2, b + [\mathbf{I} - \mathbf{Z}'(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}']\mathbf{x}/2)\end{aligned}\quad (8)$$

Letting $\phi(x_i : \mathbf{Z}_i\boldsymbol{\gamma}, \tau^2)$ denote the (multivariate) normal density of x_i with moments $\mathbf{Z}_i\boldsymbol{\gamma}$ and τ^2 , and $\Gamma^{-1}(\tau^2 : a, b)$ denote an inverse-gamma density of τ^2 with location and scale parameters a and b respectively, a complete expression for the posterior distribution is:

$$\begin{aligned}g(\mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \tau^2 | \mathbf{Y}, \mathbf{Z}) &\propto \prod_{i=i}^L \prod_{t=1}^T [\phi(y_{it}^* : x_i\beta_t - \alpha_t, 1) \text{Ind}(y_{it}^*, Y_{it})] \\ &\times \prod_{i=1}^L \phi(x_i : \mathbf{Z}_i\boldsymbol{\gamma}, 1) \\ &\times \phi(\boldsymbol{\gamma} : [\mathbf{Z}'\mathbf{Z} + \boldsymbol{\sigma}_{\gamma_0}^2]^{-1}[\mathbf{Z}'\boldsymbol{\mu}_x^{(k-1)} + \boldsymbol{\gamma}_0], \\ &\quad [\mathbf{Z}'\mathbf{Z} + (\boldsymbol{\sigma}_{\gamma_0}^2)^{-1}]^{-1}) \\ &\times \Gamma^{-1}(a + N/2, b + [\mathbf{I} - \mathbf{Z}'(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}']\mathbf{x}/2) \\ &\times \prod_{c=1}^d \phi(\gamma_c : \gamma_{0c}, \tau^2 \boldsymbol{\sigma}_{\gamma_0}^2) \\ &\times \prod_{t=1}^T \phi(\alpha_t : \mu_{\alpha}, \sigma_{\alpha}^2) \times \phi(\beta_t : 0, \sigma_{\beta}^2) \\ &\times \Gamma^{-1}(\tau^2 : a, b)\end{aligned}\quad (9)$$

where $\text{Ind}(a, b) = 1$ when $\{c > 0, d = 1\}$ or $\{c < 0, d = 0\}$, $\text{Ind}(a, b) = \{0, 1\}$ if d missing, and 0 else.

The problem is initialized with a set of starting values: $\{\mathbf{x}^0, \boldsymbol{\alpha}^0, \boldsymbol{\beta}^0, \boldsymbol{\gamma}^0, \tau_0^2\}$. At iteration k , the Gibbs sampler iteratively computes the parameters of interest by sampling from the following full conditionals:

- $\mathbf{y}^{*(k)} \sim g(\mathbf{y}^* | \mathbf{x}^{(k-1)}, \boldsymbol{\alpha}^{(k-1)}, \boldsymbol{\beta}^{(k-1)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}, \mathbf{Y}, \mathbf{Z})$
- $\mathbf{x}^{(k)} \sim g(\mathbf{x} | \mathbf{y}^{*(k)}, \boldsymbol{\alpha}^{(k-1)}, \boldsymbol{\beta}^{(k-1)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}, \mathbf{Y}, \mathbf{Z})$
- $\boldsymbol{\alpha}^{(k)}, \boldsymbol{\beta}^{(k)} \sim g(\boldsymbol{\alpha}, \boldsymbol{\beta} | \mathbf{y}^{*(k)}, \mathbf{x}^{(k)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}, \mathbf{Y}, \mathbf{Z})$
- $\boldsymbol{\gamma}^{(k)} \sim g(\boldsymbol{\gamma} | \mathbf{y}^{*(k)}, \mathbf{x}^{(k)}, \boldsymbol{\alpha}^{(k)}, \boldsymbol{\beta}^{(k)}, \tau^{2(k-1)}, \mathbf{Y}, \mathbf{Z})$
- $\tau^{2(k)} \sim g(\tau^2 | \mathbf{y}^{*(k)}, \mathbf{x}^{(k)}, \boldsymbol{\alpha}^{(k)}, \boldsymbol{\beta}^{(k)}, \boldsymbol{\gamma}^{(k)}, \mathbf{Y}, \mathbf{Z})$

Given the dependence of iteration k only on the parameter estimates of iteration $k-1$, the process of producing parameter estimates is a Markov Chain whose limiting distribution is the joint posterior $g(\mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \tau^2 | \mathbf{Y}, \mathbf{Z})$.

