Representing communities of economic interest in the U.S. House

Sarah Treul
streul@unc.edu

Nathan E. Pinnell
npinnell@live.unc.edu

Santiago Olivella
olivella@unc.edu

Department of Political Science

University of North Carolina at Chapel Hill

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Abstract

Communities of shared interest can easily fail to coincide with congressional districts. When areas that demarcate these communities span multiple congressional districts, do representatives shift their efforts to reflect the interests of a broader set of citizens, or do they maintain a focus on the local interests of their own constituents? Using journey-to-work data for millions of Americans, we measure the extent to which one such community — the labor market area — crosses congressional district boundaries, and evaluate the effect of these shared economic interests on the representational efforts of House members. We find that members coming from a common labor market area tend to collaborate more often, and that members representing districts embedded in larger labor market areas sponsor more legislation on national issues. These patterns may exacerbate polarization in Congress and hurt representation of urban minority populations, even in the absence of malapportionment.

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Introduction

Bolstered by electoral incentives, the notion of dyadic representation — the relationship between members of Congress and their geographically-defined constituents — has been the linchpin of studies of representation in the U.S. (Carson et al. 2010; Bovitz and Carson 2006; Canes-Wrone, Brady, and Cogan 2002; Achen 1978; Miller and Stokes 1963). While federal requirements regarding the U.S. House do not strictly require that congressional districts be defined by geography (but see Weissberg 1978), the interests and priorities of constituents typically are (Rehfeld 2005). For many U.S. residents today, however, life routinely happens *across* district lines, in geographies that fail to coincide with those defined by congressional districts. People frequently leave their local community to commute to work, to participate in activities, and to engage in virtual communication via the Internet. Life for many Americans is happening everywhere, and we are interested in uncovering what this increased de-localization means for representation in Congress. In this paper, we find that members of the House react to this misalignment between interests and districts by representing broader communities — going beyond the notion of Fenno's "geographic constituency" (1978).

Although there are many "communities of interest" that fail to overlap with currently defined congressional districts, few are as relevant as those defined by common economic dynamics. Given how important the economy (and unemployment in particular) is to politics in the U.S., citizens living in economically-connected areas that go beyond district boundaries can be expected to share ideas of what issues are important and of what their political representatives ought to do. As a result, the efforts of those who represent such communities of economic interest should display some degree of cohesion — one that goes beyond the confines of local district interests and partisan mandates. We evaluate whether, in fact, such communities of cross-district economic interests have a systematic impact on the work legislators do.

Specifically, we rely on the economic networks defined by typical work-related journeys into and out of a congressional district to generate a novel measure of a specific communities of economic interest: the labor market area. Labor market areas can be thought of as geographic regions within which people can reasonably be expected to change jobs (or, alternatively, where firms can be expected to find qualified candidates) without having to relocate, thus delineating the space that contains a readily available workforce. Using the LEHD Origin-Destination Employment Statistics (LODES) dataset produced by the Longitudinal Employer-Household Dynamics program at the U.S. Census Bureau (U.S. Census Bureau 2018b), we capture the commuting habits of millions of Americans from 2002 through 2015. These commuting data give us a measurable way to assess the extent to which districts are embedded in a larger labor market area, by capturing the work-related in- and out-flows of people across geographically proximate districts.

Using this measure and regression models that account for potential confounders and likely sources of autocorrelation, we find that representatives are more likely to collaborate with one another if their constituents are part of a common labor market area. We also find that they are more likely to eschew typical, locally-focused issue areas in favor of broader, more national issues, as their constituents become increasingly embedded in cross-district labor market areas. In other words, we find that the regions of shared economic interest in which constituents find themselves have a discernible effect on the type of representation members of Congress afford them.

Representation and the geography of interests

Although equal population is the only principle that *all* map-makers must legally abide by when designing congressional districts, spatial contiguity (and therefore the idea that representation ought to be fundamentally geographic) is also expected where possible. Designing geographically-bounded and contiguous districts makes sense for both historical and practical reasons, as communities of interest (i.e. the kinds of groups that districts are formally and informally designed to represent) are often rooted in geography (Rehfeld 2005). Supreme Court precedent, too, suggests that map-makers should attempt to keep the districts as compact as possible, keeping communities of interest together (see *Reynolds v. Sims* (1964) and *Shaw v. Reno* (1993)).

In designing congressional districts, those recently in charge of drawing their boundaries have paid particular attention to partisan interests. Aided by patterns of spatial concentration of partisan preferences (McDonald 2011; Chen and Rodden 2013; Cho, Gimpel, and Hui 2013), map-makers have been able to capitalize on the geographic basis of congressional representation to give prominence to partisanship as the interest that is most clearly salient within district boundaries. In general, however, the geography of interests other than partisanship need not coincide with districts thus drawn, resulting in district boundaries that do not circumscribe all politically relevant and geographically-defined interests. Given this lack of concomitance, elected representatives must decide whether to focus their attention on the set of localized issues that are only relevant to those within their district, or adapt their efforts to represent the interests of the broader communities their district is a part of.

Although focusing on constituencies as currently defined by district boundaries is more in line with a classical understanding of congressional representation (such as that in Fenno 1978, for instance), working to represent the interests of broader communities can have additional benefits that could prove electorally costly to ignore. Indeed, the sheer instability of population location should make forward-looking representatives wary of focusing too heavily on the interests of their current constituents — the United States is, despite recent downward trends, one of the most geographically mobile societies in the developed world, with 45 percent of the population over age five having recently lived somewhere else (Cho, Gimpel, and Hui 2013; Perry 2003; Ren 2011). What is more, mobility appears to be self-reinforcing: Americans are accustomed to moving for routine reasons — such as the desire to find a different-sized home, better-suited neighbors or higher-quality school districts — and across short distances, with over 60 percent of moves occurring within the same county (Ihrke and Faber 2012; Cho, Gimpel, and Hui 2013). This amount of population churn, in turn, leads to higher mobility acceptance and a geography of interests that shifts continuously — even at the local level (Enos 2017; Ogorzalek 2018). Overall, then, ignoring broader communities of interest can result in legislators who end up being "churned" out of office.

Of the many possible geographically-defined interests that can fail to coincide with congressional districts, few are as electorally relevant as those associated with the economy. Indeed, perceptions of the state of personal and local economies (and in particular perceptions of the labor market) play a major role in determining who participates and which parties and candidates have an edge in the upcoming election (Ebeid and Rodden 2006; Wright 2012; Burden and Wichowsky 2014; Aytac, Rau, and Stokes 2018). Incidentally, the economy also plays a substantial role in explaining the kind of geographic mobility that can make it electorally expedient for members of Congress to focus their attention on broader communities of interest, with over 20 percent of movers typically offering a job-related reason for their move (Ihrke 2014). So when regions that define a local economy fail to coincide with congressional districts, representatives may thus find themselves cross-pressured: they can choose to focus on representing the (typically partisan) interests of constituencies as defined by their current districts, or they can heed the needs and preferences of the communities of economic interest their district is a part of.

