

Obtaining Affective Maps of Multiparty Systems with Multidimensional Scaling

Kirill Zhirkov
University of Virginia

[Draft. Please don't cite or circulate]

Abstract

Scholars of comparative politics are increasingly interested in the affective component of partisan loyalties and vote choice. However, much about partisan affect in multiparty systems is still unknown. For instance, are affective distances in multiparty systems unidimensional or multidimensional? And how can this dimensionality be visualized? In this paper, I address these questions using multidimensional scaling (MDS) that allows locating all parties in a given system on a two-dimensional affective map. Using data from the Comparative Study of Electoral Systems (CSES), I demonstrate that, in agreement with previous findings, parties' positions on these maps follow their ideologies, coalition history, and extremity. I also show how affective maps can help to identify party systems with the same levels of affective spread but different degrees of polarization. Therefore, such maps can be a useful tool for scholars of party politics and electoral behavior.

Keywords: affective maps, multidimensional scaling, multiparty systems, partisan affect

Historically, political scientists have focused on ideology as the main source of connection between parties and voters in democratic systems. However, over the last decade this focus has been expanding toward partisan identities and affect. This increased attention to partisan affect emerged in the United States in response to the phenomenon of affective polarization, or heightened animosity between ordinary members of the Democratic Party and Republican Party (for a comprehensive review, see [Iyengar et al. 2019](#)). Affective polarization has important real-life consequences as people start to discriminate against opposing partisans in non-political settings ([Iyengar and Westwood 2015](#)).

The interest in how affect structures party systems is now increasingly shared by scholars of comparative politics. Much of this research focuses on the same phenomenon of affective polarization applied to multiparty systems. Existing evidence shows that the same phenomena of partisan animosity and discrimination is encountered in European party systems ([Reiljan 2020](#); [Westwood et al. 2018](#)). Researchers have identified important political consequences of affective polarization. For instance, strong partisan affect changes voters' perceptions of parties' extremity and makes them more invested in the political competition ([Ward and Tavits 2019](#)). Studies explaining system-level affective polarization has shown that it increases during election times ([Hernandez, Anduiza, and Rico 2021](#)), and that partisan animosity can be partly mitigated by greater representation of women in parliaments ([Adams et al. 2023](#)).

However, affective polarization in multiparty systems—as opposed to a two-party system like the United States—is difficult to summarize. As a result, researchers in the field have developed multiple measures of system-level affective polarization: for instance, some of them take into account only affect expressed by self-declared partisans ([Gidron, Adams, and Horne 2022](#)), whereas others use all available affective scores ([Wagner 2021](#)). Some studies try to avoid this problem by measuring affective polarization with regard to binary identities that are political but non-partisan, such as the Brexit vote ([Hobolt, Leeper, and](#)

[Tilley 2021](#)). Others have developed methods that allow to visualize partisan affect in multiparty systems—for instance, latent profile analysis ([Kekkonen and Yla-Anttila 2021](#)).

In this paper, I describe a method to obtain affective maps of multiparty systems based on multidimensional scaling (MDS). These maps represent a way to graphically summarize parties’ dissimilarities based on affective distances. They are useful as a visualization technique that displays all parties in a system using two-dimensional space. MDS can also serve as an analytical tool that allows exploring dimensionality of affective polarization in multiparty systems.

To demonstrate how the method can be used in practice, I apply it to electoral survey data from several European democracies. Results suggest that two dimensions are enough to adequately describe partisan affect in multiparty systems. The arrangement of parties on affective maps confirms that partisan animosity follows ideology, cooperation history, and parties’ types/extremity ([Algara and Zur 2023](#); [Gidron, Adams, and Horne 2022](#); [Harteveld, Mendoza, and Rooduijn 2022](#)). At the same time, the maps also reveal patterns of partisan affect that cannot be explored when system-level affective spread is calculated as a single number.

Multidimensional Scaling of Affective Distances

When using affective distances to construct affective maps of party systems. In doing so, I rely on the method known as multidimensional scaling (MDS; [Borg and Groenen 2005](#)). Mathematically, MDS translates objects’ pairwise dissimilarity scores (distances) into these objects’ positions in a coordinate space. Dimensionality of the resulting space is chosen by the analyst, but MDS allows to assess how many dimensions are necessary to adequately represent the original distance data.

