



Electoral outcomes of party families across regional development types in Europe

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Abstract. The interplay between regional disparities and electoral outcomes is central to understanding political dynamics in Europe. In debates on the “geography of discontent”, radical-right party support is often linked to so-called left-behind regions. This study broadens that perspective by examining the electoral support of multiple party families across different region types in 22 European countries. The analysis combines regional socio-demographic indicators with the most recent national election results available up to March 2025. First, a *k*-means cluster analysis identifies six region types by grouping regions according to socioeconomic profiles. Second, comparisons of weighted vote shares across these region types provide insights into the main strongholds of each party family. The findings show systematic electoral differences across region types. Green and radical-left parties receive the strongest support in urban clusters. Social-democratic parties are strongest in rural, disadvantaged regions and weakest in industrial ones, while conservative parties peak in industrial regions and underperform in deindustrialized metropolises. Radical-right parties are most successful in structurally disadvantaged regions and in growing industrial regions. Overall, the study highlights the value of regional typologies for understanding electoral patterns, offering a broader perspective on how regional development shapes party competition across Europe.

1 Introduction

The study of regional inequalities has a long history in human geography. Although economic factors are central, measurements also consider aspects such as demographic developments and educational composition. Recently, regional disparities have attracted renewed attention because of their connection to electoral outcomes. To explain the global rise in populism, researchers examine how regional living conditions relate to geographic patterns of support for anti-elite, anti-EU, or populist parties (Dijkstra et al., 2020; Rodríguez-Pose, 2018; Schraff and Pontusson, 2024).

Overall economic disparities between European regions have decreased, primarily due to convergence *between* European countries; however, disparities *within* individual countries have increased. Despite significant efforts by the EU, territorial cohesion remains a major challenge (Amen-dolagine et al., 2024). Most research has examined trends

of single socioeconomic indicators, while little is known about how regional indicators combine across different dimensions. Given the varied interconnections among aspects of regional development, such as deindustrialization, economic growth, and demographic change, regional typologies clarify how specific combinations of characteristics define regions across Europe.

Regional disparities are important because spatial patterns of electoral support are linked to regional economic and demographic development. The main focus of research in this area has been on anti-EU, anti-elite, and right-wing populist parties. Studies show that anti-EU election results are highest in regions that are more rural and have lower economic growth, lower education levels, and a higher proportion of older adults in the population (Dijkstra et al., 2020). Higher unemployment rates and slow economic restructuring are also associated with populist voting (Essletzbichler et al., 2018). Individual-level studies support these findings,

showing that the regional development context affects populist attitudes (Arzheimer et al., 2024) and support for anti-political establishment parties (Koeppen et al., 2021; Dvořák and Zouhar, 2023). But also beyond these types of parties, the regional context appears to structure electoral behavior more broadly, suggesting that place may constitute an emerging dimension of party cleavage in its own right (Ford and Jennings, 2020).

Despite extensive research on the relationship between regional development and populist or anti-elite voting, two important gaps remain. First, there is limited knowledge about how specific combinations of regional characteristics, rather than individual variables, relate to electoral outcomes. Second, most studies examine only populist or anti-elite parties, overlooking the broader role of place in structuring party competition across Europe.

This study aims to address two main research gaps by (1) developing a multidimensional typology of European regions based on economic, demographic, and social indicators and (2) analyzing how electoral support for all major party families varies across these region types. The research questions guiding this study are as follows: What multidimensional regional development types can be identified across Europe based on economic, demographic, and social characteristics? To what extent are these regional development types associated with distinct patterns of electoral support across major European party families?

The remainder of the study is structured as follows. First, I summarize existing literature on regional disparities across Europe and relate it to the debate on geographies of discontent. Next, I describe the uniquely collected data set and the application of cluster analysis. After presenting the resulting region types, I examine how election results vary by region type. The article concludes with a general discussion and outlines the limitations of the analysis.

2 Literature review and theoretical background

This section introduces the key processes and dimensions of regional development in Europe. It then provides an overview of previous typologies of European regions before summarizing major studies on the connection between regional disparities and electoral outcomes.

