Modeling Legislative Conformity
How Context, Demographics, and Tenure Shape Congressional Voting

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Abstract

What drives members of Congress to vote along party lines? We analyze over three decades of congressional voting behavior to identify the individual, institutional, and electoral factors that predict party conformity. Using entropy-based metrics, we quantify how consistently legislators vote with their party, then link this behavior to demographic traits, tenure, vote margins, and chamber control. We find that older, more liberal, and female legislators and those serving in strongly partisan chambers are more likely to conform. Conformity has increased steadily over time across both parties and chambers. These findings suggest that party-line voting is shaped not just by ideology, but by career stage, electoral security, and institutional context.

Data Collection

Our main source of data is from GovTrack.us. We parsed through their json files for each house/senate bill since 1989 and aggregated them into our own feather data frame, with each row representing a single vote by an individual member of congress (~10.5 million rows).

Then, we combined this data set with data from the following sources:
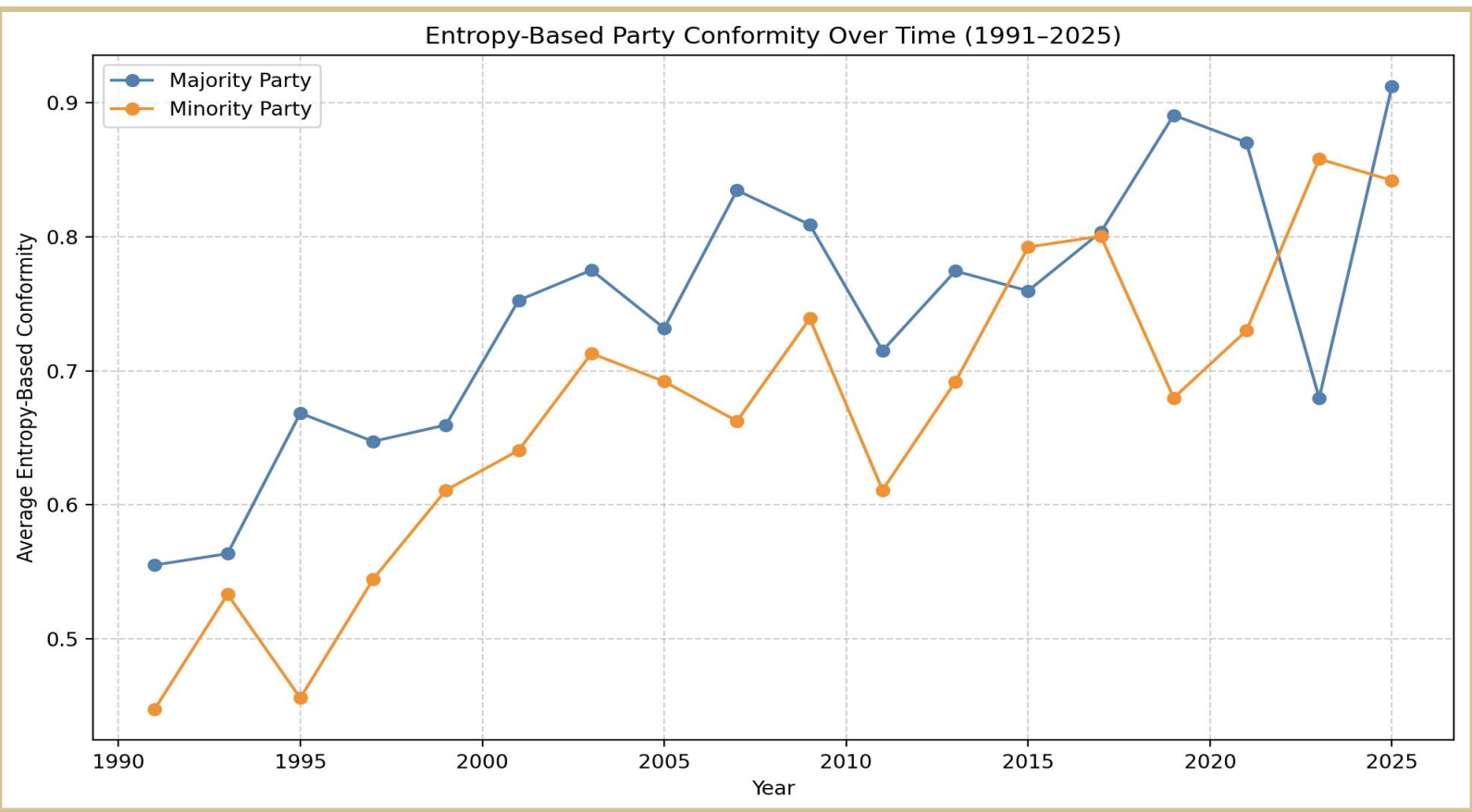- Demographic data for current and historical legislators (YAML format)
- Election data for every congressional general election from the MIT Election Lab
- Congressional approval data from Gallup polling

Research Question

How do demographic characteristics and political context influence party conformity among members of the U.S. Congress?