This setup makes MDS a perfect tool to visualize partisan affect in multiparty systems. One can easily obtain pairwise affective distances between parties from electoral

survey data. Then, these distances can be used to position all parties in a system, for which the survey data are available, on a common two-dimensional affective map. MDS also provides information on whether a two-dimensional map makes a reasonable approximation of the observed patterns of affect in a party system.

MDS as a method to map affect is not new to political science. It has been previously applied in the United States to map affect toward Democratic and Republican candidates during presidential primaries (Rabinowitz 1978; Weisberg and Rusk 1970). The analysis is motivated by a simple idea: candidates who are liked and disliked by the same voters are probably similar in terms of some substantive characteristics. They can include ideology, positions on salient political issues, group identities, and personality traits. As a result, one can evaluate the degree to which candidate's arrangement on an affective map follows these known characteristics.

An application of MDS to map party instead of candidate affect is methodologically and substantively similar. Even some of the relevant characteristics to compare against the resulting map are the same: for instance, parties' ideological scores that are usually available from either mass or expert survey data. But some other characteristics to consider are different because, instead of identities and personality traits, one may want to see how parties' positions on the affective map correspond to present or historic coalitions and party types (e.g., mainstream vs. populist).

Formal Setup

Let a_{ik} and a_{jk} be affect scores that individual $k \in \{1, \dots, K\}$ assigns to political parties i and j . There are total of p parties that respondents are asked to place on the affect scale, so that $i, j \in \{1, \dots, p\}$. Then, affective distance between parties i and j for respondent k

is the absolute difference between the two affect scores:

$$d_{ijk} = |a_{ik} - a_{jk}|. \quad (1)$$

To find affective distance between parties i and j on the level of the party system, take the average of individual affective distances:

$$d_{ij} = \frac{1}{K} \sum_{k=1}^K d_{ijk}. \quad (2)$$

These distances can be used to obtain an affective map of the party system via the classical MDS procedure that goes as follows. First, define a matrix of squared (Euclidean) affective distances:

$$\mathbf{D} = \begin{bmatrix} d_{11}^2 & d_{12}^2 & \dots & d_{1p}^2 \\ d_{21}^2 & d_{22}^2 & \dots & d_{2p}^2 \\ \vdots & \vdots & & \vdots \\ d_{p1}^2 & d_{p2}^2 & \dots & d_{pp}^2 \end{bmatrix} = \begin{bmatrix} 0 & d_{12}^2 & \dots & d_{1p}^2 \\ d_{21}^2 & 0 & \dots & d_{2p}^2 \\ \vdots & \vdots & & \vdots \\ d_{p1}^2 & d_{p2}^2 & \dots & 0 \end{bmatrix}. \quad (3)$$

By construction, \mathbf{D} is a symmetric matrix with 0 values on the diagonal (parties' squared affective distances from themselves). Second, double-center it:

$$\mathbf{B} = -\frac{1}{2} \mathbf{J} \mathbf{D} \mathbf{J}, \quad (4)$$

where $\mathbf{J} = \mathbf{I} - p^{-1} \mathbf{1} \mathbf{1}'$ is the centering matrix ($\mathbf{1}$ is an all-one column vector of length p).

Third, calculate the eigen-decomposition of the double-centered matrix:

$$\mathbf{B} = \mathbf{Q} \mathbf{\Lambda} \mathbf{Q}'. \quad (5)$$

Finally, use the decomposition to define the coordinate matrix:

$$\mathbf{X} = \mathbf{Q}_2 \mathbf{\Lambda}_2^{1/2}, \quad (6)$$

where \mathbf{Q}_2 is the first two columns of \mathbf{Q} and $\mathbf{\Lambda}_2^{1/2}$ is the diagonal matrix of the square roots of the first two (largest) eigenvalues. The $p \times 2$ matrix \mathbf{X} can be used to position all p parties in the system on a two-dimensional Euclidean affective map. Eigenvalues can be used to determine the proportion of variation in partisan affective distances explained by the first two dimensions:

$$\frac{\lambda_1 + \lambda_2}{\sum_{i=1}^n \lambda_i}, \quad (7)$$

where λ_i are eigenvalues ordered by size.