Accordingly, our main goal is to evaluate which of these two avenues is typically chosen by representatives faced with the types of cross-pressures that come from being in a district with boundaries that do not coincide with those of other relevant communities of interest, particularly communities defined by common *economic* interests. More specifically, we focus on the representational effects of a lack of overlap between congressional districts and regions with shared economic conditions.

In looking for evidence of the type of choices legislators make, we begin by noting that choosing to heed a broader set of interests cannot come at the expense of reelection prospects. This implies that if legislators choose not to focus on issues that are only of interest to their local constituents, they should still concern themselves with interests that are *shared* between their voters and those in districts that are embedded in the same communities. Accordingly, we would expect to see representatives from districts that are part of the same cross-district communities of economic interest focus on similar issues, and engage in "nearest neighbor" legislation (Kirkland and Williams 2011; Treul 2017). In other words, they should work together to push policy in mutually beneficial ways. This leads us to our first hypothesis:

> **Hypothesis 1:** If two districts are part of a common community of economic interest, the corresponding members of Congress are expected to collaborate with each other more often.

Furthermore, and from the voters' perspective, being part of multiple intersecting communities of interest that go beyond district boundaries is likely to make them less connected to the localities defined by their congressional districts (Putnam 2000; Besser, Marcus, and Frumkin 2008). Indeed, a simple analysis of data from the Cooperative Congressional Election Study (CCES) shows that constituents from smaller, denser districts — where cross-district communities of economic interest are most likely to exist — are 10% less likely to know the name and party affiliation of their local representative, suggesting such voters may focus their political attention on matters that are not parochial in nature. As a result, representatives who have a choice between focusing on narrow, local issues vs. broader, more national ones often stand to gain from doing the latter. If legislators are more prone to acknowledge the broader interests of the economic communities their districts are embedded in, we would expect to see representatives from cross-pressured districts focusing on broader, less parochial issues. Accordingly, our second hypothesis is as follows:

> **Hypothesis 2**: If a district is part of a larger community of economic interest, the corresponding member of Congress is expected to focus the scope of her legislative efforts on broader, more national issues.

Evaluating these hypotheses empirically requires constructing a measure of the extent to which a district's boundaries are criss-crossed by the boundaries of electorally relevant communities of economic interest. The question, then, is how to delineate communities of economic interest on the same map as congressional districts are drawn, and how to measure the extent to which the boundaries of the two geographies intersect to generate the kinds of cross-pressures that would lead to our hypothesized empirical patterns. In what follows, we turn to these questions, and use the ensuing measures to evaluate our expectations.

Measuring communities of economic interest

Delineating areas with a cohesive economy is not an easy job, as many economic forces are not bound by well-established political divisions, such as counties and states. Such areas are nevertheless of interest, as many economic indicators (such as unemployment and wage rates) are most usefully defined over regions with interconnected economic dynamics. Of these dynamics, few are as relevant for understanding the local economy as those defined by the labor market. Accordingly, labor market areas (LMAs) — defined as "economically integrated area[s] within which individuals can reside and find employment within a reasonable distance or can readily change jobs without changing their place of residence" (Bureau of Labor Statistics 2019) — have played a major role in the dissemination of relevant economic statistics in the U.S. for over thirty years (Tobert and Killian 1987).

LMAs have historically been measured using journey-to-work data collected by the U.S. Census, as well as the more frequently deployed American Community Survey. These data contain information about place of work and place of residence of respondents, which has then been aggregated and clustered to define regions of interest. Although such exercises have produced clearly delineated areas that should correspond to the communities of interest we have been discussing, our focus is on how such communities interact with the map of U.S. congressional districts. Specifically, we are interested in whether districts that share the kinds of economic interests captured by typical LMAs are represented by legislators whose work reflects that source of interdependence.

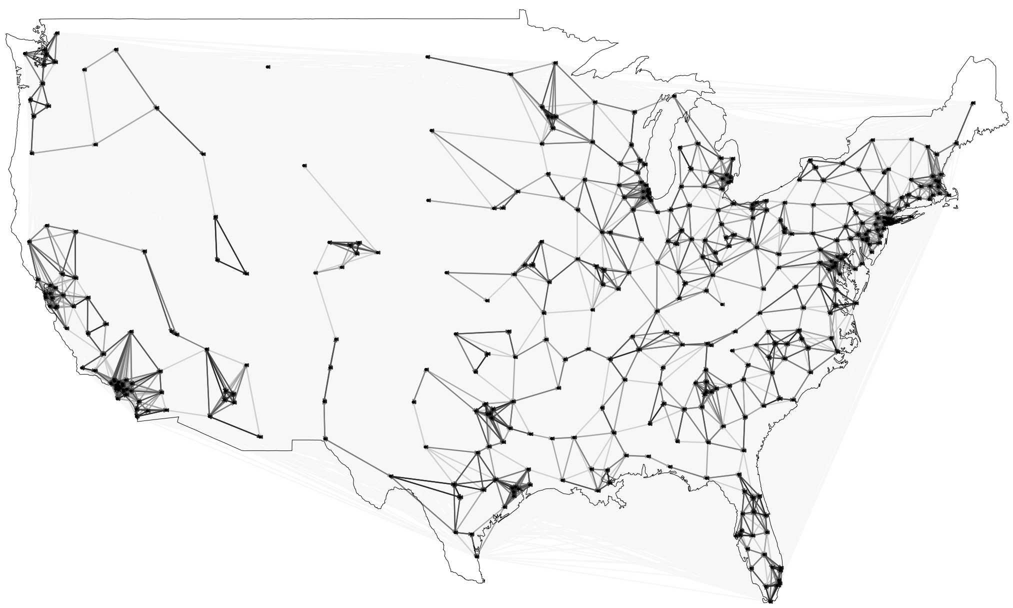

Figure 1: Network of average worker flows between congressional districts during the 112^{th} Congress. Nodes correspond to district centroids, and darker edges between them indicate heavier worker flows.

Accordingly, we construct our measure of economic interdependence of congressional districts using the same kind of journey-to-work data that underlies current LMA definitions. Specifically, and following Nelson and Rae 2016, we rely on the Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES) dataset produced by the U.S. Census Bureau (U.S. Census Bureau 2018b). The dataset combines federal, state and business administrative records with data from household surveys and census projections to produce joruney-to-work information at low levels of geographic aggregation (viz. census blocks), resulting in yearly observations of the home and work locations of millions of Americans, aggregated in the form of "origin-destination tables" (U.S. Census Bureau 2018b). We then convert these census block-level cross-tabulations to tabulations at the congressional district level using GIS software,[1] enabling us to determine how many

[1]Congressional district shapefiles were obtained from Lewis et al. 2013. Census block shapefiles were obtained from U.S. Census Bureau 2018a.

individuals both live and work within the same congressional district, and how many go across district borders to get to their registered work-place.