What drives a member of Congress to break ranks with their party? Is it ideology, constituency pressure, or personal conviction? Do long-serving legislators become more independent—or more loyal—as time goes on? Does the experience of being in the minority sharpen partisanship or soften it? How might gender shape the calculus of dissent? How has conformity changed over time? These questions point to the complex web of incentives and identities that shape legislative behavior. Beneath every vote lies a decision not just about policy, but about risk, reputation, and allegiance.
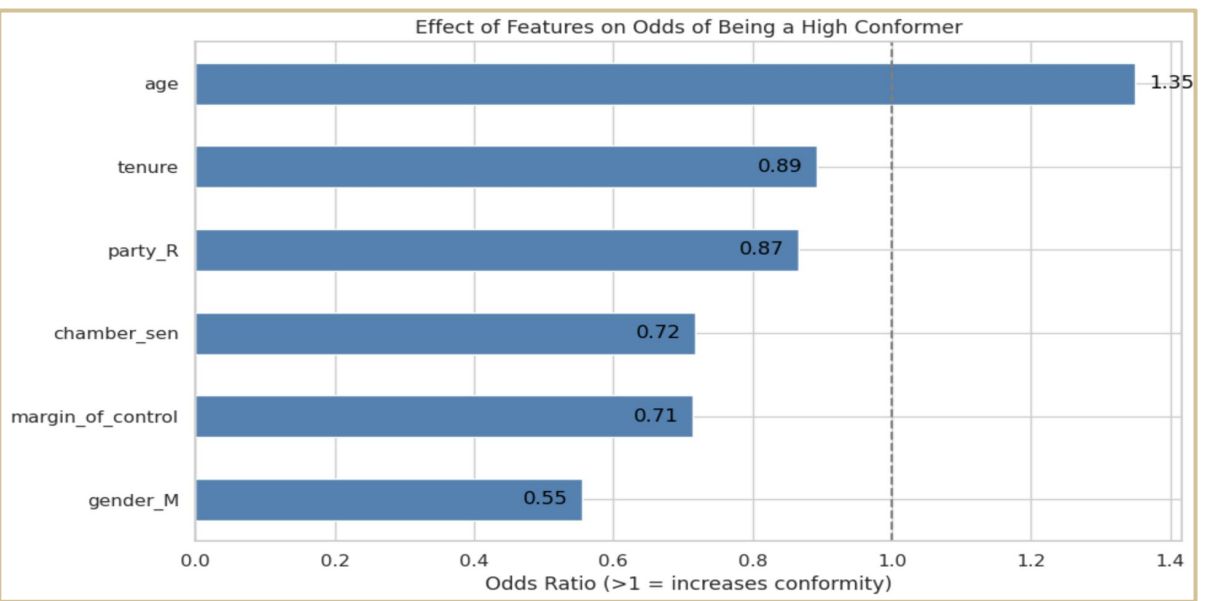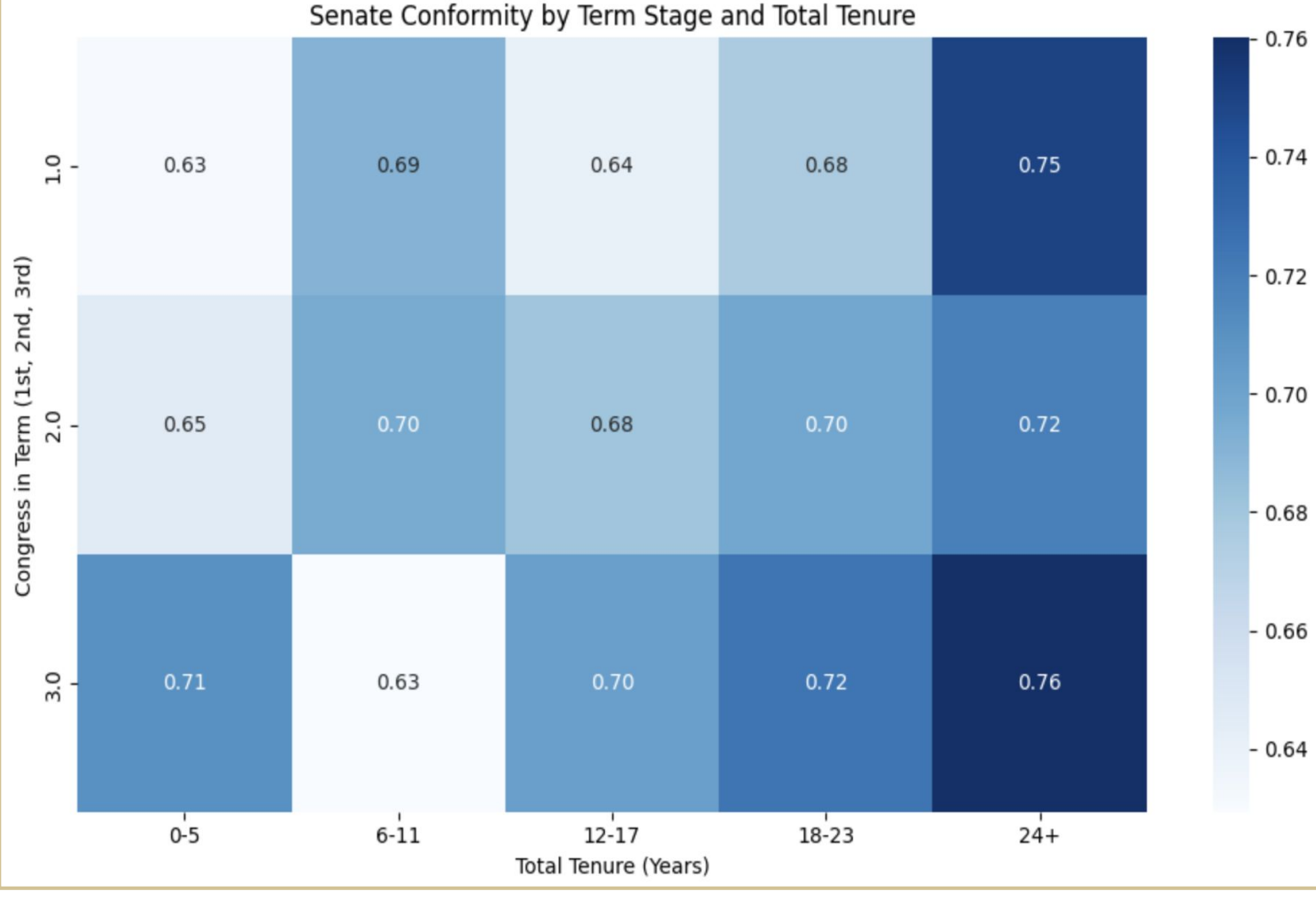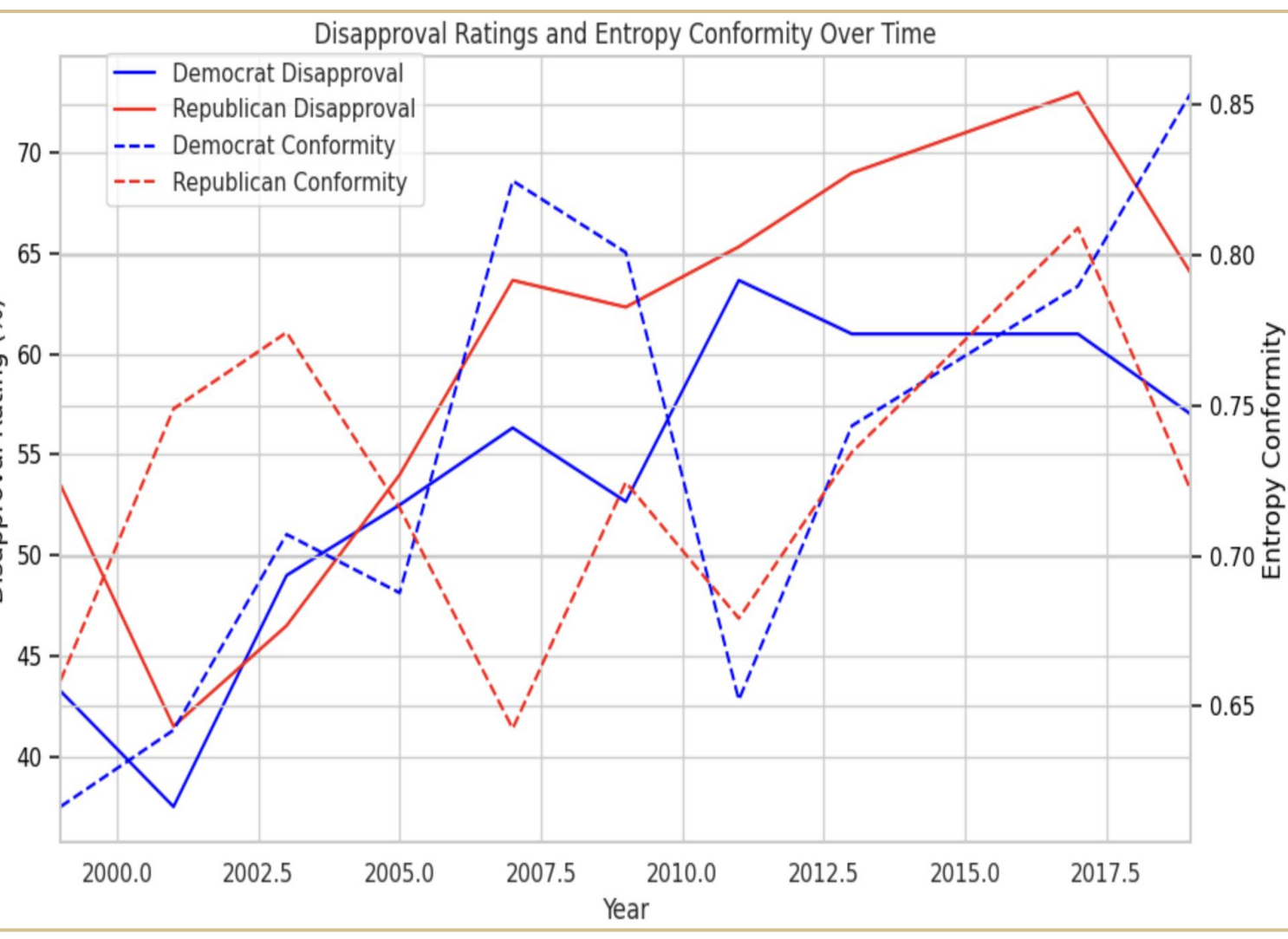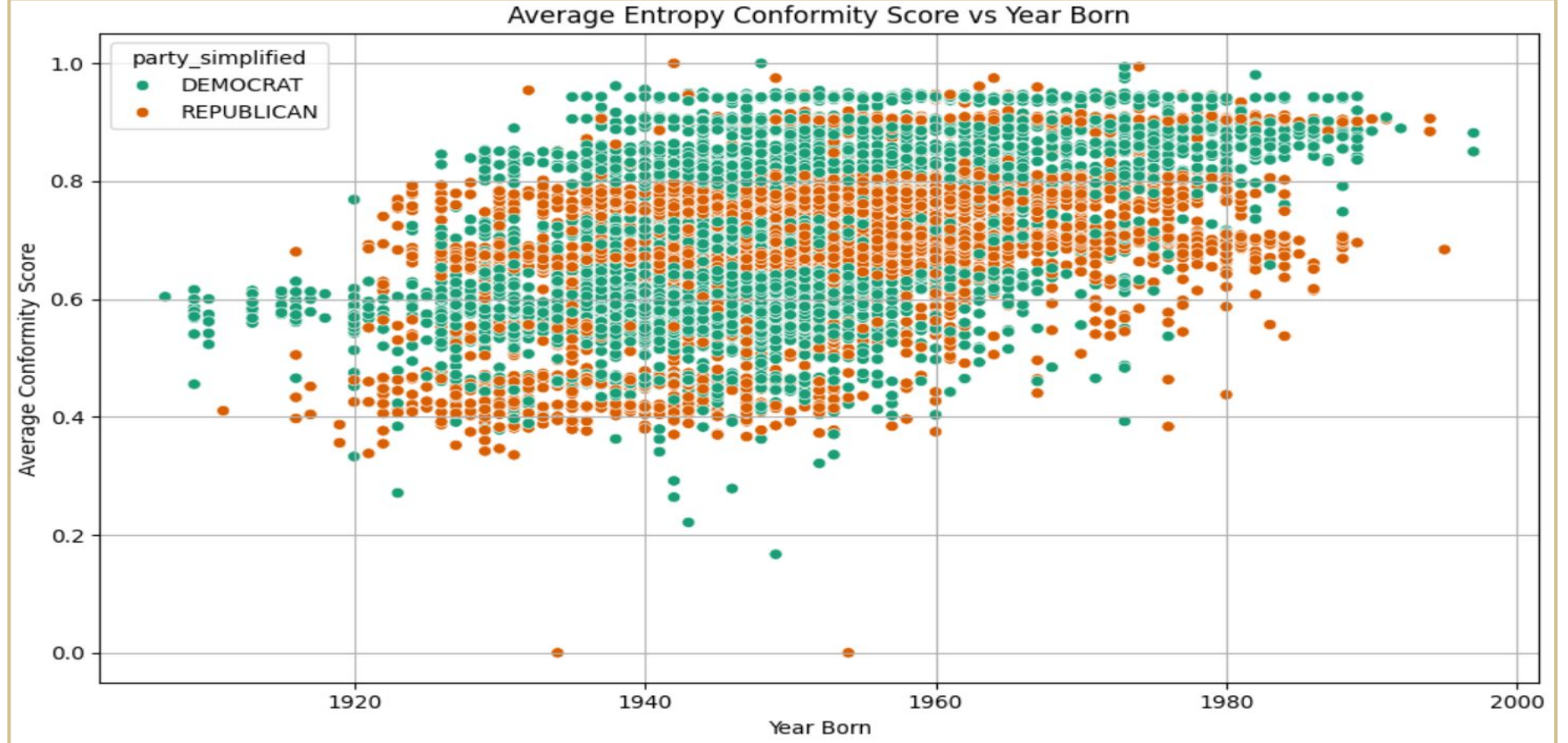