Thus, after a sufficient number of iterations, the joint posterior can be used to characterize the parameters of interest (or functions of the parameters of interest).

1. $g(\mathbf{y}^* | \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \tau^2, \mathbf{Y}, \mathbf{Z})$. At the start of iteration k , we have parameter estimates from iteration $k - 1$ for $\boldsymbol{\alpha}_t^{(k-1)}$, $\boldsymbol{\beta}_t^{(k-1)}$, $\mathbf{x}^{(k-1)}$, $\boldsymbol{\gamma}^{(k-1)}$ and $\tau^{2(k-1)}$ and the matrix of constituency characteristics \mathbf{Z} . The k -th iteration's estimate of $\gamma_{it}^{(k)}$ is recovered by rejection sampling from one of three truncated normal densities depending on whether $Y_{it} = \{1, 0, \text{or missing}\}$. Specifically:

$$g(y_{it}^{*(k)} | Y_{it} = 1, x_i^{(k-1)}, \boldsymbol{\beta}^{(k-1)}, \boldsymbol{\alpha}^{(k-1)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}) \sim N(x_i^{(k-1)}\beta_t^{(k-1)} - \alpha_t^{(k-1)}, 1)$$

and only a realization of $y_{it}^{*(k)} > 0$ is retained (else draw again),

$$g(y_{it}^{*(k)} | Y_{it} = 0, x_i^{(k-1)}, \boldsymbol{\beta}^{(k-1)}, \boldsymbol{\alpha}^{(k-1)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}) \sim N(x_i^{(k-1)}\beta_t^{(k-1)} - \alpha_t^{(k-1)}, 1)$$

and only a realization of $y_{it}^{*(k)} < 0$ is retained (else draw again),

$$g(y_{it}^{*(k)} | Y_{it} = \text{missing}, x_i^{(k-1)}, \boldsymbol{\beta}^{(k-1)}, \boldsymbol{\alpha}^{(k-1)}, \boldsymbol{\gamma}^{(k-1)}, \tau^{2(k-1)}) \sim N(x_i^{(k-1)}\beta_t^{(k-1)} - \alpha_t^{(k-1)}, 1)$$

and any realization of $y_{it}^{*(k)}$ is retained (effectively conducting multiple imputations for the missing votes).

2. $g(\boldsymbol{\beta} | \mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \tau^2, \mathbf{Y}, \mathbf{Z})$ and $g(\boldsymbol{\alpha} | \mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \mathbf{Y}, \mathbf{Z})$. Equation (4) reveals that we can recover $\beta_t^{(k)}$ and $\alpha_t^{(k)}$ by regressing the L -length vector $\mathbf{y}_{:t}^{*(k)}$ on $\mathbf{x}^{(k-1)}$ and -1 , where $\mathbf{y}_{:t}^{*(k)}$ denotes the vector of utility differentials for the L votes cast on vote t . Letting $\boldsymbol{\kappa}_t$ denote the 1×2 vector of $\alpha_t^{(k)}$ and $\beta_t^{(k)}$, and \mathbf{V} be the $L \times 2$ matrix with row i containing the elements $(-1, x_i^{(k-1)})$, it is clear that this is just a standard univariate Bayesian linear regression with an intercept of $-\alpha_t$ and a slope of β_t . Consequently, $\boldsymbol{\kappa}_t$ is recovered by sampling from the multivariate normal distribution:

$$\boldsymbol{\kappa}_t \sim MVN([\mathbf{V}'\mathbf{V} + (\boldsymbol{\sigma}_{\kappa_0}^2)^{-1}]^{-1}[\mathbf{V}'\mathbf{y}_{:t}^{*(k)} + (\boldsymbol{\sigma}_{\kappa_0}^2)^{-1}\boldsymbol{\kappa}_0], [\mathbf{V}'\mathbf{V} + (\boldsymbol{\sigma}_{\kappa_0}^2)^{-1}]^{-1})$$

where the prior mean $\boldsymbol{\kappa}_0$ is the 1×2 vector of $\{\mu_\alpha, 0\}$ and the prior variance $(\boldsymbol{\sigma}_{\kappa_0}^2)^{-1}$ is the 1×2 vector of $\{\sigma_\alpha^2, \sigma_\beta^2\}$. Sampling from the respective distributions for $t = 1, \dots, T$ recovers $\boldsymbol{\alpha}^{(k)}$ and $\boldsymbol{\beta}^{(k)}$.