These relationships are directional, separately indicating the number of people who have a home in district A but work in district B, as well as the number of people who work in district A but live in district B. Taking the average of these district-to-district flows throughout the two years in a given Congress results in a set of networks of typical work-related flows between districts represented in the course of eight Congresses (viz. from the 107^{th} the 114^{th}), similar to those found in Nelson and Rae 2016. Figure 1, depicting average flows between districts during the 112^{th} Congress, illustrates the resulting networks.

Do members in shared communities of economic interest collaborate more often?

To evaluate whether being embedded in a community of economic interest that transcends district boundaries has any bearing on whether members of Congress choose to collaborate on legislation, we turn to a network analysis of their co-sponsorship patterns. Our goal is to evaluate whether being part of the same labor market areas discernibly increases the probability that representatives will cosponsor a piece of legislation together, beyond what would be expected given their policy preferences and those of their respective constituents, and structural features of the collaboration networks. We find that being part of the same community of economic interest has a discernible and substantively meaningful effect on the collaborative efforts of members of Congress.

Our measure of collaboration between members of Congress is based on co-sponsorship information for all bills considered during the same time period. Specifically, and for all bills introduced during the period of study, we identify the set of their listed co-sponsors and form a set of networks between members who served in each session, with weighted edges given by the number of bills on which both members appear as co-sponsors, as is standard in the literature (e.g. Fowler 2006). We then model these session-specific collaboration relations as a function of the extent to which the corresponding members' electoral districts share in the same communities of economic interest.

As with other types of dependent data, the risk we face when modeling relational outcomes (such as legislative collaboration) is to incorrectly ascribe to an exogenous predictor an effect that is more readily the result of endogenous tendencies of networks to display certain connectivity patterns (e.g. the tendency of co-sponsorship relationships to be transitive). As a result, we need to estimate a model that accounts for these structural features. Although there are a number of alternative modeling strategies that can accommodate these endogenous effects (Cranmer et al. 2017), we rely on the additive and multiplicative effects (AME) model of Hoff 2018 — a more general variant of the latent space network model proposed by Hoff, Raftery, and Handcock 2002. In addition to incorporating exogenous predictors measured at the node- (or member) and dyad- (or member pair) levels, AME models account for endogenous features of undirected networks by using node-level random intercepts (to account for dependency arising dyads sharing a common node) and a multiplicative term between vectors of latent traits of nodes (to account for other forms of higher order dependence, such as transitivity).[2]

More formally, and letting y_{ij} be the number of bills cosponsored by members i and j during a specific Congress,[3] we define

$$\begin{aligned} \log(y_{ij}) &\sim N\left(\mathbf{x}_{ij}\boldsymbol{\beta} + a_i + a_j + \mathbf{u}_i^\top \boldsymbol{\Lambda} \mathbf{u}_j, \sigma_y^2\right) \\ a_i &\sim N\left(\mathbf{z}_i \boldsymbol{\gamma}, \sigma_a^2\right) \end{aligned} \tag{1}$$

where $\mathbf{x}_{ij}$ is a row vector of dyad-level predictors, including the distance between members'

[2]Minhas, Hoff, and Ward 2019 offer a good introduction to AME models, and a thorough discussion of its advantages over other commonly used approaches, such as ERGMs.

[3]We model each Congress separately to avoid issues arising from redistricting and incumbent replacement; each node in a network is thus unambiguously defined as the combination of a clearly defined congressional district and an individual representative.

districts (or their centroids, to be precise), a binary copartisan status and — most importantly — total worker flows between members' districts, scaled by the number of people who live or work in either district.

To control for potential confounders at the level of the representative and/or the district, we include node-level predictors, denoted above as row-vector $\mathbf{z}_i$. These include the first dimension of the representative's NOMINATE score, gender, whether the member is a freshman and whether the member is a committee chair. In turn, and to account for collaboration driven by constituency characteristics, we include a measure of each district's policy preferences. We derive these from the estimates produced by Tausanovitch and Warshaw 2013, who offer a post-stratified measure of how liberal or conservative citizens are, on average, in each congressional district.[4] When available (i.e. from the 100^{th} through the 114^{th} congresses), we also include additional district-level socio-demographic data — including the number of high-school graduates, median household income, and percent of people who work in historically mobile economic sectors (viz. construction and transportation). Finally, and to further strengthen our ability to avoid spurious findings, our models estimate node-level, 2-dimensional latent vectors $\mathbf{u}$ designed to capture potentially omitted variables that can also account for the higher order dependencies typical of network data. Holding all of these features constant allows us to evaluate the effect of work-related flows net of forces that are typically understood to generate mutual legislative interests among members of Congress, and net of endogenous structural features of the collaboration network itself. We present a table with estimates of parameters in Model 1 (as well as details of the Bayesian sampling strategy) in Appendix A.

The model estimates suggest that an increase in the work-related flows between districts generates independent incentives for their corresponding representatives to collaborate through bill co-sponsorship, as we hypothesized. These increases in collaborative efforts

[4] As their estimates are available for districts as generated after the 2000 and 2010 census rounds, we use a hierarchical linear model (with random intercepts by district and state) to obtain estimates for all congresses in our period of study.

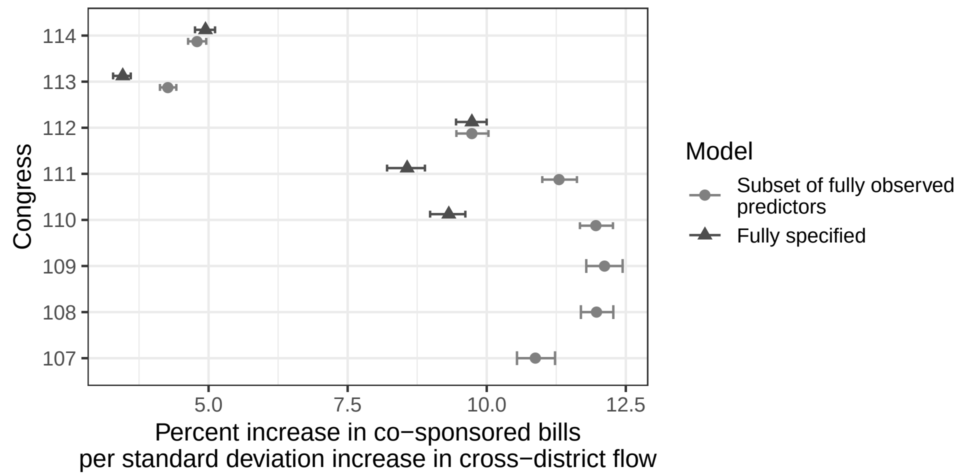

Figure 2: Predicted percent change in amount of co-sponsored bills between pairs of members of Congress as we allow work-related flows to increase by one standard deviation. Predicted values depicted using a lighter circle are derived from models estimated using the subset of predictors available in all session. Darker triangles depict prediction derived from models with all available socio-demographic predictors, which are only fully observed from the 110^{th} Congress on.

go beyond what would be expected given the policy preferences of constituents, members' copartisan status, the geographic distance between their districts, the (observed and unobserved) characteristics of said districts/members, and the endogenous tendency of networked representatives to show collaborative ties. To get a better sense of the substantive magnitude of this effect, Figure 2 shows the predicted percent increase in co-sponsorship collaboration as we let work-related flows increase by one standard deviation.