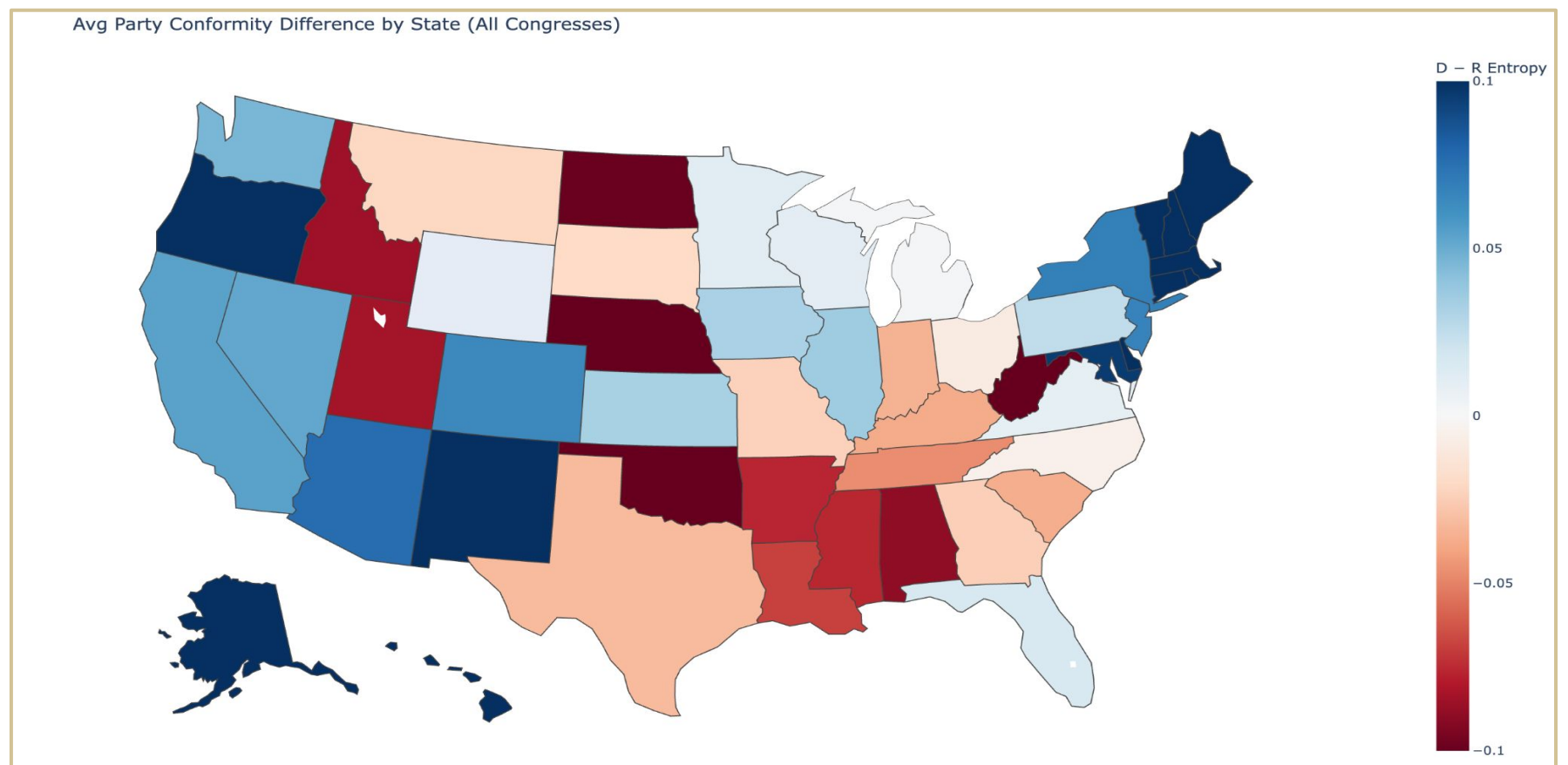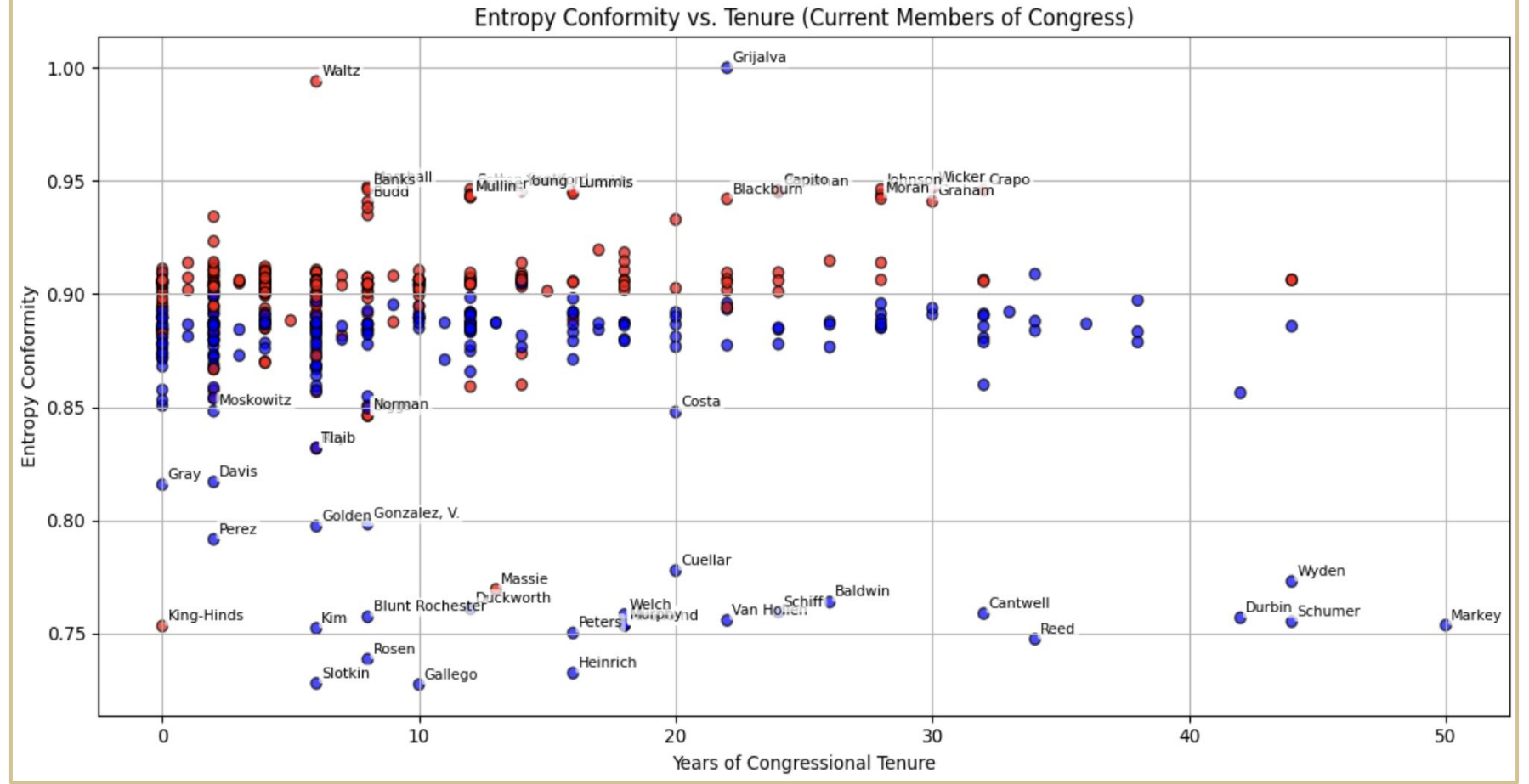