How Congress Became a Partisan Battlefield: Measuring Political Polarization, 1947–2024

Example Paper — Gov 51: Data Analysis and Politics

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1 Introduction

In March 1971, Senator Clifford Case of New Jersey — a Republican — co-sponsored the Case-Church Amendment alongside Democrats to end U.S. funding of military operations in Southeast Asia. The vote cut across party lines; a dozen Senate Republicans joined with most Democrats to pass it. Nobody found this remarkable. At the time, the Senate contained liberal Republicans and conservative Democrats, and major legislation routinely required building coalitions across the aisle.

That world is gone. Today, the probability that a Republican votes with most Democrats on any major bill has fallen close to zero. The parties have sorted into near-perfect ideological blocs. What happened? And how do we *measure* something as abstract as ideological polarization?

This paper uses roll-call voting data from the U.S. House of Representatives to track the ideological positions of every Member of Congress from 1947 to 2024. The data come from Voteview, which uses a statistical technique called DW-NOMINATE to estimate each legislator's position on a liberal-conservative scale from their actual votes. The method turns voting behavior into a number — a measurement challenge that sits at the heart of quantitative social science.

Three findings emerge. First, both parties have moved sharply away from the ideological center since the 1970s. Second, the overlap between the two parties' ideological distributions has collapsed from substantial in the 1960s to nearly zero today. Third, the movement has been asymmetric: Republican members have moved further from center than Democrats, though both parties have moved.

2 Data and Measurement

2.1 The Voteview DW-NOMINATE Scores

Ideology is not directly observable. You cannot hand a senator a ruler and ask her where she falls on a liberal-conservative scale. Political scientists have therefore developed indirect measurement strategies — ways of inferring ideological positions from observable behavior.

The most widely used measure is **DW-NOMINATE** (Dynamic Weighted Nominal Three-Step Estimation), developed by Keith Poole and Howard Rosenthal and maintained by the Voteview project. The logic is elegant: legislators with similar ideologies should vote together. By analyzing patterns in who votes "yea" and "nay" on thousands of roll calls, the model estimates each

legislator's position in a low-dimensional policy space.

The first dimension of DW-NOMINATE runs from approximately -1 (most liberal) to $+1$ (most conservative) and captures the main liberal-conservative divide. The second dimension historically captured the cross-cutting issue of civil rights (splitting southern Democrats from northern Democrats), but has become less important over time as that cross-cutting dimension collapsed.

DW-NOMINATE scores are comparable *across Congresses* within an era, which is what makes them useful for studying change over time. A score of $+0.3$ in 1960 means roughly the same thing as $+0.3$ in 2020.