2.1 Current patterns of regional development in Europe

Regional disparities in Europe have been a central topic in regional research over the past 2 to 3 decades, with economic development as the primary focus. Economic performance is most commonly measured by gross domestic product (GDP) per capita, which serves as a widely accepted indicator of economic prosperity and living standards. Its prevalence in national statistics enables comparisons between countries and regions over time. Earlier studies examined regional convergence or divergence within the EU,

concentrating mainly on long-standing members from the EU12 and EU15 (Geppert and Stephan, 2008; Vickerman and Armstrong, 1995). These studies used various methodological approaches and produced mixed results. However, there is consistent evidence of overall regional convergence in economic performance across the EU. This trend reversed after the 2008 financial crisis, leading to increased inequalities among NUTS-3 regions. Since 2016, European regions have shown renewed convergence (López-Villuendas and del Campo, 2024). Research on different time frames indicates that convergence at the European level is primarily due to *inter-country* convergence (Islam, 2003; Magrini, 2008), and particularly driven by high GDP growth rates in much of eastern Europe (Goecke and Hüther, 2016; Jankiewicz, 2024). Despite this inter-country convergence, older member states continue to have higher economic prosperity than those that joined after 2004 (Peredy et al., 2022).

Despite the general trend of European convergence, regional inequalities *within* most EU member states increased during the 1990s and 2000s (Petrakos et al., 2011; Geppert and Stephan, 2008), particularly in central and eastern European (CEE) countries, which as a group have been catching up (Smętkowski, 2013; Tvrdon and Skokan, 2011). Post-socialist transformation and European integration brought benefits to CEE countries, but these gains were distributed unequally within them. Some metropolitan regions saw high in-migration, foreign investment, economic growth, and job creation, while structural problems in former industrial regions, large rural areas, and the EU's eastern border regions worsened (Smętkowski, 2013).

From a longitudinal perspective, researchers have identified trajectories that lead to the so-called “regional development trap” (Diemer et al., 2022). This approach shows that regional disparities persist over time and result mainly from long-term structural developments rather than short-term economic changes. There are also different trajectories for regional growth and for regions becoming left-behind places (Le Petit-Guerin et al., 2025). Vulnerability to global crises varies by location; for example, the global financial crisis of 2008 affected European regions differently, with the most rural and most urban regions being the most vulnerable (Dijkstra et al., 2015). These spatially differentiated effects highlight the importance of regional characteristics beyond aggregate economic performance. Regional resilience is also influenced by other indicators, such as migration and aging (Giannakis and Bruggeman, 2020). Overall, this literature shows that regional inequalities are multidimensional, involving not only economic outcomes but also broader social and demographic conditions. These findings point to other relevant and related dimensions of regional disparities, such as living conditions and their development, which provide important context for understanding regional political outcomes.

Deindustrialization is a macro-level trend affecting European societies. From 1991 to 2017, the share of manufactur-

ing employment in the EU fell by about 8 % (Di Berardino et al., 2021). In addition to its economic effects, deindustrialization significantly alters regional employment structures, social composition, and collective experiences of economic change. This process has not occurred uniformly across regions and has been driven by various factors. Central and eastern European countries underwent rapid deindustrialization following transition and integration into global competition, while this process began earlier in western countries. Some regions experienced deindustrialization due to productivity gains, whereas others saw a broader decline in industrial added value, which increased regional economic divergence (Di Berardino et al., 2021). The reduction in manufacturing employment affects countries and regions in different ways, with outcomes shaped by diverse policy responses (Teimouri and Zietz, 2020). These varied trajectories lead to distinct regional development paths and influence local socioeconomic contexts, indicating that regional differences are best understood as configurations of multiple, interconnected conditions rather than as the effect of single factors in alone.

Demographic change, particularly depopulation, is a related process that is most evident in eastern and southern European regions, affecting rural areas and, increasingly, urban centers because of suburbanization (Majdzińska, 2024). These demographic dynamics change the size and composition of regional populations and thereby influence labor markets, service provision, and social structures. Many depopulating regions experience both natural decrease and negative migration balance and often lag in economic development. The outflow of young, educated people is a key concern, creating a “talent development trap” in rural regions (Majdzińska, 2024), especially in eastern and southern Europe, where low innovation capacity limits regional competitiveness. These processes are closely tied to peripheralization – an interconnected dynamic of out-migration, economic dependence, disconnection from political and economic centers, and social stigmatization. Peripheralization acts in a spatially selective manner, meaning that its scope and the resources available to address it vary considerably across regions. Depopulating and peripheralized regions face a compounding structural crisis: the erosion of public services and infrastructure, a widening urban–rural divide, and a diminishing local capacity for endogenous development (Leibert and Golinski, 2017). Auer and Schaub (2024) have shown for post-socialist countries that strong emigration flows can form a risk for democracy.