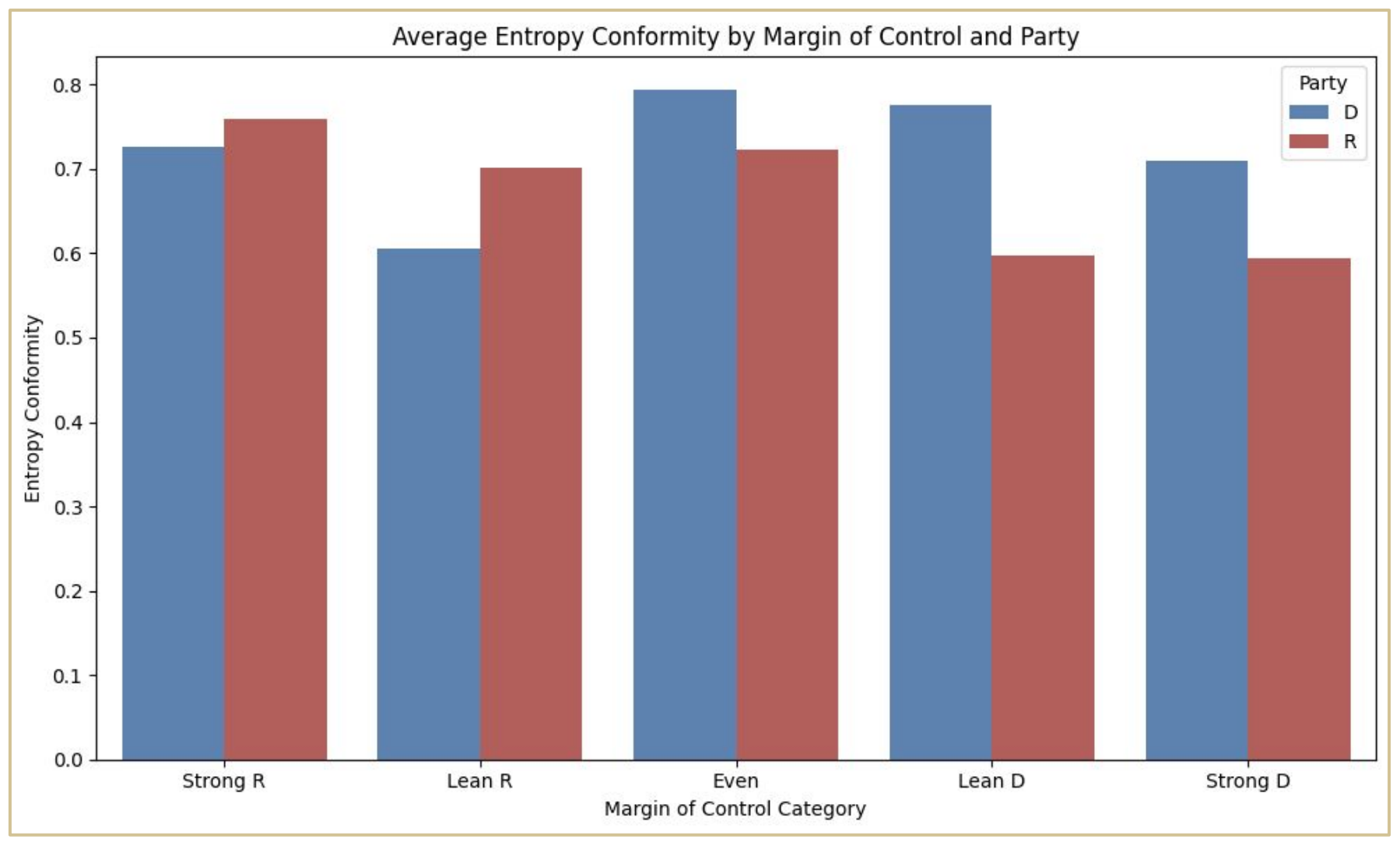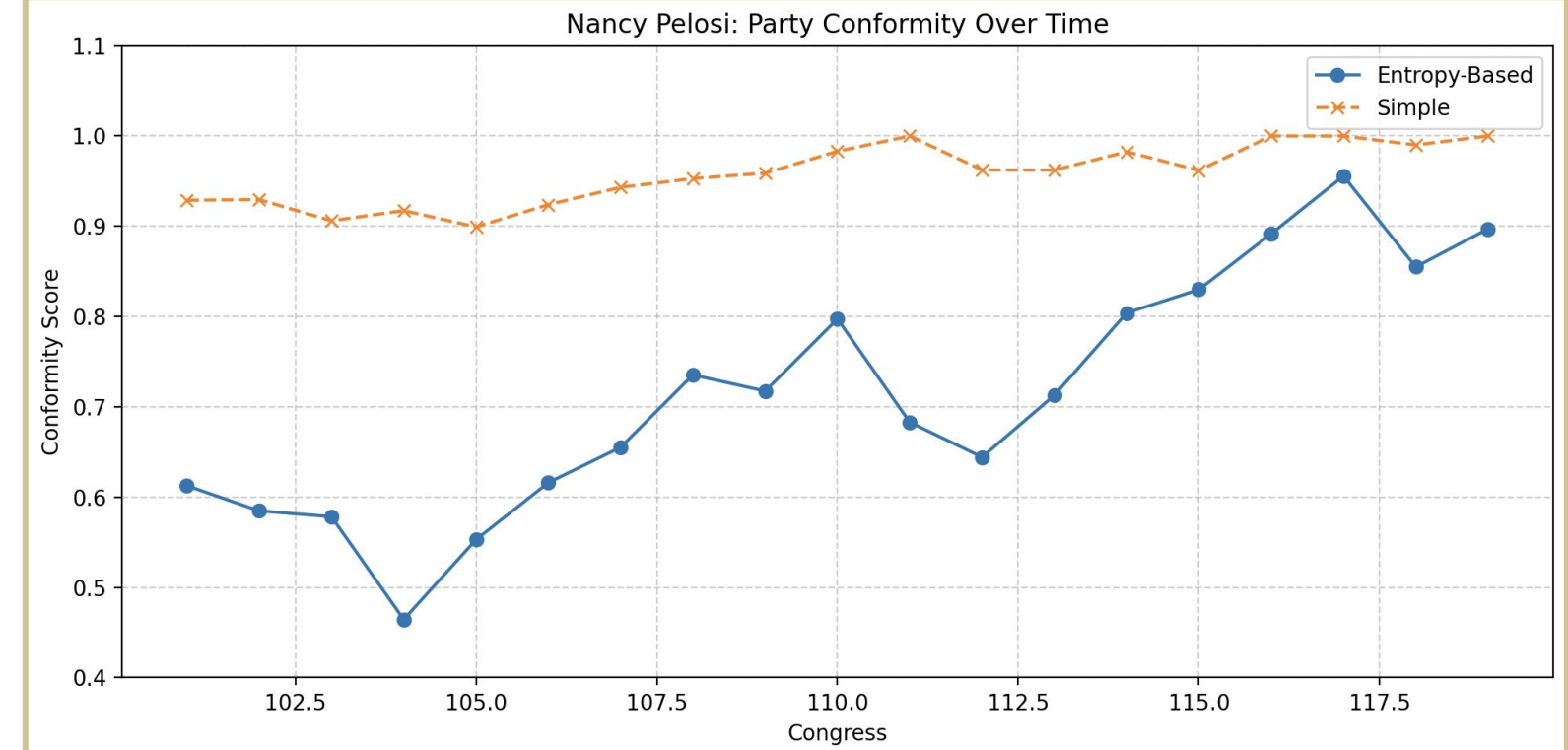Entropy-Based Party Conformity Over Time (1991–2025)