Data

As the source of data, I use the Integrated Module Dataset (IMD) from the Comparative Study of Electoral Systems (CSES). It includes the first four waves of the study from 1996 to 2015, in which the CSES collected data on 140 elections in 53 countries. Affect towards political parties is measured using the following question: “I’d like to know what you think about each of our political parties. After I read the name of a political party, please rate it on a scale from 0 to 10, where 0 means you strongly dislike that party and 10 means that you strongly like that party. If I come to a party you haven’t heard of or you feel you do not know enough about, just say so.” These questions have been recently validated as a measure of partisan affect in multiparty systems (Gidron, Sheffer, and Mor 2022).

Results

Figure 1 presents affective maps of the German party system using survey information from 2002, 2005, 2009, and 2013 elections.¹ It is important that, in most election years, parties cannot be aligned on a single affective dimension. Depending on the election year,

¹ Underlying affective distances are presented in Tables S1–S4 in Supplementary Material. Numeric coordinate values are presented in Tables S5 in Supplementary Material. Explained variation percentages are presented in Table S6 in Supplementary Material.

one dimension explains between 44% and 65% of variation in partisan affective distances. Two dimensions, in turn, explain more than 80% of variation for all election years, thus allowing for the better representation of patterns in partisan affect.

From the substantive point of view, three interesting patterns can be identified. First, parties that are members of an existing or historical coalition tend to have smaller pairwise affective distances. The example of SPD (the Social Democratic Party) and The Greens is illustrative in this regard. When the two parties entered a government coalition in 2002, the affective distance was 2.1—and this exact distance persisted in 2013, despite the “red–green” alliance ceasing to exist in 2005 when SPD started to cooperate with CDU/CSU (the Christian Democratic Union and the Christian Social Union) in a so-called “grand coalition.” Similarly, the distances between SPD and CDU/CSU got from 4.0 in 2005 (when the grand coalition emerged) to 2.9 in 2009 and 2013 (when it has become a stable feature of German politics).

Second, the resulting dimensions do not have inherent interpretations—they are simply abstract coordinates that best reflect the supplied affective distances in a two-dimensional space. However, even a brief look at the resulting maps suggests that the mainstream–populist cleavage is no less important for partisan affect than the standard left–right ideological one. For instance, voters of Die Linke (The Left), a populist left party, are affectively much closer to the populist right, with a distance of 2.6 from AfD (Alternative for Germany), than to the mainstream right, with a distance of 4.2 from CDU.

Third, it is possible to see how parties become “accepted” using the example of Die Linke, a successor of the Socialist Unity Party of Germany from the East German single-party system. Initially, given the history of the authoritarian communist regime in East Germany and radical left terrorism in West Germany, the party was perceived by voters of other parties with caution and avoidance. However, this situation changed with time as The Left gradually became accepted in the German political mainstream. For