2.2 Loading and Cleaning the Data

```
voteview_raw <- read_csv(
  "https://voteview.com/static/data/out/members/HSall_members.csv",
  show_col_types = FALSE
)

voteview <- voteview_raw |>
  filter(
    congress     >= 80,              # 80th Congress = 1947 onward
    chamber      == "House",         # focus on the House
    party_code   %in% c(100, 200),   # Democrats (100) and Republicans (200) only
    !is.na(nominate_dim1)            # drop members with no score
  ) |>
  mutate(
    party = if_else(party_code == 100, "Democrat", "Republican"),
    year  = 1789 + 2 * (congress - 1) # approximate start year of each Congress
  )

glimpse(voteview)
```

```
Rows: 17,743
Columns: 24
$ congress                    <dbl> 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, ~
$ chamber                     <chr> "House", "House", "House", "House", "Hou~
$ icpsr                       <dbl> 195, 520, 937, 3754, 4471, 4892, 5058, 5~
$ state_icpsr                 <dbl> 41, 41, 41, 41, 41, 41, 41, 41, 41, 61, ~
$ district_code               <dbl> 3, 9, 1, 2, 4, 6, 8, 7, 5, 98, 98, 4, 1,~
$ state_abbrev                <chr> "AL", "AL", "AL", "AL", "AL", "AL", "AL"~
$ party_code                  <dbl> 100, 100, 100, 100, 100, 100, 100, 100, ~
$ occupancy                   <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0~
$ last_means                  <dbl> 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1~
$ bioname                     <chr> "ANDREWS, George William", "BATTLE, Laur~
$ bioguide_id                 <chr> "A000206", "B000242", "B000725", "G00038~
$ born                        <dbl> 1906, 1912, 1885, 1897, 1887, 1892, 1912~
$ died                        <dbl> 1971, 2000, 1969, 1982, 1952, 1955, 1997~
$ nominate_dim1               <dbl> -0.030, -0.187, -0.105, -0.117, -0.176, ~
```

```
$ nominate_dim2                 <dbl> 1.000, 0.837, 0.849, 0.993, 0.984, 0.971~
$ nominate_log_likelihood       <dbl> -32.44283, -30.64096, -34.05004, -26.025~
$ nominate_geo_mean_probability <dbl> 0.782, 0.786, 0.719, 0.815, 0.683, 0.766~
$ nominate_number_of_votes      <dbl> 132, 127, 103, 127, 137, 117, 141, 119, ~
$ nominate_number_of_errors     <dbl> 14, 15, 18, 10, 22, 13, 13, 13, 14, 17, ~
$ conditional                   <lgl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
$ nokken_poole_dim1             <dbl> -0.187, -0.240, -0.025, -0.192, -0.345, ~
$ nokken_poole_dim2             <dbl> 0.982, 0.753, 0.561, 0.981, 0.939, 0.958~
$ party                         <chr> "Democrat", "Democrat", "Democrat", "Dem~
$ year                          <dbl> 1947, 1947, 1947, 1947, 1947, 1947, 1947~
```

The resulting dataset contains 17,743 House members scored across 40 Congresses. The table below summarizes the first-dimension scores by party over the full 1947–2024 period.

```
voteview |>
  group_by(party) |>
  summarise(
    Members      = n(),
    `Mean Score` = round(mean(nominate_dim1), 3),
    `SD`         = round(sd(nominate_dim1),   3),
    `Min`        = round(min(nominate_dim1),   3),
    `Max`        = round(max(nominate_dim1),   3),
    .groups = "drop"
  ) |>
  kable(caption = "DW-NOMINATE First Dimension by Party, U.S. House (1947-2024)")
```

Table 1: DW-NOMINATE First Dimension by Party, U.S. House (1947–2024)

party	Members	Mean Score	SD	Min	Max
Democrat	9698	-0.326	0.167	-0.998	0.884
Republican	8045	0.364	0.177	-0.174	0.975

Democrats average roughly −0.35 (liberal side) and Republicans roughly +0.40 (conservative side) over the full period. But these overall averages obscure the dramatic change over time — which is the focus of this paper.

3 Trends Over Time

The first question is simple: has the average ideological position of each party's members changed since 1947?

```
trend <- voteview |>
  group_by(party, year) |>
  summarise(mean_score = mean(nominate_dim1), .groups = "drop")

ggplot(trend, aes(x = year, y = mean_score, color = party)) +
```

```r
  geom_line(linewidth = 1.0) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "gray50", linewidth = 0.5) +
  scale_color_manual(values = c("Democrat" = "#2166AC", "Republican" = "#D6604D")) +
  scale_x_continuous(breaks = seq(1950, 2024, by = 10)) +
  labs(
    title    = "Both Parties Have Moved Away from the Center",
    subtitle = "Mean DW-NOMINATE score, U.S. House of Representatives",
    x        = NULL,
    y        = "Mean DW-NOMINATE Score\n(liberal <-- · --> conservative)",
    color    = NULL,
    caption  = "Source: Voteview (Lewis et al., 2024)"
  ) +
  theme_minimal(base_size = 11) +
  theme(legend.position = "bottom")
```