Overall, the impact of such an increase is sizable. Depending on the Congress under study, we find that increasing flows by one standard deviation (or roughly by 4 percentage points) results in increases in cosponsorship that range between 5% and 12%, holding all other predictors constant. On average, such effects correspond to increases between 2 and 6 additional co-sponsored bills on top of the 50 bills typically co-sponsored by any pair of legislators during our period of study. And although the results are somewhat attenuated when the full set of predictors is available for estimation (as indicated by the lower effect estimates under the fully specified model, represented by the darker triangles in Figure 2), these substantive claims remain unaltered.

There is, however, considerable variation in the magnitude of the estimated effects across time, with a decreasing trend that starts after the 109^{th} Congress and precipitates during the last two congresses in our sample. One plausible explanation for this effect heterogeneity over time is that the 113^{th} Congress was elected under newly apportioned (and potentially re-drawn) districts, thus resulting in overall weaker connections between constituents and their representatives in those districts that changed as a result of the census information.

These changes, however, cannot be solely responsible for the distinct decrease in effect size of flows, as we see no such change for the 108^{th} Congress (which also followed a decennial census). A more viable explanation is hinted at by the fact that the peak in shared labor market effects coincides with the emergence of modern social media platforms like Facebook and Twitter. Indeed, the rise of social media usage coincides with the decline in magnitude of the effect of work-related flows, with the fastest growth in Facebook usage occurring precisely between the 109^{th} and 110^{th} congresses, and platforms like Snapchat and Instagram becoming popular right when we see the precipitous fall in effect size between the 112^{th} and the 113^{th} congresses. Social media redefines what it means to be adjacent—as it does not rely on geographic proximity for building networks—which means that adjacency defined by economic interdependence can be expected to become less relevant during this more recent time.

In general, cross-district communities of economic interest (as measured by commuter-induced labor market areas) seem to generate discernible incentives for legislators to collaborate via co-sponsorship, even after controlling for relevant covariates and endogenous characteristics of the cosponsorship networks. Although this effect seems to be decreasing as of late, it is possible that the notion of a trans-district constituency is being affected by the use of social media and other online platforms that make it easier for local voters to focus on matters that are more national in scope. Can we find a similar shift in attention from local to national matters for legislators whose constituents are more likely to cross district lines in their everyday lives? We turn to this question, and to evaluation of our second hypothesis, in the next section.

Does representing a cross-district community of economic interest affect legislative attention?

Having established that being embedded in an economic community of interest that crosses district lines results in increased collaboration among legislators, we turn to studying the scope of legislative attention: Does being part of trans-district labor market areas result in legislators who focus on broader, less parochial issues, as our second hypothesis suggests? To evaluate this expectation, we estimate a model of scope as a function of typical worker flows in and out of districts, and find evidence that these flows affect the extent to which legislators focus on local vs. national issues in their legislative efforts.

To construct the predictors of interest, we once again rely on our journey-to-work networks to derive three ratios defined at the congressional district level. We start by defining the total extent to which a given district shares in cross-district labor markets using the ratio of people who either only live in the district or only work in the district (but not both) to the number of people who both live *and* work in the district. This can be thought of as the total amount of work-related flow in and out of a district, normalized by that district's stable population. Notice that there is no mathematical need for the ratio to be between 0 and 1: if there are very few people who both live and work in the district, but many people who commute in every day to get to work, the ratio could (and does) obtain values higher than 1, and we would conclude that the district's labor market is non-exclusive.

In turn, and in order to evaluate whether legislators respond differently to workers coming primarily into or primarily out of their districts, we disaggregate this total amount of flow into two separate ratios — one for outflows (i.e. the ratio of people who live in a given district but work elsewhere to the total number of people who both live and work in the district) and another for inflows (similarly defined, but using the number of people who work in the district and live somewhere else as the numerator). Once again, we note that there is nothing compositional about these two ratios, so it is entirely possible for the inflow ratio to increase without a compensatory decrease in the outflow ratio.

To measure the degree to which a legislator's attention is national or local, we begin by classifying the more than 50,000 non-private bills introduced during the period of study according to the scope of their subject matter. To do so, we rely on the the work of Grimmer 2013, who uses a combination of automated and human coding to generate a taxonomy of issue areas with the potential to generate broad policy appeals, and issue areas associated with more localized, parochial interests. More specifically, we use the most relevant words in the topics discovered and classified by Grimmer (2013; in particular Table 1 therein) to define informative lexical priors for topic-word distributions in a Bayesian topic model (Blei, Ng, and Jordan 2003; Quinn et al. 2010) estimated on the summaries of all bills introduced in the House between the 107th and the 114th Congresses. This measurement strategy, the details of which can be found in Appendix B, allows us to retain the semantic content of issues identified by Grimmer, while allowing enough flexibility to accommodate the fact that we are studying a different corpus of text than the one his model was originally trained on(viz. Senate press releases). We use the output of our model to classify bills into those that deal with local issues, and those that deal with broader, more national issues (or "appropriations" and "credit-claiming" topics, in Grimmer's terms). For reasons that will become apparent when we discuss the robustness of our findings, we retain all those bills that fit neither attention scope category and which deal mainly with ceremonial and administrative matters.[5]

Having classified each bill, we create each member's attention profile by computing the total number of each type of bill they introduced (i.e. sponsored) in a given Congress.[6]

[5] In Appendix C, we present a simple validation check of our classification exercise, and find our classification scheme is consistent with that of the Policy Agendas Project (Baumgartner and Jones 2013)

[6] While sponsorship is not the only avenue members have at their disposal to address issues of local representation, writing and promoting bills are some of the most consequential actions a legislator can take. If other strategies — such as constituency service — are more commonly used, this only makes ours a hard test of our hypothesized relationships. The rare instances of legislators who do not introduce any bill during

With these counts in hand, we model the probability that a representative sponsors local vs. national bills as a function of typical work-related flows (both aggregated and disaggregated into inflows and outflows) in her district. More specifically, we define a binomial probit model of the number of local bills sponsored by a representative in a given Congress (out of all bills she sponsored that are either national or local), as a function of district-specific flow measures and relevant controls (including the representative's gender, her cumulative time served in Congress, whether the member is a committee chair, whether she is in the majority, and the estimated policy preferences of her constituents, estimated as in the previous section).

Although the likelihood of sponsoring bills related to local or national issues is not a relational outcome, we must nevertheless account for the fact that, under the evidence presented above, representatives whose districts are connected via work-related flows can be expected to share similar propensities to sponsor local bills. This effectively generates patterns of "spatial" dependence that, if ignored, could result in biased estimates of the effects of interest. Accordingly, we include a conditionally auto-regressive (CAR) distributed random intercept in our model (Carlin, Gelfand, and Banerjee 2014; Jackson and Monogan 2018), with a weighted adjacency matrix derived from the flow network we used as a predictor in the previous section. This adjacency matrix is forced to be block diagonal (with blocks defined by a session of Congress), with weights equal to zero (i.e. zero co-flows) between districts that were represented in different sessions. Finally, we incorporate a (non-spatial) random intercept by session, to allow for partially-pooled session-level effects.