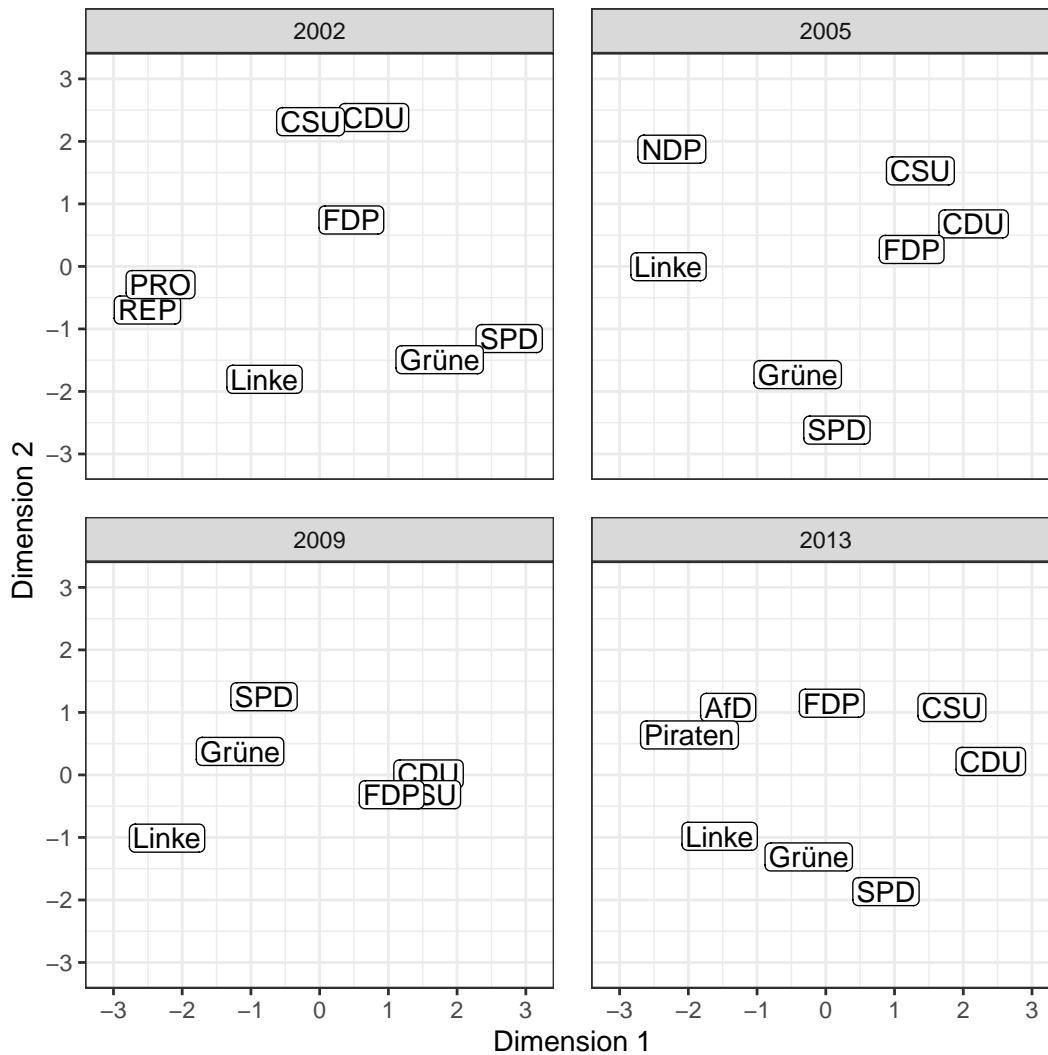


Figure 1. Affective maps of the German party system, 2002–2013

Note. AfD = Alternative for Germany, CDU = Christian Democratic Union, CSU = Christian Social Union, FDP = Free Democratic Party, Grüne = Alliance '90/The Greens, Linke = The Left, NPD = National Democratic Party, Piraten = Pirate Party, PRO = Party for a Rule of Law Offensive, REP = The Republicans, SPD = Social Democratic Party

instance, the affective distance between Die Linke and The Greens, its closest neighbor among the mainstream parties, decreased from 3.2 in 2002 and 3.3 in 2005 to 2.2 in 2009 and 2.4 in 2013.

Is the “avoidance” effect common for parties deemed politically extreme? If so, the same pattern should be found in other party systems with strong populist left and/or populist right parties. [Figure 2](#) presents affective maps of four European multiparty party systems from the 4th wave of the CSES: France in 2012, Greece in 2012, Norway in 2013, and Switzerland in 2011.² The pattern of greater affective distance from the populist, and especially populist right parties seems to be confirmed. In all four countries, the populist or extreme right parties are affectively distant from the rest: the National Front (FN) in France, Golden Dawn (XA) in Greece, the Progress Party (FrP) in Norway, and the Swiss People’s Party (SVP). This is less of a case for the populist or far left parties: the Left Front (FG) in France, the Coalition of the Radical Left (SYRIZA) in Greece, and the Red Party (R) in Norway.

As the final step in the analysis, I compare affective maps of two party systems with equal affective spread scores and similar numbers of relevant parties. The two cases are Chile in 2005 (six rated parties and affective spread score of 2.02) and Czech Republic in 2013 (seven rated parties and affective spread score of 2.01). These scores are calculated using the unweighted variant of the formula that accounts for all available affective distances in the system ([Wagner 2021](#)), because MDS results are also unweighted. The corresponding affective maps are presented in [Figure 3](#), and they show different patterns

² Underlying affective distances are presented in Tables S7–S10 in Supplementary Material. Numeric coordinate values are presented in Tables S11 in Supplementary Material. Explained variation percentages are presented in Table S6 in Supplementary Material. It’s worth noting that in the case of Greece, two dimensions explain only 61% of variation in partisan affective distances.