3. $g(\mathbf{x} | \mathbf{y}^*, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \tau^2, \mathbf{Y}, \mathbf{Z})$. To recover $x_i^{(k)}$, equation (4) is again used, although using only the parameter values relevant to legislator i . Specifically, the T length vector $\mathbf{y}_{i:}^{*(k)} + \boldsymbol{\alpha}^{(k)}$ is regressed on the T length vector $\boldsymbol{\beta}^{(k)}$, with the resulting scalar coefficient on $\boldsymbol{\beta}^{(k)}$ being $x_i^{(k)}$. Denoting the $T \times 1$ vector $\mathbf{y}_{i:}^{*(k)} + \boldsymbol{\alpha}^{(k)}$ associated with legislator i as \mathbf{U}_i , the

standard Bayesian regression results obtain. Hence, with a $N(\mathbf{Z}\boldsymbol{\gamma}, 1)$ prior, $x_i^{(k)}$ is sampled from:

$$x_i \sim N([\boldsymbol{\beta}^{(k)'}\boldsymbol{\beta}^{(k)} + \mathbf{I}]^{-1}[\boldsymbol{\beta}^{(k)'}\mathbf{U}_i + \mathbf{Z}\boldsymbol{\gamma}^{(k-1)}], [\boldsymbol{\beta}^{(k)'}\boldsymbol{\beta}^{(k)} + \mathbf{I}^{-1}]^{-1})$$

This regression is performed L times (once for each $i \in L$) to generate the vector $\mathbf{x}^{(k)}$.

4. $g(\boldsymbol{\gamma}|\mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \tau^2, \mathbf{Y}, \mathbf{Z})$ and $g(\tau^2|\mathbf{y}^*, \mathbf{x}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \mathbf{Y}, \mathbf{Z})$. Assuming a linear functional form, $\boldsymbol{\gamma}^{(k)}$ and $\tau^{2(k)}$ are recovered via a Bayesian linear regression of $\mathbf{x}^{(k)}$ on Z . As discussed above, the conditional posterior distributions of $\boldsymbol{\gamma}^{(k)}$ and $\tau^{2(k)}$ are given in equation (8).

7 Appendix B

```
#####  
## Josh Clinton  
## Stanford University  
## WinBUGS Code for Specification 1  
#####  
  
# Variables in Model  
# N (indexed by i) = number of Legislators  
# M (indexed by j) = number of roll call votes  
# g.id = geographic constituency ideology (Avg. \% Clinton Vote in district)  
# p.id = party constituency ideology (survey measure)  
  
{ for (i in 1:N){  
  for (j in 1:M){  
    mu[i,j] <- beta[j,1]*x[i] - beta[j,2]; # Mean utility differential  
                                           # for legislator i on roll call j  
  
    h106ystar[i,j] ~ dnorm(mu[i,j],1.0)I(h106lower[i,j],h106upper[i,j]);  
                                           # Truncated Normal Sampling  
                                           # for latent utility  
  }  
}  
  
for (i in 1:N){ # Structural Component  
of Ideal Point  
  mux[i] <- coef[1]*g.id[i] + coef[2]*p.id[i] # Expression for prior mean  
  
  x[i] ~ dnorm(mux[i],sigma) # Ideal point prior distribution  
}  
  
# Define Prior Distributions  
for(j in 1:M){  
  beta[j,1:2] ~ dnorm(0.0, B[1:2,1:2]) # Item discrimination [1]  
  } # and difficulty [2] priors  
  
coef ~ dnorm(b[1:2],B[1:2,1:2])  
sigma ~ gamma(a,b)  
tau2 <- 1/sigma # BUGS uses precisions  
}
```