Regional education structure reflects both the supply and demand sides of the labor market. Human capital is closely connected to regional development and drives economic growth and competitiveness (Faggian et al., 2019). Accordingly, education is a main factor in inter-regional income disparities, with educational sorting processes contributing to regional differentiation and spatial inequality (Bathelt et al., 2024). Beyond income effects, regional disparities in educa-

tion also influence social mobility, innovation potential, and long-term resilience. As economies shift toward knowledge-intensive activities, expanding sectors increasingly depend on a highly educated and skilled workforce, which further increases the importance of regional human capital. This trend is especially evident in the context of Industry 4.0, which aims to increase efficiency by digitalizing production processes; such technological change creates new disparities between regions with different educational capacities (Balland and Boschma, 2021). In this sense, education constitutes a central non-economic dimension of regional inequality that complements economic indicators. Overall, regional advantages and disadvantages in Europe are multidimensional and shaped by specific combinations of economic, demographic, and social characteristics, which makes it necessary to apply methods capable of capturing such complex patterns of regional indicators.

2.2 Types of regional (dis)advantage in Europe

This section reviews previous applications of cluster analysis in regional studies and demonstrates its usefulness for identifying multidimensional patterns of regional inequality. Cluster analysis is a method for describing multidimensional regional inequalities across Europe by identifying region types. This approach maximizes differences between groups and minimizes differences within groups, allowing similar regions to be grouped into analytically meaningful categories. Cluster analysis is particularly sensitive to patterns in indicator values across the aforementioned dimensions of regional inequality. Several regional classifications using different data sets and structures have been proposed. For example, Aumayr (2007) conducted an early cluster analysis of 1212 NUTS-3 regions in the EU25, identifying 14 types based on industrial specialization, productivity, and accessibility. Her findings showed that only certain region types show signs of convergence, while peripheral regions are likely to remain at lower steady-state income levels. A similar approach to the present study was applied by Velthuis et al. (2025). In a cluster analysis based on NUTS-3 regions in EU15 countries (mainly western, including the United Kingdom and Greece) and using 10 indicators covering economic, demographic, and social dimensions, the authors identified six clusters. Le Petit-Guerin et al. (2025) focused on development trajectories and distinguished different patterns of regional left-behindness in the EU15. Another recent EU-wide study applied time series clustering to compare GDP-per-capita developments, with special attention to the 2008 financial crisis (López-Villuendas and del Campo, 2023). The authors compared cluster solutions from NUTS-2 and NUTS-3 data, finding that NUTS-3 data were more effective, as NUTS-2 data mainly produced national clusters. Marsan and Maguire (2011) categorized 240 regions from 23 OECD countries by innovation-related characteristics, identifying eight clusters grouped into three main region

types: knowledge hubs, industrial production zones, and non-science-and-technology-driven regions. In Germany, Royer and Leibert (2024) harmonized the dimensions of deprivation, demographic change, economic centrality, and human capital in a cluster analysis, resulting in six clusters that reflected and expanded on the well-known differences between eastern and western Germany. Hennebry and Strykiewicz (2020) developed a classification of rural areas in Austria and Portugal to assess the structural strength of rural regions. In Turkey, clusters of left-behind regions at the NUTS-2 level were defined by economic stagnation, population decline, and out-migration (Cüre, 2025). For Denmark, Jessen (2024) identified four region types through a cluster analysis of long-term regional development data. Overall, previous research demonstrates that cluster analysis is a well-established approach for identifying distinct regional types and uncovering complex patterns of territorial inequality. While the specific indicators and geographical scopes vary across studies, the common objective is to reveal meaningful regional groupings that are not captured by single indicators alone. Although not building on regional typologies, an extensive body of research has analyzed relationships between regional inequalities and electoral outcomes.

2.3 Voting behavior and regional disparities

In recent years, associations of regionally unequal living conditions with voting behavior and political attitudes have been subject to a vivid debate. Previous studies have found that populist positions and political distrust are highest in regions with lower GDP, lower employment (Di Matteo and Mariotti, 2021), and lower population density (Kenny and Luca, 2021; Mitsch et al., 2021), as well as in non-capital regions (Ejrnæs et al., 2024) and regions with a higher proportion of older adults (Dijkstra et al., 2020) and higher unemployment rates (Essletzbichler et al., 2018; Kevický, 2022). Beyond relative cross-sectional deprivation, long-term economic decline might also contribute to right-wing populist success (Greve et al., 2023), and decline in manufacturing jobs increases political discontent when compared within regions (Ejrnæs and Jensen, 2024). What are the mechanisms behind these regional voting patterns? This article draws on existing theories to provide a conceptual background that informs the exploratory analysis.