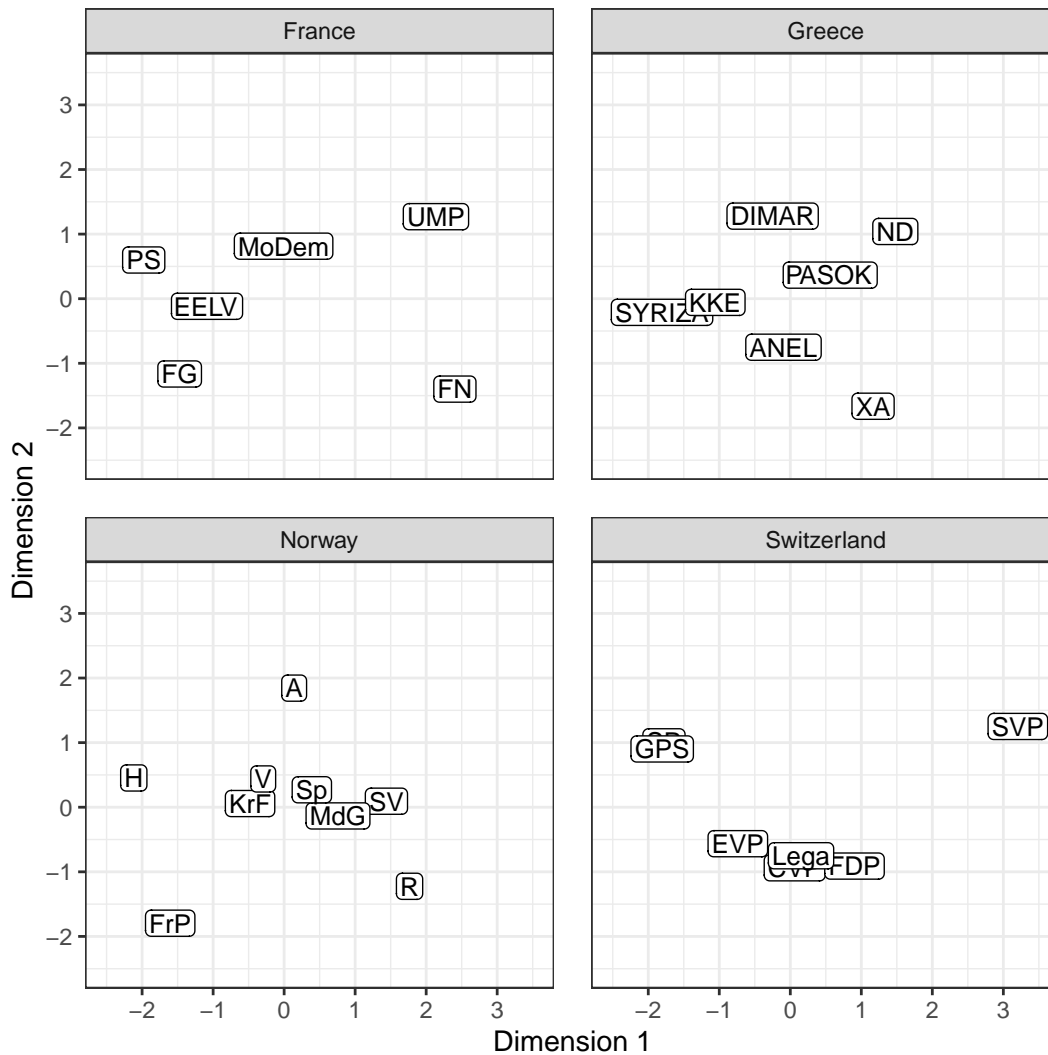


Figure 2. Affective maps of systems with notable populist right parties, 2011–2013

Note. France: EELV = Europe Ecology – The Greens, FG = Left Front, FN = National Front, MoDem = Democratic Movement, PS = Socialist Party, UMP = Union for a Popular Movement. Greece: ANEL = Independent Greeks, DIMAR = Democratic Left, KKE = Communist Party, ND = New Democracy, PASOK = Panhellenic Socialist Movement, SYRIZA = Coalition of the Radical Left, XA = Golden Dawn. Norway: A = Labour Party, FrP = Progress Party, H = Conservative Party, KrF = Christian Democratic Party, MdG = Green Party, R = Red Party, Sp = Centre Party, SV = Socialist Left Party, V = Liberal Party. Switzerland: CVP = Christian Democratic People’s Party, EVP = Evangelical People’s Party, FDP = Free Democratic Party, GPS = Green Party, Lega = Ticino League, SP = Social Democratic Party, SVP = People’s Party

across the two countries.³ In Chile, the party system is affectively polarized between the two ideological coalitions that has defined country’s politics after Pinochet. In Czech Republic, the picture is much more complicated as parties are spread out across the two-dimensional map. This impression is confirmed by the MDS statistics: in Chile, as much as 82.9% of variation in partisan affective distances is explained by a single dimension, whereas in Czech Republic the corresponding number is 45.6%. In other words, both party systems are characterized by affective spread—but only Chilean politics is affectively polarized between the two coherent partisan coalitions. This example demonstrates how affective maps can become an important visualization tool that allows analysts to explore affective alignment of parties beyond single-number summaries.