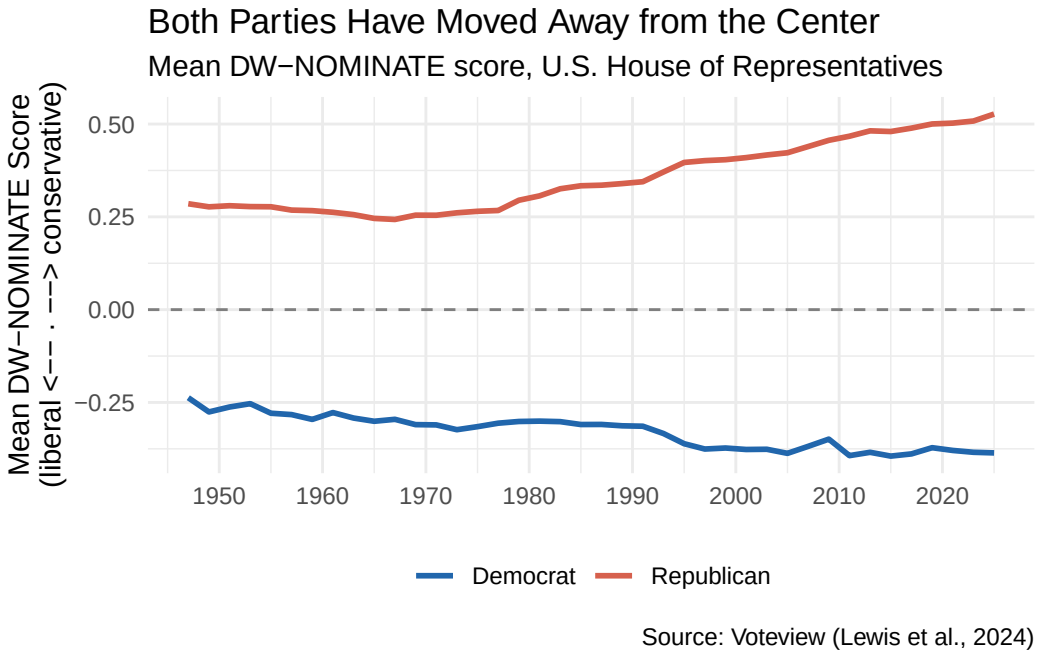

Figure 1: Mean DW-NOMINATE first dimension by party, U.S. House of Representatives, 1947–2024. Scores range from –1 (most liberal) to +1 (most conservative). The horizontal dashed line marks zero (ideological center). The convergence period of the 1960s–70s, followed by sharp divergence after 1980, is clearly visible.

Figure 1 tells a striking story. In the 1950s and 1960s, both parties clustered near zero — the ideological center. Democrats averaged around −0.20 and Republicans around +0.20, and both distributions overlapped considerably. From the late 1970s onward, the parties began a steady divergence that has not stopped. By the 2020s, House Democrats average around −0.40 and House Republicans around +0.60.

Several historical moments stand out. The 1994 "Gingrich Revolution" — when Republicans took control of the House for the first time in 40 years under a platform of sharp ideological contrast

— appears as an inflection point in the Republican series, which accelerates rightward after 1994. The Tea Party wave of 2010 pushed the Republican mean further right. On the Democratic side, the movement leftward is more gradual but continuous.

4 The Disappearing Middle

Tracking mean positions understates the change in a crucial way: averages can move while the *distribution* remains wide and overlapping. A party could shift its center while still containing many moderates. To see whether this happened, we plot the full distribution of scores for both parties in three eras: the 1960s, the 1990s, and the 2020s.

```
era_data <- voteview |>
  mutate(era = case_when(
    year %in% 1960:1969 ~ "1960s",
    year %in% 1990:1999 ~ "1990s",
    year %in% 2020:2024 ~ "2020s",
    TRUE ~ NA_character_
  )) |>
  filter(!is.na(era)) |>
  mutate(era = factor(era, levels = c("1960s", "1990s", "2020s")))

ggplot(era_data, aes(x = nominate_dim1, fill = party, color = party)) +
  geom_density(alpha = 0.35, linewidth = 0.6) +
  geom_vline(xintercept = 0, linetype = "dashed", color = "gray40", linewidth = 0.4) +
  facet_wrap(~era, ncol = 3) +
  scale_fill_manual(values  = c("Democrat" = "#2166AC", "Republican" = "#D6604D")) +
  scale_color_manual(values = c("Democrat" = "#2166AC", "Republican" = "#D6604D")) +
  labs(
    title    = "The Ideological Middle Has Collapsed",
    subtitle = "Distribution of DW-NOMINATE scores by party, selected decades",
    x        = "DW-NOMINATE Score  (liberal <-- · --> conservative)",
    y        = "Density",
    fill     = NULL,
    color    = NULL,
    caption  = "Source: Voteview (Lewis et al., 2024)"
  ) +
  theme_minimal(base_size = 11) +
  theme(legend.position = "bottom")
```