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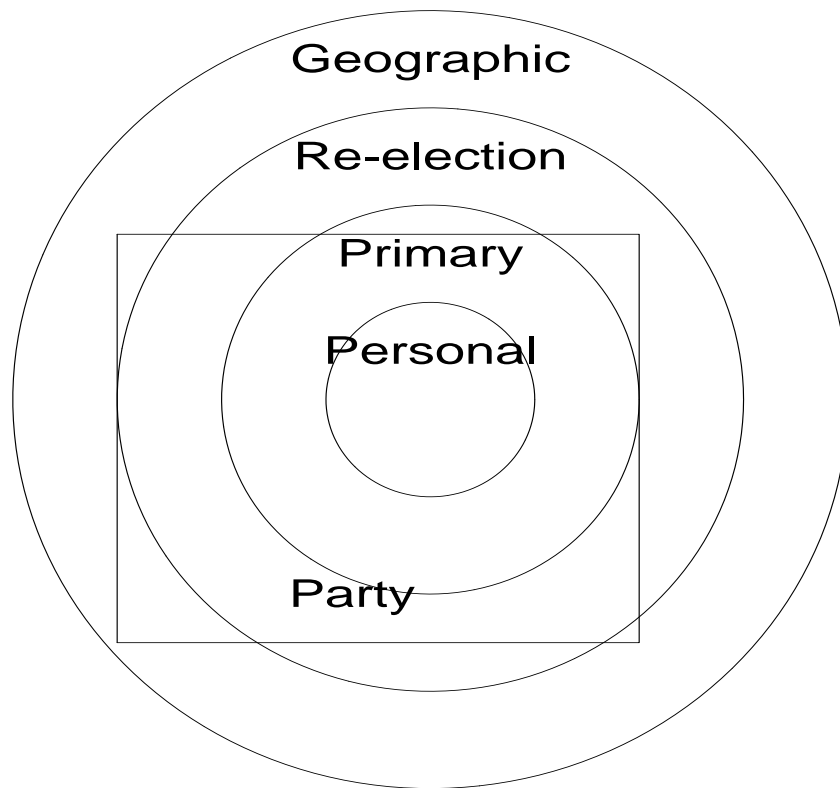


Figure 1: **Constituency as Seen by the Representative** The labelled concentric circles represent the constituencies as described by Fenno. The labelled rectangle representing the party constituency illustrates the relationship between the party constituency and those described by Fenno.

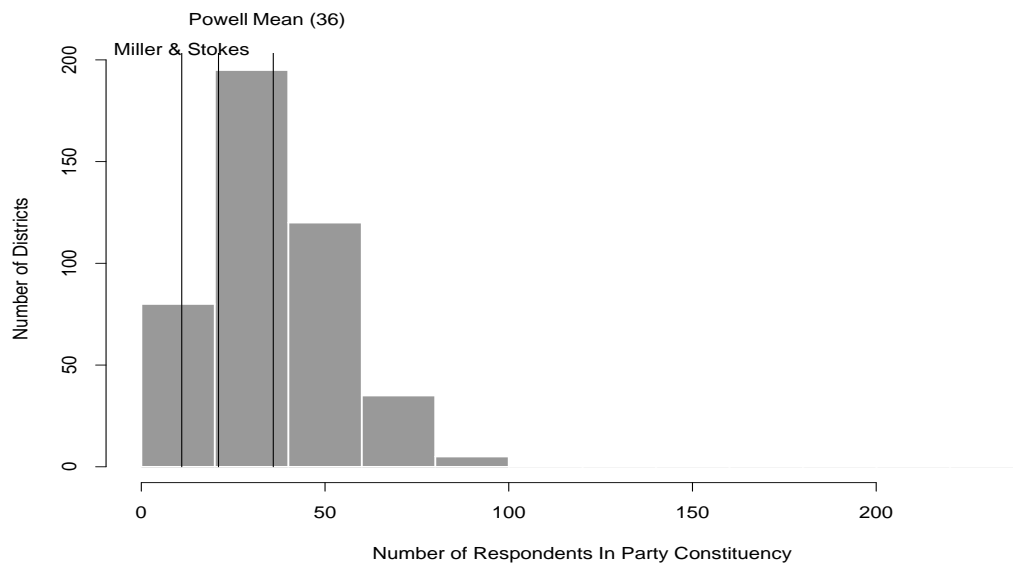
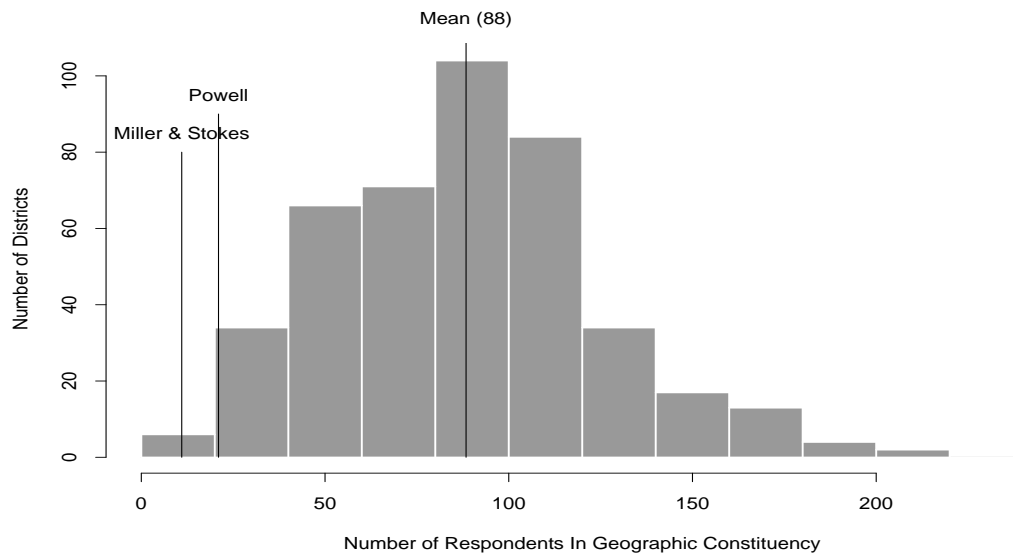