Conclusion

Scholars of comparative partisan politics and electoral behavior are increasingly interested in the ways affect, not just ideology structures party systems. However, studying partisan affect in multiparty systems has an important methodological problem: the necessity to summarize partisan affective distances with unknown dimensionality. In this paper, I have described the MDS-based method that scholars of comparative politics can use to obtain and explore affective maps of multiparty systems. The method is informed by the straightforward geometric principle: it translates observed affective distances into parties’ coordinates in a two-dimensional space.

I have also demonstrated how the MDS method can be applied in practice using partisan affect data from the CSES. Affective maps presented in the paper reveal several interesting patterns. First, parties that are members of existing or historical coalitions tend to have smaller pairwise affective distances. Second, left–right ideology structures partisan

³ Underlying affective distances are presented in Tables S12–S13 in Supplementary Material. Numeric coordinate values are presented in Tables S14 in Supplementary Material. Explained variation percentages are presented in Table S6 in Supplementary Material.

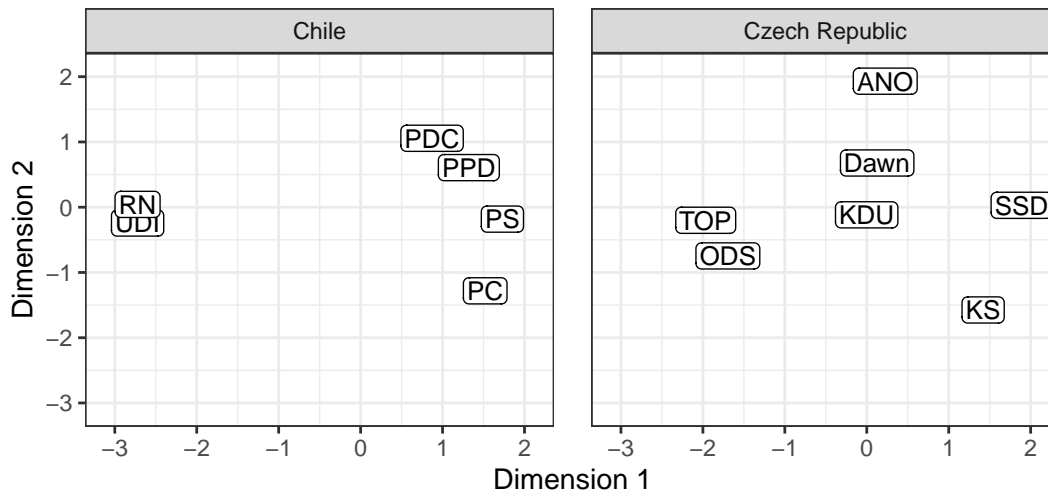


Figure 3. Affective maps of two systems with equal affect spread scores

Note. Chile: PC = Communist Party, PDC = Christian Democratic Party, PPD = Party for Democracy, PS = Socialist Party, RN = National Renewal, UDI = Independent Democratic Union. Czech Republic: ANO = Action of Dissatisfied Citizens, Dawn = Dawn of Direct Democracy, KDU = Christian and Democratic Union, KS = Communist Party, ODS = Civic Democratic Party, SSD = Social Democratic Party.

affect, but other factors—such as the mainstream vs. populist cleavage—are present as well. Finally, populist and extreme parties, especially on the right, tend to be located farther from the rest, but this effect seems to weaken with time. Since these findings have been reported in the literature before (Algara and Zur 2023; Gidron, Adams, and Horne 2022; Harteveld, Mendoza, and Rooduijn 2022), their replication with the MDS method shows validity of the produced affective maps.