In the context of Congress, conformity refers to how closely a legislator's votes align with the majority of their party. It reflects the extent to which members "toe the party line" rather than vote independently.
We measure conformity in two ways:

1. Simple Conformity
The percentage of votes in which a member voted with the majority of their party.

2. Entropy-Based Conformity
A more nuanced measure that captures how predictably a member votes with their party. We use Shannon entropy to assess how consistent their voting alignment is across bills.

Low entropy = unpredictable / independent
High entropy = highly consistent with party
Entropy-based conformity allows us to compare members not just by how often they conform, but by how uniformly they do so, offering a richer view of party loyalty and behavior.

Nancy Pelosi: Party Conformity Over Time

Average Entropy Conformity by Margin of Control and Party

Entropy Conformity vs. Tenure (Current Members of Congress)

Avg Party Conformity Difference by State (All Congresses)

Average Entropy Conformity Score vs Year Born

Disapproval Ratings and Entropy Conformity Over Time

Senate Conformity by Term Stage and Total Tenure

Effect of Features on Odds of Being a High Conformer

Machine Learning

We trained a **logistic regression model** to predict whether a legislator would be a high conformer (top 20% of entropy-based scores). Our features included demographic and institutional characteristics. Our precision and recall for identifying conformers was 93%

Further Research

What we found prompted us to ask more questions.
District-Level Analysis: How do constituency ideology, urban/rural splits, or media markets influence conformity?
Behavioral Clustering: Are there archetypes of legislators beyond just party?
Causal Inference: Does a shift in party control cause changes in individual voting behavior, or just reflect strategic adaptation?

Does Party Matter?

Analysis by party suggested that both parties are guilty of conforming and it is usually the majority party in Congress that has a slightly higher conformation score.

Conclusion

Conformity is not just personal — **it's contextual** -Members are more likely to conform when their party holds a narrow majority, especially in the Senate.
Age and tenure increase conformity - Older, more experienced legislators tend to vote more consistently with their party.
Gender differences emerge - Female legislators show higher entropy-based conformity than their male counterparts.
Electoral pressure matters - Congresses with smaller margins are more likely to have conforming voters.
Conformity is predictable.
Our machine learning model shows that conformity can be meaningfully predicted from age, tenure, party, gender, and margin of control.

Takeaway:
In today's polarized climate, conformity is a dynamic behavior—shaped by identity, power, and survival in an increasingly partisan Congress.

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