Regional-context effects refer to how regional living conditions influence individual characteristics, such as political attitudes or electoral preferences. From an agency perspective, these conditions can be summarized as regional opportunity structures, including economic opportunities (especially in the labor market), accessibility and quality of public and private services, and environmental conditions. These structures shape individuals' chances of achieving personal goals and socioeconomic achievements (Bernard et al., 2023). If voters assess political actors based on policy outcomes (van de Walle and Bouckaert, 2003), they tend to hold governing par-

ties responsible for the opportunity structures in their region. Recent studies showed that the political perception of regional living conditions is affected by individual characteristics (Green et al., 2025) and local political climate (Deppisch and Klärner, 2025). Because opportunity structures change over multiple election periods, regional deprivation may be attributed to several political parties, the political elite, or the functioning of the democratic system itself. Nevertheless, regionally unequal short-term developments, such as the different effects of the Great Recession, can be reflected in the regional support of the governing party (Celli and Ferrante, 2024).

Studies that control for individual-level characteristics show that regional context does influence political preferences. For example, regional unemployment and GDP per capita are associated with populist voting (Koeppen et al., 2021; Haartevelde et al., 2022; Refisch et al., 2026), as are higher proportions of certain age groups (Dvořák et al., 2022; Paeth and Vogel, 2024) and limited infrastructure accessibility (Haartevelde et al., 2022). In Germany and France, regional economic hardship and demographic decline influence populist attitudes through perceptions of local decline, but this effect is not observed in the Netherlands (Arzheimer et al., 2024). In Italy, deprivation of public services increases support for far-right parties (Cremaschi et al., 2024). However, multilevel studies indicate that regional characteristics account for only a small portion of regional variation (Koeppen et al., 2021). Therefore, other factors must also contribute to regional electoral patterns.

The spatially uneven distribution of social groups with different political preferences contributes to regional voting patterns. These *composition effects* indicate that aggregated voting patterns partly reflect the residential distribution of individuals, rather than only contextual influences at the regional level. In western Europe, urban–rural differences in immigration attitudes result from composition effects and are influenced by the residential sorting of pro-immigration individuals into large cities (Maxwell, 2019). A study focusing on England also finds that individuals tend to move into regions with similar political orientations (Gallego et al., 2016). However, US data show that voters often sort themselves based on neighborhood characteristics that correlate with partisan preferences, rather than intentionally moving to politically aligned regions. Additionally, partisan bias in moving decisions accounts for only a small portion of regional variation (Martin and Webster, 2020). On the emigration side, population change also has political consequences but operates through somewhat different mechanisms. Residential mobility is selective regarding education and social origin (Panichella and Impicciatore, 2024), thereby changing the social composition of local electorates over time. The selective departure of more educated groups from predominantly rural regions can strengthen narratives of regional neglect, economic stagnation, and political marginalization, which then influence political attitudes independently of in-

dividual characteristics (Dancygier et al., 2025). This is especially evident in central and eastern Europe, where large-scale emigration has occurred, and the out-migration of politically liberal individuals has coincided with “deterioration of democracy in their home countries” (Auer and Schaub, 2024). These patterns highlight the interaction between composition and context effects: migration not only changes the makeup of regional electorates but also transforms the social environments and local narratives that shape political preferences. Consequently, regional voting patterns result from cumulative processes in which demographic change, collective experience, and place-based perceptions interact, rather than from isolated or easily separable mechanisms.

In addition to the mechanisms mentioned above, regional historical and cultural factors also shape regional voting patterns. In Poland, for example, the 19th-century partitions of the country are still reflected in political orientations and spatially diverse electoral behavior (Zagórski and Markowski, 2021; Zarycki, 2015). At the local level, specific policies, such as the reshaping of administrative borders (Rösel and Sonnenburg, 2016), and the local presence of political parties can also affect how political parties are evaluated.

Classic cleavage theory (Lipset and Rokkan, 1967) offers a complementary view of regional voting patterns by connecting territorial inequalities to structured party competition. In this framework, regional disparities do not simply lead to protest voting but instead activate lasting cleavages (such as urban–rural, center–periphery, or work–capital) that shape the entire party system. Although recent research often highlights radical-right or populist parties as the main beneficiaries of regional decline, cleavage theory helps to understand that all parties respond to these spatial conflicts by adopting specific programmatic and organizational strategies. Revisions of cleavage theory also indicate that territorial divides remain salient, but established parties often fail to address new conflict lines, such as the emerging transnational cleavage between nationalist and universalistic values (Hooghe and Marks, 2017), or the evolving socio-demographic cleavages education, ethnicity, and class that are reshaping political competition in advanced industrial societies (Ford and Jennings, 2020). Additionally, as a consequence of the “reawakening of center-periphery conflicts”, Ford and Jennings (2020) identify place as one dimension holding potential to shape political party competition. Consequently, thorough explorations of regional voting patterns across the European party system can shed light on the current role of place in party support. The following section outlines the methodological approach taken to this end.

