Clusters of Influence: How Electoral Margins, Identity and Region Shape Congressional Networks

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ABSTRACT

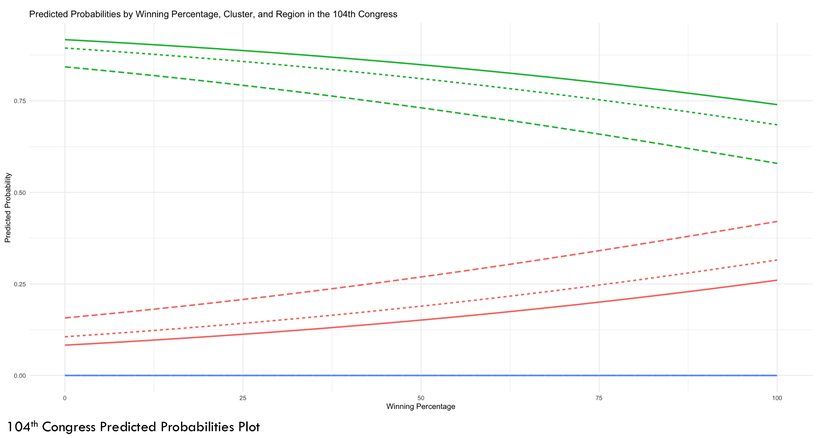
This project investigates the factors that predict the membership clustering of congressional representatives across four different sessions of the United States Congress: the 104th, 108th, 112th, and 116th. Using multinomial logistic regression, I analyze how electoral margin (electpct), leadership status (leader_fact), gender (gender_fact), geographic region (region), and ideological extremism (extremism_measure) shape the probability of a representative belonging to a membership cluster. These clusters are developed by community detection runs that create network-based groupings of congressional financial behavior. These clusters offer insights into how legislators position themselves within the institutional and partisan landscape of Congress by financial donations. Findings highlight the significance of leadership status, gender, and regional affiliation in determining cluster membership. In particular, female representatives, those from the Northeast, South, or the West, and those who hold leadership positions display distinct probability trends across clusters in each congressional network. The predicted probabilities are visualized over a range of electoral margins to explore how winning an election by a larger percentage interacts with the previously mentioned characteristics. Across the four congressional sessions I analyzed, there are clear regional patterns in how electoral margins shape the probability of membership cluster affiliation. While the direction and intensity of the relationship between electpct and predicted probability vary by Congress session and cluster, regional consistency is present.

INTRODUCTION

Traditional analysis of congressional behavior often relies on ideology or party affiliation, but these dimensions can overlook the informal networks and strategic alliances that shape legislative influence. This project investigates how electoral margins, leadership status, gender, and geographic region influence representatives' alignment within network-based clusters of financial behavior. These clusters, derived from community detection algorithms, offer a view into how members of Congress position themselves in relation to others through campaign contributions. By comparing these patterns across different sessions of Congress, this research captures both the consistency and variability of these influences over time. The goal of this research is to deepen understanding of the structural and identity-based forces that shape political networks beyond the normal party lines.

Hypothesis

I believe that congressional representatives with larger electoral margins, specific genders, leadership positions, and who represent a state from a specific geographic region—specifically the Northeast and South, due to those being what I consider the token party regions—are more likely to fall into congressional membership clusters.



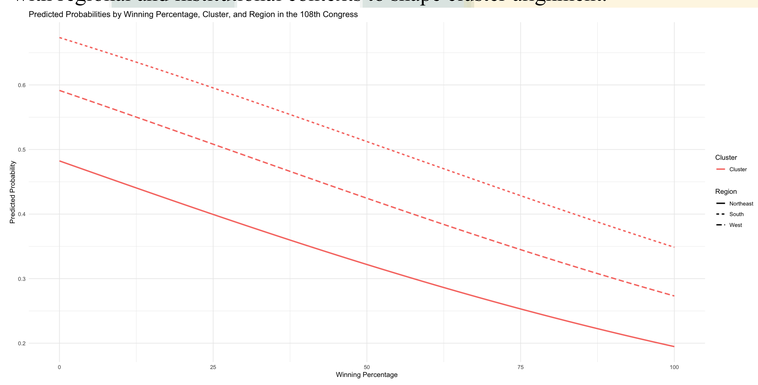
104th Congress Predicted Probabilities Plot

Literature Review

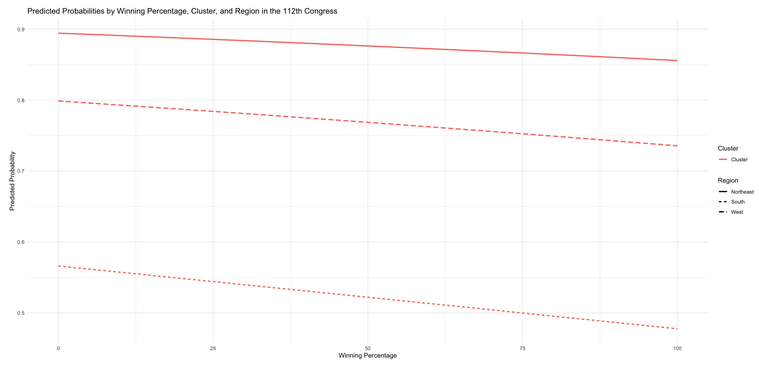
While national-level trends in Congress receive considerable attention, scholars have increasingly emphasized the importance of subnational variation in understanding political behavior. As a source notes, "While national trends often dominate the headlines, regional political patterns reveal a deeper, more nuanced picture of the nation's ideological divides" (Social Studies Help). This insight supports the analytical focus of this project on the geographic region's impact on politics. While it doesn't discuss the impact of electoral margins and the other characteristics I examine, it does emphasize the importance and impact that region can have.