Formally, and letting y_i be the number of local bills sponsored by representative i out of

a session are omitted from the analyses in this section.

n_i sponsored bills that have a definite scope, our model is given by

$$\begin{aligned} \Pr(y_i) &= \Phi(\mathbf{x}_i\boldsymbol{\beta} + \eta_i + \gamma_{\text{cong.}[i]}) \\ \eta_i \mid \eta_{j\neq i} &\sim N\left(\rho \sum_{j=1}^{n} w_{ij}\eta_j, \sigma^2_\eta\right) \\ \gamma_{\text{cong.}} &\sim N(0, \sigma^2_\gamma) \end{aligned} \tag{2}$$

where $\gamma_{\text{cong.}}$ is a random intercept by Congress, η_i is a CAR-distributed random effect, $w_{i,j}$ is the row-normalized work-related flow between districts i and j,[7] $|\rho| < 1$ is a spatial correlation coefficient, and the $\sigma^2_\cdot$ terms are variance components. In turn, we specify two separate predictor matrices $\mathbf{x}_i$ — one with the total work-related flows in and out of i's district along with controls, and another with the same set of controls, but with flows disaggregated as discussed earlier. As usual, $\Phi(\cdot)$ denotes the CDF of a standard Normal distribution. A table containing our estimates of parameters in Model 2 is once again available in Appendix A, along with details on the Bayesian sampler used to obtain them.

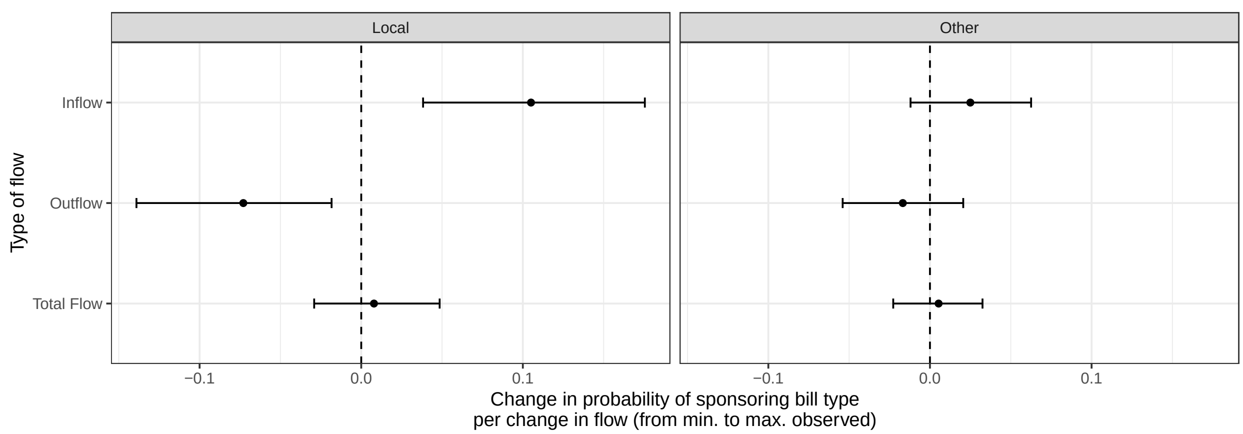

Figure 3: Predicted change in probability of sponsoring a local vs. national (left panel), or other scope vs. definite scope (right panel) type of bill, as a function of a one-standard-deviation change in total flows, outflows and inflows of workers to and from a representative's district.

When we consider all work-related flows in and out of a district, it would appear as if being

[7] To improve computation efficiency, we assume that two districts are adjacent if the flow between them is above average.

embedded in a cross-district community of economic interest makes no difference in terms of the scope of legislation sponsored by representatives. The bottom row in the left panel of Figure 3 shows the average estimated change in probability of sponsoring local bills as total worker flows change by one standard deviation.[8] The expected change is substantively very close to zero, and statistically indiscernible from it.

Focusing on the aggregate flows, however, masks heterogeneity in the mutually cancelling effects of flows into and out of the district, as evidenced by the remaining rows in the left panel of Figure 3. As expected, estimates from the disaggregated flow model suggest that the probability of focusing on local issues decreases as a member's district experiences a surge of *outgoing* commuters, as indicated by the middle row of the left panel in Figure 3. More specifically, as the proportion of people working in a different district increases from 0 to about 12% of the district's static work-force, our model suggests the probability of working on more *national* issues increases by about 7.5 percentage points.

In turn, the relation is exactly the opposite when we consider the flow of people *into* a member's district, which is (we hasten to reiterate) independent of the worker outflow in a district, and which results in an increase in the probability of sponsoring locally-scoped bills, as indicated by the top row of the left panel of Figure 3. Our model suggests that representatives of districts that experience a maximal influx of daily workers can be expected to focus on more *local* issues with a probability that is about .1 higher than those who see no workers coming into their districts to work.

Overall, our evidence suggests that simply knowing that a district is embedded in a broader labor market area is not sufficient to understand how these communities of shared economic interest affect representatives' scope of attention. Different types of participation in these communities warrant different representational strategies, with members whose constituents work in other districts emphasizing less parochial issues, and members who see a high influx of commuters into their districts emphasizing local issues.

[8] The average is taken both over posterior samples of the model parameters and observed values of all other predictors.

We evaluate the robustness of these results by studying an outcome that should remain unaffected by membership into cross-district labor markets. Specifically, being part of a broad community of economic interests should not affect legislative activity that has little representational content, such as work on bills dealing with honorary and administrative matters — precisely the types of bills that our classification exercise sorts into the "neither local nor national" category. Thus, and to show that journey-to-work flows do not affect *all* kinds of legislative activity, we reproduce the above analysis by modeling the probability of sponsoring "other" types of bills as a function of commuting flows. The null results of this estimation, which are depicted on the right panel of Figure 3, serve as a placebo test of our claim that cross-district communities of economic interest affect the scope of *representational* attention, rather than other types of legislative activity.

Conclusion: Potential consequences of more de-localized representation styles in Congress

Our findings suggest that representatives of constituencies embedded in larger communities of economic interest are both more likely to cosponsor legislation with member districts that share in those communities and focus their scope of legislative attention on national, rather than local, issues. This response to the cross-pressures of intersecting interests may have wide-ranging consequences. Higher collaboration among representatives with shared communities of economic interest may reduce the representational issues raised by heavy partisan gerrymandering, and members whose constituents have to leave their district to go to work are more likely to concentrate on national legislation and issues — thereby accomplishing the goal of a federal legislator to make laws for the nation.