Figure 2: **Sample Sizes of the Constituencies** The upper (lower) histogram presents the number of respondents in the geographic (party) constituency. For purposes of comparison, the labeled lines denote the mean sample sizes used by several previous studies.

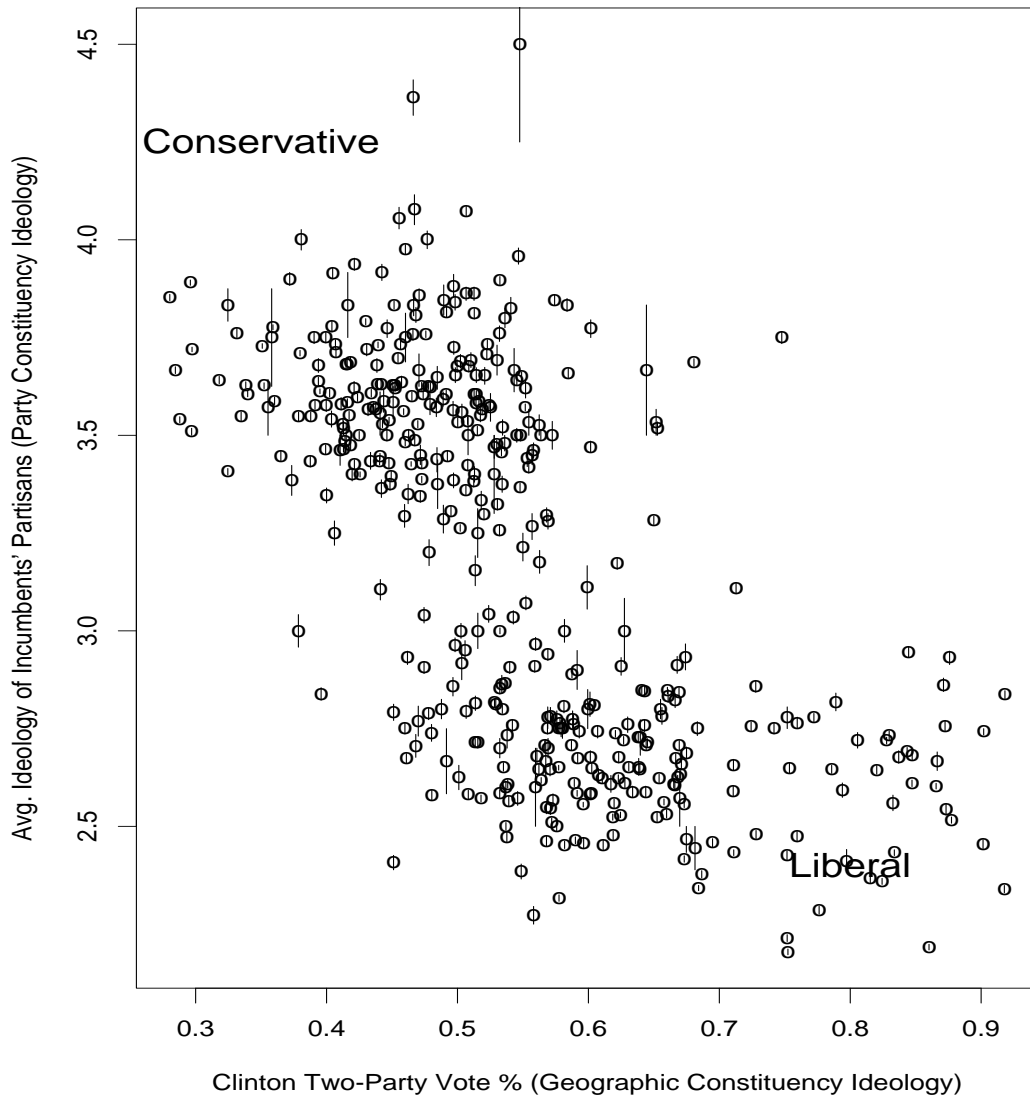


Figure 3: **Joint Distribution of the Preferences of Geographic and Party Constituencies** The midpoints of the plotted circles indicates the joint distribution of interest. The length of the line segments are given by the reciprocal of the sample size used to measure the ideology of the party constituency. The two measures correlate at .657.