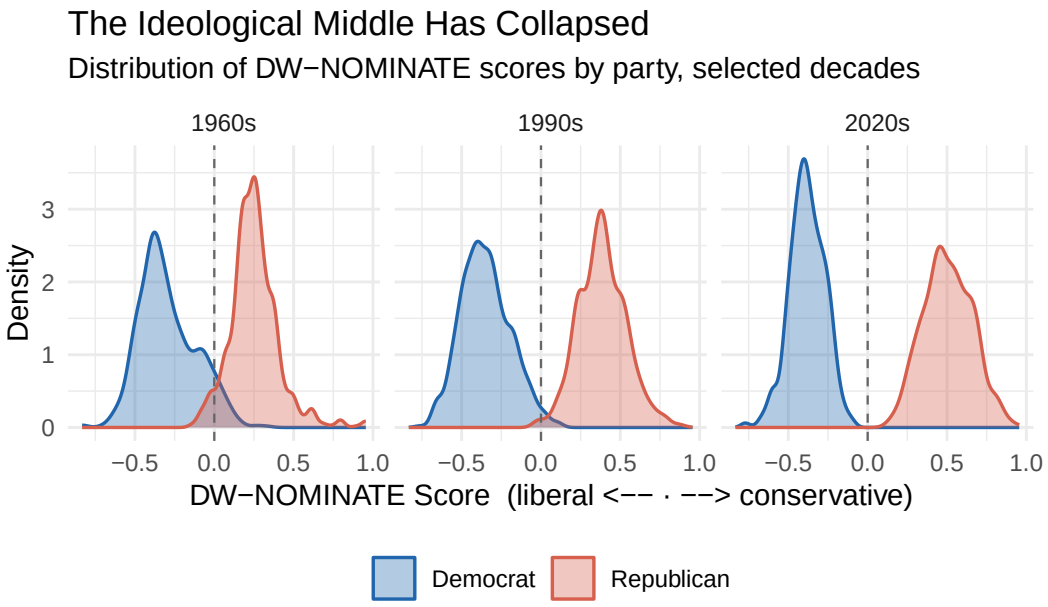

Figure 2: Kernel density estimates of DW-NOMINATE first dimension scores by party, in three decades. In the 1960s, the two distributions overlap substantially — there were many conservative Democrats and moderate Republicans. By the 2020s, the distributions are nearly non-overlapping, and the space between them is empty.

The visual evidence is striking. In the 1960s, the two distributions overlap extensively. Conservative Southern Democrats — a powerful bloc in Congress for decades — pulled the Democratic distribution rightward, while moderate "Rockefeller Republicans" from the Northeast pulled the Republican distribution leftward. A Member of Congress with a score of 0.0 (dead center) could plausibly belong to either party.

By the 1990s, the overlap has narrowed. The moderate wings of both parties have shrunk. By the 2020s, almost no overlap remains. The space between the two distributions — once populated by moderates, dealmakers, and cross-party coalition builders — is essentially empty. A voter seeking a moderate legislator from either major party has almost nowhere to turn.