As more members concentrate on national issues, however, the ability to use particularized benefits to engage in cross-partisan compromise decreases, since localized strategies such as securing earmarks or (in an earmark-moratorium era) other district-specific provisions and projects do not generate much in the way of electoral payoff. For districts with high commuter outflows, the likelihood of seeing polarizing and partisan legislation being supported by a more nationally-oriented set of representatives could be expected to increase. This, in turn, might result in a kind of positive feedback loop, driving the amount of polarizing and partisan legislation even higher due to member selection effects. As the electoral payoff of national position taking increases and the benefits of compromise decrease, potential candidates or current members whose preferred homestyle includes particularized benefits would feel increasingly out-of-sync with their party, possibly choosing not to run (Thomsen 2014). A larger percentage of a legislature whose main focus is on national, partisan issues would necessarily make compromise more difficult, as few partisan voters actually like compromise, regardless of what they might profess (Harbridge and Malhotra 2011). De-localization of interests and representation may thus be one mechanism of the multitude that exacerbates polarization and feeds into its self-reinforcing cycle.

In addition, the lack of attention to district-specific issues may have unexpected consequences for populations that are particularly prone to crossing district boundaries routinely. As we argued before, such populations are less likely to feel a strong sense of connection to the local contexts defined by their congressional districts, thus reducing the chances that they will form or express many local policy demands. Local policy, however, is still important, insofar as such populations continue to have needs on primarily local dimensions, such as infrastructure and pre-collegiate education. As a result, and even though the less localized interests of these populations may be receiving adequate attention, their unavoidable local needs may not be. If this is the case, are the local needs of major metropolitan areas — where such locally-disaffected populations are most likely to exist — lacking attention at the federal level on account of being embedded in larger regions of economic interest? In particular, do urban minorities suffer from legislators who shift their attention away from local issues?

For instance, prior research has found that minority populations across the United States tend to pay a higher "transit time penalty" than White commuters in the same geographic area: according to the National Equity Atlas, African-Americans spend, on average, 6 more minutes than Whites commuting to and from work every day (Razza 2015) — with time disparities ballooning in metropolitan areas.[9] For such populations, time spent moving to and from their place of residence means less time for helping at home, volunteering in the community, or engaging in political activities — in sum, less time to build the kind of local connections and social capital that could be translated into demands for local policy (Besser, Marcus, and Frumkin 2008). Such dynamics can thus blur the notion of a geographically circumscribed pole in the canonical dyadic relationship that is the foundation of representation and accountability in single-member district systems.

If legislators at the federal level cease to provide localized benefits for their districts, more of the burden would fall to local and state governments. For example, recently elected Virginia state representative Danica Roem beat a 13-term incumbent by focusing on a local issue long neglected by her peers in the federal government: traffic. Often, however, cash-strapped local and state governments may not have the funds to provide for even the most necessary projects. It thus might be the case that, due to a change in the focus of their representatives, constituencies embedded in larger communities of interest are missing out on distributional benefits from their federal representation. Compounded with institutional arrangements that already put densely populated metro areas at a disadvantage (e.g. the malapportionment of the Senate; see Lee 2000), the representational de-localization brought about by the cross-pressures of different communities of interest is certain to exacerbate legislative differences between urban and rural areas in the United States, with minority populations that would likely benefit the most from effective local policies (e.g. infrastructure changes that could alleviate the transit time penalty) shouldering the cost of this shift in legislative attention.

And while we find that the magnitude of some of these effects has grown smaller over

[9] In the Twin Cities metro area, for instance, Latinx and African American commuting times are roughly a month longer that those for Whites (Bernard 2015).

time, it is possible that other communities of interest — such as those defined by broader online networks — are taking over the cross-pressuring role that we have identified for labor market areas in our study. Further research into the effects of these other communities would help us better understand the nature of contemporary and future representation, as interests become less well defined by bounded geographies.

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A Appendix: Regression Tables

A.1 Estimation of Model 1

To obtain estimates of the parameters and latent variables in Model 1, we specify vague (but proper) priors and take 2500 samples from their posterior distributions. Specifically, and for all regression coefficients, we use a g-prior (Zellner 1986) with g equal to the number of member-pairs (i.e. dyads) in each session of Congress, as implemented in the `amen` R package (Minhas, Hoff, and Ward 2019). We discard 5500 samples as burn-in, and verify convergence of the Markov Chain to its intended stationary distribution both visually (using traceplots) and using the Gelman-Rubin statistic for each parameter.

Point estimates and corresponding measures of uncertainty are given in Table A.1, below. Overall, the model fits the data exceptionally well. Standard R^2 measures range between 0.60 and 0.73 across models, with other measures of fit more adequate for the relational nature of the outcome — including posterior predictive checks on the extent of degree heterogeneity and triadic dependence[10] — also suggest the model captures systematic features of the observed networks.

[10]The test statistic for the latter, measured using a quantity closely related to the skewness of the sociomatrix, is given by $\frac{\text{trace}(E)}{\text{trace}(D)\sigma_y^3}$, where E is the matrix cube of the centered sociomatrix, and D is a binary matrix of non-missing indicators for edges in Y.