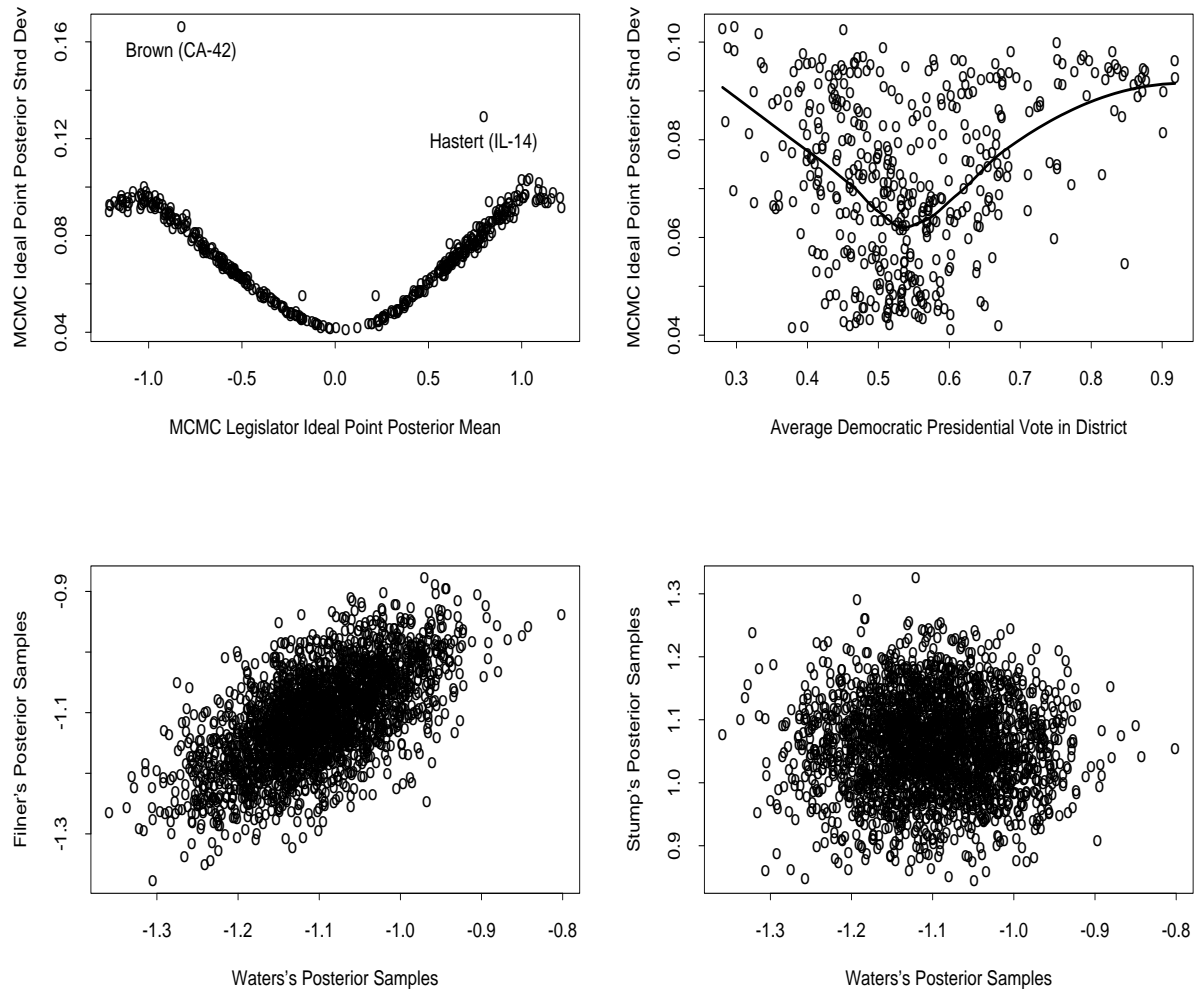


Figure 4: **Covariation of Ideal Point Error Estimates** The upper left graph shows the relationship between the recovered legislator ideal point estimates and their standard errors. The outlier, which is excluded from the other graphs, is the Speaker of the House Dennis Hastert. The upper right graph shows the relationship between the ideal point standard errors and the average two-party percentage of votes cast for Clinton in 1992 and 1996. The bottom left (right) graph shows the relationship between the posterior distributions of Waters (D,CA-35) and Filner (D,CA-50) (Stump (R,AZ-3)).