To quantify this more precisely, we can compute the fraction of each decade's members who fall within the "overlap zone" (defined as the range between the 10th percentile of Republicans and the 90th percentile of Democrats in each era):

```
overlap_stats <- era_data |>
  group_by(era) |>
  summarise(
    dem_90  = quantile(nominate_dim1[party == "Democrat"],  0.90),
    rep_10  = quantile(nominate_dim1[party == "Republican"], 0.10),
    overlap = round(dem_90 - rep_10, 3),
    .groups = "drop"
  ) |>
  rename(Era = era,
```

```
          `Dem 90th pct` = dem_90,
          `Rep 10th pct` = rep_10,
          `Overlap (Dem 90th - Rep 10th)` = overlap)

kable(overlap_stats,
      digits = 3,
      caption = "Overlap Between Party Score Distributions by Decade. Positive values indica
```

Table 2: Overlap Between Party Score Distributions by Decade. Positive values indicate the distributions cross; negative values indicate a gap between them.

Era	Dem 90th pct	Rep 10th pct	Overlap (Dem 90th − Rep 10th)
1960s	-0.037	0.071	-0.108
1990s	-0.144	0.204	-0.348
2020s	-0.238	0.307	-0.545

A positive overlap value means there is a range of scores where members of both parties exist; a negative value means there is a *gap* between the parties with no members at all. The progression from positive to increasingly negative captures the collapse of the middle precisely.

5 Was the Polarization Symmetric?

The trends figure showed both parties moving, but one important question remains: did both parties move equally, or did one drive more of the polarization? This matters for political diagnosis. If only one party has moved, that suggests something different than if both moved symmetrically.

To answer this, we measure each party's distance from zero (the ideological center) over time:

```
symmetry <- voteview |>
  group_by(party, year) |>
  summarise(mean_score = mean(nominate_dim1), .groups = "drop") |>
  mutate(distance_from_center = abs(mean_score))

ggplot(symmetry, aes(x = year, y = distance_from_center, color = party)) +
  geom_line(linewidth = 1.0) +
  scale_color_manual(values = c("Democrat" = "#2166AC", "Republican" = "#D6604D")) +
  scale_x_continuous(breaks = seq(1950, 2024, by = 10)) +
  labs(
    title    = "Republicans Have Moved Further from Center Than Democrats",
    subtitle = "Absolute distance of party mean from ideological center (zero)",
    x        = NULL,
    y        = "|Mean DW-NOMINATE Score|",
    color    = NULL,
    caption  = "Source: Voteview (Lewis et al., 2024)"
  ) +
  theme_minimal(base_size = 11) +
```

```
  theme(legend.position = "bottom")
```