Methodology

This study uses a multinomial logistic regression model to examine how electoral margin, leadership status, gender, geographic region, and ideological extremism influence congressional representatives' alignment within congressional network clusters. The analysis spans four sessions of Congress: the 104th, 108th, 112th, and 116th. Membership clusters were created using community detection algorithms from *igraph* that are applied to congressional networks. Membership clusters with only one member were excluded to ensure model validity. The key variables—leadership status, gender, and region—were coded as categorical factors. The variables electoral margin and extremism scores were treated as continuous predictors. For each session, a multinomial model was estimated using the *nnet* package in R, with membership clusters as the dependent variable. Predicted probabilities were then calculated across a full range of electoral margins (0–100%) for selected profiles—specifically, female leaders from the Northeast with average extremism. This was replicated for the South and West regions. The predicted probabilities were then visualized using the R package *ggplot2*. This allowed for a comparative view of how electoral margins interact with regional and institutional contexts to shape cluster alignment.



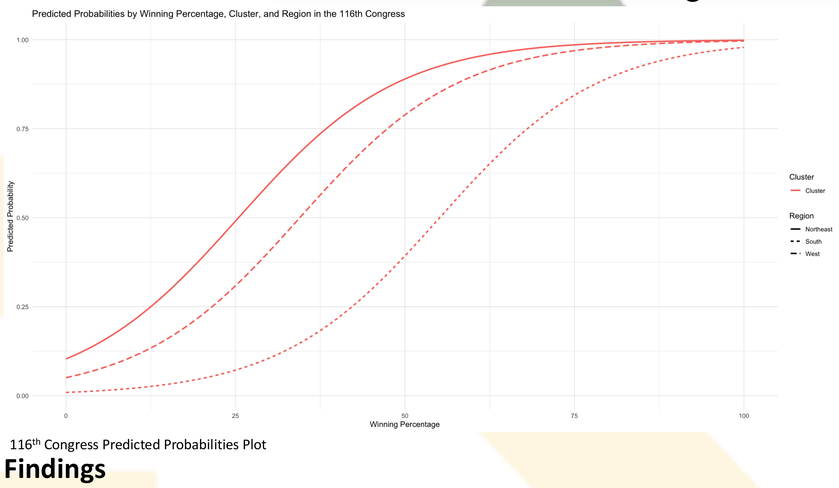
108th Congress Predicted Probabilities Plot



112th Congress Predicted Probabilities Plot

RESEARCH QUESTION

To what extent do electoral margins, leadership status, gender, and geographic region shape congressional representatives' alignment within network-based financial clusters across different sessions of the U.S. Congress?



116th Congress Predicted Probabilities Plot

Findings

The predicted probability plots across the 104th, 108th, 112th, and 116th Congresses reveal evolving regional and electoral dynamics in congressional membership clusters. In the 104th Congress, cluster patterns show subtle trends: one cluster's probabilities decrease slightly with rising electoral margin, while another cluster's probabilities increase with rising electoral margins. One cluster shows the Northeast region with the highest probability and the West region with the lowest. The other cluster depicts the exact opposite. When looking at the 108th Congress, the patterns have shifted, with a cluster showing a sharp decline in probability as electoral margin percent increases. In the 108th, the South region leads in predicted probabilities, while the Northeast region has the lowest probabilities. In the 112th, the mildest change in probabilities is seen across all regions, this change being a decline. The Northeast region once again dominates the predicted probability, while the South region remains low in probability. The most interesting case is the 116th Congress. Probabilities start low across all regions, gradually rising until they reach the 10% to 25% electoral margin range, depending on the region. At this point, we see a strong rise in probabilities from all regions, leading to all of them ending at almost 1.00 probability at 100% electoral margins—the only Congress to do so. The Northeast region again consistently has the highest probability, and the South region consistently has the lowest probability. These results both support and challenge my hypothesis. The results support my hypothesis in that the Northeast region is consistently one of the regions with the highest probabilities through all four sessions. However, the results do not support my hypothesis in that the South region is more often the lowest probability than the highest. The results support regional party strength in the Northeast region over time but raise questions about that in the South region.

Conclusion

This analysis highlights the complex and evolving relationship between electoral margins, regional affiliation, and congressional membership cluster alignment over time. While the Northeast region consistently shows high probabilities of cluster membership — supporting the hypothesis that it represents a strong, token party region — the South region does not follow that same pattern, often displaying the lowest probabilities. These regional dynamics suggest that party strength and alignment within congressional network clusters are not distributed uniformly across traditionally stronghold regions. Additionally, the sharp rise in predicted probabilities tied to higher electoral margins in the 116th Congress demonstrates a growing importance of high electoral margins in shaping legislative behavior. Overall, the findings partially support the hypothesis and display a nuanced role that electoral, leadership, gender, and regional factors play in structuring congressional networks. Future work would involve delving more into why the South is consistently low, as well as looking at the patterns of the other two regions, the West and Midwest, on a more specific level.

REFERENCES

"Exploring the Intriguing Regional Political Differences Shaping the U.S. Landscape." *SOCIALSTUDIESHELPCOM*, socialstudieshelp.com/ap-government-and-politics/regional-political-differences-in-the-u-s/?utm_source=chatgpt.com. Accessed 18 Apr. 2025

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