	107^{th}	108^{th}	109^{th}	110^{th}		111^{th}		112^{th}		113^{th}		114^{th}	
	Partial	**Partial**	**Partial**	**Partial**	**Full**	**Partiald**	**Full**	**Partial**	**Full**	**Partial**	**Full**	**Partial**	**Full**
Intercept	2.91	2.96	3.34	3.34	1.64	3.35	-3.37	3.10	3.42	3.01	2.50	3.20	4.34
	(2.69, 3.15)	(2.73, 3.20)	(3.10, 3.57)	(2.97, 3.72)	(-13.41, 16.87)	(3.00, 3.70)	(-9.93, 3.39)	(2.84, 3.36)	(-0.12, 7.05)	(2.67, 3.34)	(-2.12, 7.18)	(2.84, 3.56)	(-0.22, 8.98)
Work-related flow	2.58	2.83	2.86	2.83	2.23	2.68	2.05	2.32	2.32	1.05	0.85	1.17	1.21
	(2.51, 2.66)	(2.77, 2.90)	(2.79, 2.93)	(2.76, 2.89)	(2.15, 2.29)	(2.61, 2.75)	(1.97, 2.13)	(2.26, 2.39)	(2.26, 2.38)	(1.01, 1.08)	(0.81, 0.89)	(1.13, 1.21)	(1.16, 1.25)
DW Nominate 1	-0.45	-0.39	-0.09	-0.07	-0.10	-0.03	-0.03	-0.01	-0.02	-0.08	-0.11	-0.05	-0.07
	(-0.55, -0.34)	(-0.48, -0.28)	(-0.16, 0.00)	(-0.18, 0.05)	(-0.22, 0.01)	(-0.15, 0.09)	(-0.14, 0.08)	(-0.09, 0.08)	(-0.11, 0.06)	(-0.18, 0.03)	(-0.22, -0.00)	(-0.16, 0.08)	(-0.19, 0.06)
Freshman	0.08	0.05	0.03	0.04	0.04	0.06	0.06	0.04	0.03	0.02	0.01	0.03	0.03
	(-0.04, 0.20)	(-0.06, 0.17)	(-0.09, 0.16)	(-0.10, 0.19)	(-0.11, 0.19)	(-0.08, 0.21)	(-0.08, 0.21)	(-0.05, 0.13)	(-0.06, 0.12)	(-0.11, 0.15)	(-0.11, 0.14)	(-0.11, 0.17)	(-0.11, 0.17)
Male	0.09	0.08	-0.08	-0.09	-0.08	-0.00	0.02	0.05	0.06	0.01	0.03	0.09	0.09
	(-0.03, 0.20)	(-0.04, 0.19)	(-0.18, 0.02)	(-0.23, 0.04)	(-0.21, 0.05)	(-0.15, 0.13)	(-0.10, 0.15)	(-0.05, 0.14)	(-0.03, 0.16)	(-0.13, 0.13)	(-0.10, 0.16)	(-0.05, 0.20)	(-0.03, 0.22)
Committee chair	-0.29	-0.43	-0.18	-0.29	-0.30	-0.23	-0.23	-0.10	-0.09	0.00	0.01	-0.23	-0.18
	(-0.46, -0.12)	(-0.61, -0.26)	(-0.35, -0.03)	(-0.51, -0.09)	(-0.53, -0.07)	(-0.46, -0.03)	(-0.45, -0.01)	(-0.27, 0.07)	(-0.26, 0.07)	(-0.23, 0.21)	(-0.21, 0.23)	(-0.45, -0.02)	(-0.40, 0.04)
Nr. of sponsored bills	0.16	0.16	0.07	0.10	0.10	0.06	0.07	0.09	0.09	0.14	0.14	0.07	0.07
	(0.12, 0.21)	(0.11, 0.21)	(0.03, 0.12)	(0.04, 0.17)	(0.03, 0.17)	(-0.01, 0.13)	(0.00, 0.14)	(0.04, 0.14)	(0.04, 0.13)	(0.07, 0.20)	(0.07, 0.20)	(0.01, 0.14)	(0.01, 0.14)
District policy liberalism	-0.01	-0.04	-0.08	-0.10	-0.12	-0.09	-0.07	0.01	-0.00	-0.03	-0.06	-0.06	-0.07
	(-0.05, 0.04)	(-0.09, 0.00)	(-0.12, -0.04)	(-0.14, -0.05)	(-0.18, -0.07)	(-0.14, -0.04)	(-0.13, -0.02)	(-0.02, 0.06)	(-0.04, 0.04)	(-0.08, 0.03)	(-0.12, 0.00)	(-0.11, -0.00)	(-0.12, -0.01)
Distance	-0.06	-0.06	-0.05	-0.05	-0.15	-0.05	-0.14	-0.04	-0.04	-0.04	-0.13	-0.04	-0.04
	(-0.06, -0.06)	(-0.06, -0.06)	(-0.05, -0.05)	(-0.05, -0.04)	(-0.15, -0.15)	(-0.05, -0.04)	(-0.15, -0.14)	(-0.04, -0.04)	(-0.04, -0.04)	(-0.04, -0.04)	(-0.13, -0.12)	(-0.05, -0.04)	(-0.04, -0.04)
Copartisan	0.11	0.21	0.01	0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	-0.00	-0.00
	(0.10, 0.11)	(0.20, 0.21)	(0.00, 0.01)	(0.00, 0.01)	(0.00, 0.00)	(0.00, 0.00)	(-0.00, 0.00)	(-0.00, -0.00)	(-0.01, -0.00)	(0.00, 0.00)	(-0.00, 0.00)	(-0.00, 0.00)	(-0.00, 0.00)
% graduated HS					0.01		0.26		0.50		0.48		0.48
					(-1.14, 1.23)		(-0.59, 1.22)		(-0.23, 1.30)		(-0.54, 1.60)		(-0.56, 1.64)
% in construction					-0.26		-0.62		0.23		1.43		1.77
					(-3.40, 2.68)		(-4.32, 3.12)		(-2.62, 3.24)		(-2.23, 5.31)		(-1.58, 5.36)
% in transportation					-1.32		1.30		2.46		0.54		-2.34
					(-5.05, 2.29)		(-2.51, 5.09)		(-0.35, 5.32)		(-3.01, 4.28)		(-5.65, 1.14)
Median household income					0.08		0.26		-0.07		-0.03		-0.09
					(-0.59, 0.77)		(-0.01, 0.54)		(-0.24, 0.13)		(-0.25, 0.23)		(-0.32, 0.16)
Node-level variance	0.15	0.15	0.14	0.25	0.27	0.27	0.27	0.14	0.14	0.25	0.26	0.26	0.27
	(0.13, 0.18)	(0.13, 0.18)	(0.12, 0.16)	(0.22, 0.29)	(0.24, 0.31)	(0.24, 0.31)	(0.24, 0.31)	(0.12, 0.16)	(0.12, 0.16)	(0.22, 0.29)	(0.23, 0.30)	(0.23, 0.30)	(0.23, 0.30)
Residual Variance	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)	(0.01, 0.01)
N Nodes	435	435	435	435	435	435	435	435	435	435	435	435	435
WAIC	848964.3	806608.4	853724.7	802846.2	820744.8	816212.2	831188.3	816194.1	815536.1	811777.4	792812.7	845191	869182.6

Table A.1: Bayesian point estimates (viz. posterior means) and 95% credible intervals (quantile based, in parentheses) for parameters in additive and multiplicative effects Gaussian network model of log co-sponsorship.

A.2 Estimation of Model 2

To estimate parameters in Model 2 and the placebo model using the "neither" category as a baseline, we use a single chain per model and obtain 1000 samples from the posterior distribution of all parameters (after letting each Markov Chain warm-up for 1000 iterations). The results of our estimation are presented in Table A.2. A remarkably low Brier score[11] for both models (around 0.03 on both instances) indicates that, once again, our models are well calibrated and do a good job of representing the observed data. Our modeling strategy is further justified by a spatial correlation $\hat{\rho}$ discernibly different from zero (and estimated to be close to 0.56).

[11] Brier scores are simply the mean squared difference between the predicted probability of an outcome and the observed categorical outcome. As a result, they range between zero and one, and lower values indicate higher predictive accuracy and better calibrated predictions.