Finally, I demonstrate that affective maps can look differently even when the system-level affective spread scores are almost equal. Specifically, similar spread scores can be observed when the party system is polarized between two homogenous coalitions and when partisan affect simply has high dispersion. Therefore, scholars may want to consider system-level indicators of affective polarization that combine measures of dispersion with some measure of bimodality (Esteban and Ray 1994). And the unidimensionality

score—the percentage of variation in partisan affective distances in a system explained by a single dimension—returned by MDS can be useful in this regard.

References

- Adams, James, David Bracken, Noam Gidron, Will Horne, Diana Z. O’Brien, and Kaitlin Senk. 2023. “Can’t We All Just Get Along? How Women MPs Can Ameliorate Affective Polarization in Western Publics.” *American Political Science Review* 117 (3): 318–24.
- Algara, Carlos, and Roi Zur. 2023. “The Downsian Roots of Affective Polarization.” *Electoral Studies* 82: 102581. <https://doi.org/10.1016/j.electstud.2023.102581>.
- Borg, Ingwer, and Patrick J. F. Groenen. 2005. *Modern Multidimensional Scaling: Theory and Applications*. New York: Springer.
- Esteban, Joan-Maria, and Debraj Ray. 1994. “On the Measurement of Polarization.” *Econometrica* 62 (4): 819–51.
- Gidron, Noam, James Adams, and Will Horne. 2022. “Who Dislikes Whom? Affective Polarization between Pairs of Parties in Western Democracies.” *British Journal of Political Science*. Published ahead of print. <https://doi.org/10.1017/S0007123422000394>.
- Gidron, Noam, Lior Sheffer, and Guy Mor. 2022. “Validating the Feeling Thermometer as a Measure of Partisan Affect in Multi-party Systems.” *Electoral Studies* 80: 102542. <https://doi.org/10.1016/j.electstud.2022.102542>.
- Harteveld, Eelco, Philipp Mendoza, and Matthijs Rooduijn. 2022. “Affective Polarization and the Populist Radical Right: Creating the Hating?” *Government and Opposition* 57 (4): 703–27.

- Hernandez, Enrique, Eva Anduiza, and Guillem Rico. 2021. "Affective Polarization and the Salience of Elections." *Electoral Studies* 69: 102203.
<https://doi.org/10.1016/j.electstud.2020.102203>.
- Hobolt, Sara B., Thomas J. Leeper, and James Tilley. 2021. "Divided by the Vote: Affective Polarization in the Wake of the Brexit Referendum." *British Journal of Political Science* 51 (4): 1476–93.
- Iyengar, Shanto, Yphtach Lelkes, Matthew Levendusky, Neil Malhotra, and Sean J. Westwood. 2019. "The Origins and Consequences of Affective Polarization in the United States." *Annual Review of Political Science* 22: 129–46.
- Iyengar, Shanto, and Sean J. Westwood. 2015. "Fear and Loathing across Party Lines: New Evidence on Group Polarization." *American Journal of Political Science* 59 (3): 690–707.
- Kekkonen, Arto, and Tuomas Yla-Anttila. 2021. "Affective Blocs: Understanding Affective Polarization in Multiparty Systems." *Electoral Studies* 72: 102367.
<https://doi.org/10.1016/j.electstud.2021.102367>.
- Rabinowitz, George. 1978. "On the Nature of Political Issues: Insights from a Spatial Analysis." *American Journal of Political Science* 22 (4): 793–817.
- Reiljan, Andres. 2020. "'Fear and Loathing across Party Lines' (Also) in Europe: Affective Polarisation in European Party Systems." *European Journal of Political Research* 59 (2): 376–96.
- Wagner, Markus. 2021. "Affective Polarization in Multiparty Systems." *Electoral Studies* 69: 102199. <https://doi.org/10.1016/j.electstud.2020.102199>.

- Ward, Dalston G., and Margit Tavits. 2019. "How Partisan Affect Shapes Citizens' Perception of the Political World." *Electoral Studies* 60: 102045.
<https://doi.org/10.1016/j.electstud.2019.04.009>.
- Weisberg, Herbert F., and Jerrold G. Rusk. 1970. "Dimensions of Candidate Evaluation." *American Political Science Review* 64 (4): 1167–85.
- Westwood, Sean J., Shanto Iyengar, Stefan Walgrave, Rafael Leonisio, Luis Miller, and Oliver Strijbis. 2018. "The Tie that Divides: Cross-national Evidence of the Primacy of Partyism." *European Journal of Political Research* 57 (4): 333–54.