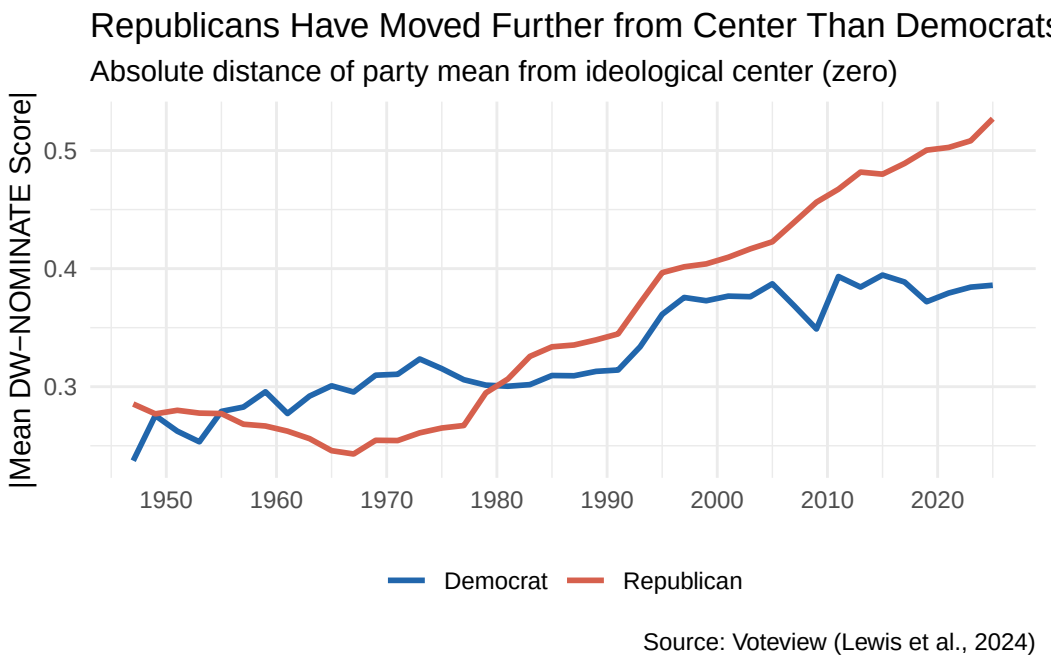

Figure 3: Absolute distance of each party's mean DW-NOMINATE score from zero, U.S. House, 1947–2024. The Republican trajectory is steeper, particularly after 1994 and again after 2010. Democrats have also moved leftward, but more gradually.

```
# Print the endpoint values for reference in prose
symmetry |>
  filter(year == max(year)) |>
  select(party, mean_score, distance_from_center) |>
  kable(digits = 3,
        col.names = c("Party", "Mean Score", "Distance from Center"),
        caption = "Most Recent Congress: Mean Score and Distance from Center")
```

Table 3: Most Recent Congress: Mean Score and Distance from Center

Party	Mean Score	Distance from Center
Democrat	-0.386	0.386
Republican	0.527	0.527

Both parties have moved, but the Republican trajectory is steeper and has accelerated at two inflection points: after 1994 and again around 2010. Democrats have moved leftward too — the decline in the Democratic mean (becoming more negative) is continuous and measurable — but the rate of change is lower.

This asymmetric finding has generated an active debate in political science. Some researchers argue the data are unambiguous: Republican members have moved further and faster. Others argue that

DW-NOMINATE can only measure the relative positions of members within the same voting space, and that the apparent asymmetry may partly reflect changes in the legislative agenda (which bills come to the floor) rather than true preference change.

6 Limitations

DW-NOMINATE measures *voting behavior*, not underlying policy preferences. Legislators sometimes vote strategically — going along with party leadership to maintain caucus unity, or voting against their true preferences to signal positions to constituents — rather than sincerely expressing their ideology. The scores capture the joint result of preferences and strategy.

The scores are also relative rather than absolute: they measure each member's position relative to others in the same chamber and Congress. This makes cross-time comparisons meaningful only under the assumption that the overall scale has remained anchored — an assumption the Voteview team works hard to maintain but that cannot be fully verified.

The analysis is limited to the House of Representatives. Senate polarization patterns are similar but not identical; Senate rules (like the filibuster) create different strategic incentives.

Finally, third-party members and independents are excluded. While their numbers are small, their presence in certain Congresses may affect the measured positions of the major parties.

7 Conclusion

Congress has polarized dramatically. The ideological middle — once home to conservative Democrats from the South and moderate Republicans from the Northeast — has collapsed. Both parties have sorted into near-homogeneous blocs, and the gap between them continues to widen.

Three findings stand out. First, polarization accelerated sharply after 1980 and has not reversed. Second, the ideological overlap between parties has gone from substantial to essentially zero. Third, the movement has been asymmetric: Republican members have moved further from the center, particularly after 1994 and 2010, though Democrats have also moved leftward.

The consequences extend beyond aesthetics. Legislative gridlock, the collapse of bipartisan deal-making, and increasing difficulty passing even routine legislation are all related to this sorting. Measuring polarization — carefully, with real data — is a first step toward understanding it.

This paper was produced using Quarto with R. All code is included above. Data are from the Voteview project (Lewis, Jeffrey B., Keith Poole, Howard Rosenthal, Adam Boche, Aaron Rudkin, and Luke Sonnet. 2024. "Voteview: Congressional Roll-Call Votes Database." https://voteview.com/).