	Outcome: Local Bills		Outcome: "Neither" Bills	
	Aggregated Flows	Disaggregated Flows	Aggregated Flows	Disaggregated Flows
Intercept	-0.57	-0.56	-0.32	-0.32
	(-0.77, -0.38)	(-0.76, -0.36)	(-0.45, -0.18)	(-0.47, -0.17)
Total Flow	0.00		0.00	
	(-0.01, 0.01)		(-0.01, 0.01)	
Outflow		-0.02		-0.00
		(-0.04, -0.00)		(-0.01, 0.01)
Inflow		0.03		0.01
		(0.01, 0.05)		(-0.01, 0.02)
Constituency Liberalism	-0.10	-0.09	-0.03	-0.03
	(-0.20, 0.00)	(-0.18, 0.00)	(-0.10, 0.03)	(-0.09, 0.03)
Cumulative Time Served	-0.01	-0.01	0.01	0.01
	(-0.04, 0.01)	(-0.04, 0.01)	(-0.00, 0.03)	(-0.00, 0.03)
Freshman	0.07	0.08	-0.01	-0.01
	(0.00, 0.14)	(0.01, 0.14)	(-0.06, 0.03)	(-0.05, 0.03)
Committee Chair	0.28	0.28	-0.07	-0.07
	(0.19, 0.36)	(0.20, 0.37)	(-0.12, -0.01)	(-0.12, -0.01)
Female	0.08	0.07	0.02	0.02
	(0.03, 0.14)	(0.01, 0.12)	(-0.01, 0.06)	(-0.01, 0.05)
In Majority	-0.03	-0.03	-0.02	-0.02
	(-0.07, 0.01)	(-0.08, 0.01)	(-0.04, 0.01)	(-0.05, 0.01)
σ^2_γ	0.32	0.33	0.23	0.23
	(0.19, 0.54)	(0.20, 0.55)	(0.14, 0.37)	(0.14, 0.41)
σ^2_η	1.95	1.95	0.99	0.99
	(1.85, 2.05)	(1.86, 2.05)	(0.93, 1.06)	(0.92, 1.06)
ρ	0.56	0.56	0.50	0.49
	(0.39, 0.69)	(0.41, 0.69)	(0.29, 0.67)	(0.27, 0.67)
N	3315	3315	3315	3315
WAIC	11369.4	11382.2	13752.5	13754.0

Table A.2: Bayesian point estimates (viz. posterior means) and 95% credible intervals (quantile based, in parentheses) for parameters in binomial probit models of number of local bills sponsored (left two columns) and number of non-local and non-national bills sponsored (right two columns), with a random intercept by congress and an spatially auto-regressive random effect for districts.

B Appendix: Bill classification model

In order to measure how much attention legislators devote to broad vs. localized issues, we first need a tool to classify the extent to which different bills can be thought of as national or parochial. To classify bills into these categories, we define a standard topic model (Blei, Ng, and Jordan 2003), where words in a bill summary are believed to have been drawn from a bill-specific mixture of different probability distributions over unique terms, or *topics*. More specifically, we assume that summaries are generated as follows:

- For each bill summary i, draw a vector with the relative rate of attention to different topics $\theta_i \sim \text{Dirichlet}(\alpha)$.
- For each word y_{iw} in a bill summary, draw a topic $z_{iw} \sim \text{Categorical}(\theta_i)$ using the summary's specific topic attention vector.
- For each topic k, draw a distribution over unique terms that defines it as a topic $\beta_k \sim \text{Dirichlet}(\eta_k)$
- Using the word-specific topic z_{iw}, sample each word in the bill summary using the corresponding topic's distribution over unique terms: $y_{iw} \sim \text{Categorical}(\theta_{z_{iw}})$.

The prior parameter vector η_k (with as many elements as there are unique terms) captures the extent to which, *a priori*, a topic is associated with a particular term in the vocabulary. It is these connections that ultimately end up identifying what a "topic" is about. We therefore use these topic-specific priors to nudge our model toward learning topics that are similar to those learned by Grimmer 2013, as doing so allows us in turn to use his classification of topics into categories that he labels as "position-taking", "appropriations" and "neither". For our purposes, these categories are mapped onto issue areas the scope of which is broad (or *national*), *local*, or *neither*, respectively.

Specifically, we begin by restricting our bill summaries to the 2,796 unique terms that define Grimmer model's vocabulary. We then define lexical priors by collecting the terms that Grimmer identifies as being highly characteristic of each topic (i.e. those presented in Table 1 of his manuscript) into a topic-specific set ω_k, and letting the elements of the prior vectors be given by $\eta_{k,v \in \omega_k} = 149.1$ and $\eta_{k,v \notin \omega_k} = 1$ (where 149 is the modal length of a summary).

This strategy still allows for semantic differences to emerge as a result of the fact that bill summaries are different from press releases, while encouraging the model to identify topics similar to those identified by Grimmer. In practice, we found that this choice of prior was enough to learn bill attention vectors (i.e. θ_i's) that appear to be defined over the same set of issue areas discovered by Grimmer using Senate press releases, which in turn allows us to classify bills into national, local, or neither category.

We use R function `topicmodels::LDA()` (with argument `seedwords` used to pass our η_k priors) to estimate each summary's θ_i. We estimate a separate model for each Congress, setting $\alpha = 0.01$, discarding 500 samples as burn-in, and taking 500 samples from the model's posterior afterwards using Gibbs sampling.

C Appendix: Face-validity of topic model based classification of bills

To evaluate the face-validity of our classification, we cross-tabulate bills based on our scope labels and the topics assigned independently by the Policy Agendas Project (PAP) (Baumgartner and Jones 2013). We then evaluate the proportion of bills in each of the 21 major topic areas of the PAP that deal with national or local issues, and present the results in Figure C.4. As expected, categories that typically deal with issues that tend to pertain the whole country (such the macroeconomy and health policy) are found to be composed mostly of bills that have a national scope. In contrast, categories that pertain to more focalized, local matters (such as transportation and the use of public lands) are found to be primarily made up of bills that have a local scope.

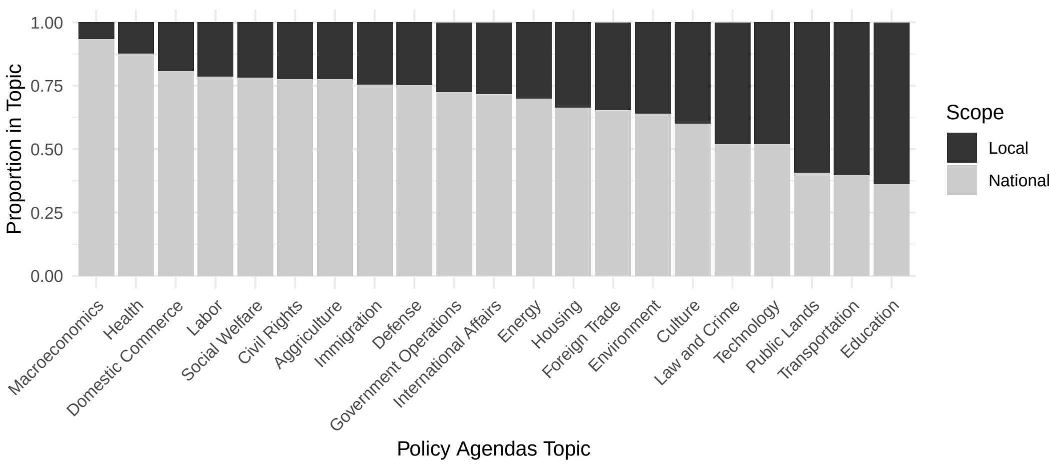

Figure C.4: Distribution of scope categories within policy area designations of the Policy Agendas Project.