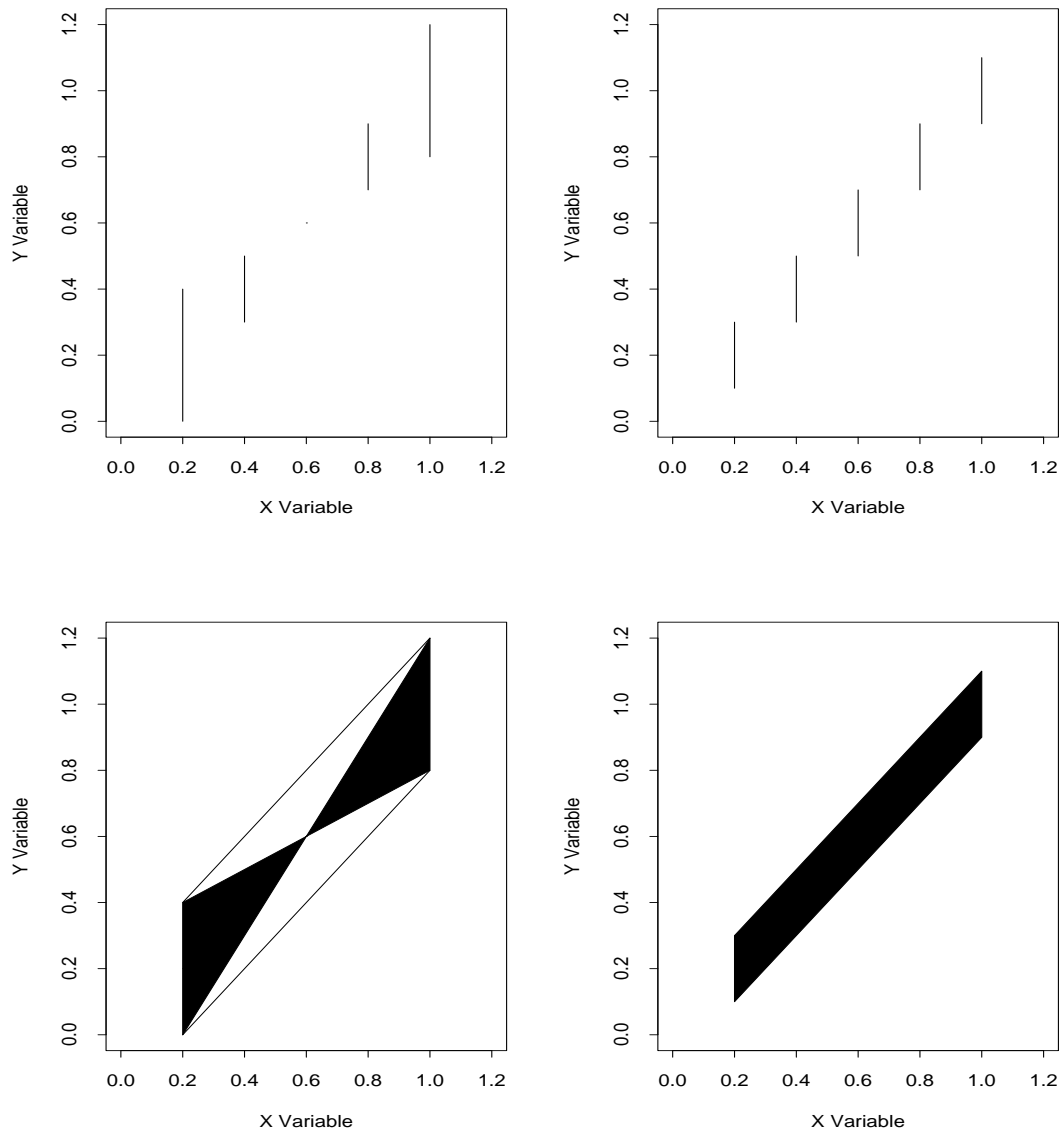


Figure 5: **Effect of Measurement Error in Y** The upper left (right) graph depicts the relationship between X and Y when the error in Y is correlated (uncorrelated) with X. The lower graphs depicts the area in which a best linear predictor for the respective upper graph would be found.

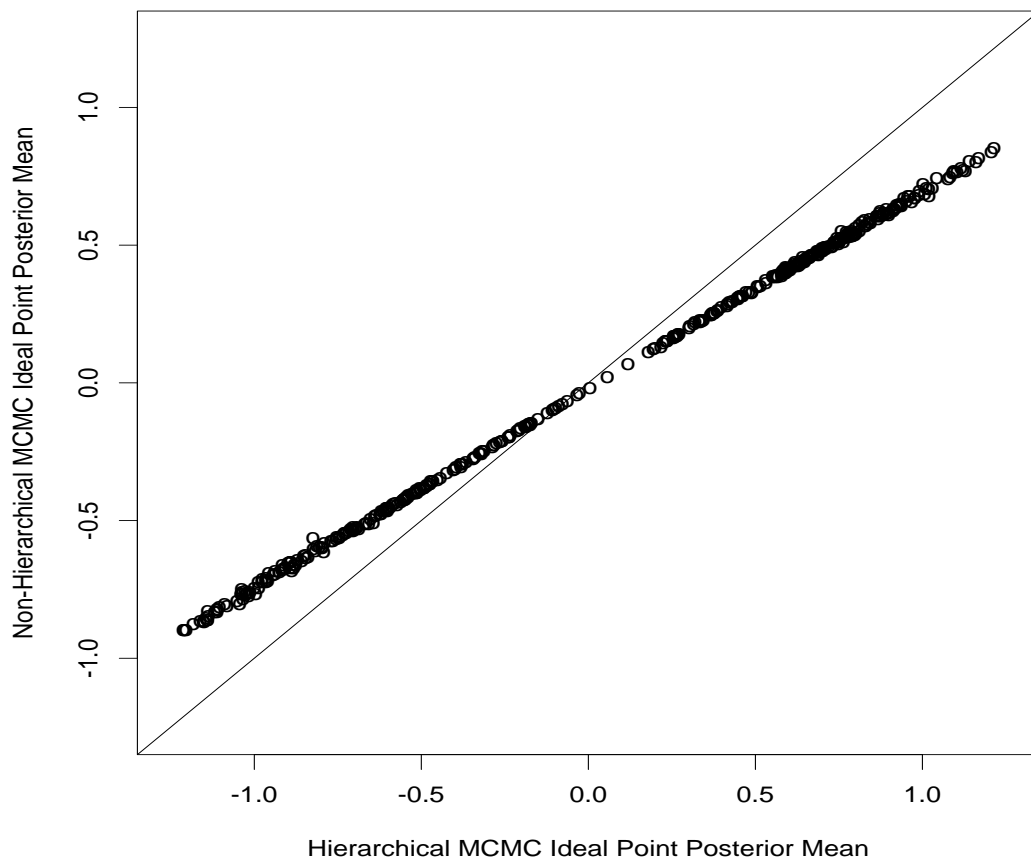


Figure 6: Hierarchical and Non-Hierarchical MCMC Estimates Compared