3 Methods

This section outlines the general analytical strategy and its guiding principles before introducing the electoral and contextual data used in the analysis. It then describes the *k*-

means clustering procedure used to identify regional development types and finally presents the standardization of vote shares that will be combined with these region types.

3.1 Analytical strategy

The analytical strategy of linking regional inequalities and electoral outcomes is as follows. Although many studies examine the political implications of regional disadvantage, none have combined EU-wide cluster analyses with national election results. Voting behavior is shaped by combinations of regional characteristics rather than by single factors in isolation. Cluster analysis is well suited to identify specific configurations of regional conditions, such as regions that are economically struggling but demographically growing or the reverse. Compared to the common practice of using individual predictors in linear regression models, this approach provides a more realistic representation of the multidimensional contexts in which electoral behavior develops.

Regional voting patterns across all parties require explanation. Although recent research has mainly examined anti-establishment, anti-EU, radical-right, or populist voting, analyzing all major party families provides important benefits. First, it offers a more complete understanding of regional voting patterns within the entire party system. Second, it reveals differences in the geographical strongholds of various party families, which also clarifies the specific features of radical-right mobilization, for example. To achieve this, country-weighted average vote shares are calculated for each party family by region type. Standardizing these values then allows the analysis to identify both strongholds and areas of consistently weaker electoral support for each party family. The focus is directed to party families without explicitly addressing populism. As populism reflects a “thin ideology” (Mudde, 2007) or style (Moffitt, 2016), a general populist party classification would subsume diverse ideological directions. Instead, focusing on “thick ideologies” by exploring cross-national party families allows higher homogeneity in political programs within the respective categories. This approach is in line with the finding of Crulli (2024) that regional political disparities are more related to thick ideological underpinnings of the radical right than to populism itself. Building on these considerations, this study develops a new typology of regions in 20 European countries and examines its association with the electoral performance of various party families. The analytical strategy follows four guiding principles, detailed in the next section.

- *Principle 1: the study aims to include as many European countries as possible, with particular attention to CEE countries.* This focus addresses a gap in previous research, which often has not adequately considered post-communist contexts. For instance, a key reference study included only the EU15 countries (Velthuis et al., 2025).

- *Principle 2: use small-scale data with comparable unit sizes.* Previous research indicates that the NUTS-3 level is more suitable than the NUTS-2 level for identifying regional disparities (López-Villuendas and del Campo, 2023). This study uses the labor market region (LMR) level, which is based on NUTS-3 regions. LMRs offer a balance between detailed data and comparable unit sizes. Because regional economies generate wealth and opportunities mainly through local labor markets, we formed LMRs by merging NUTS-3 regions within the same metropolitan area, as defined by Eurostat (2018). Additionally, regions surrounded by another NUTS-3 region were combined with their surrounding area. As documented in our working paper (Bernard et al., 2025), this primarily reduces the number of regions in Germany, where NUTS-3 units are especially small and often separate core cities from their suburban areas.
- *Principle 3: use the most recent available data.* Because many countries are experiencing rapid political changes, understanding political implications requires up-to-date data. Decisions on regional development funding, infrastructure projects, and spatial economic policies occur in national parliaments. Therefore, I use data from the most recent national parliamentary elections (September 2021–March 2025) combined with regional development indicators from 2021.
- *Principle 4: focus on intra-country inequalities from a cross-national perspective.* This principle supports the aim to identify nationally comparable regional development types across Europe. Despite European embeddedness, countries remain the primary reference point for evaluating an individual's region of residence. Therefore, regional development indicators are standardized at the country level. Also, national elections remain the primary arena where intra-national grievances are expressed, despite European embeddedness. Since regional development policies are largely determined at the national level, national election results provide the clearest insight into the electoral impact of regional (dis)advantage.

3.2 Data

The analyses use three types of data: regional development indicators, electoral data, and party data. To identify regional types across Europe through cluster analysis, we collected economic, social, and demographic indicators from Eurostat, ARDECO, and national administrative sources (Table S1 in the Supplement). Because the applied LMR level is based on NUTS-3 regions, data collection focused on NUTS-3-level data. Only countries with complete data were included, resulting in a data set of 855 regions in 20 European Union countries and Norway. Slovenia was excluded due to lacking congruence of regional development indicators and elec-

tion data. Greece and Croatia are not part of the analysis because of missing regional data on unemployment. Consistent with the relative nature of regional deprivation and regional left-behindness, all regional development indicators were z-standardized relative to the national level. This approach enabled us to identify regions across Europe with similar characteristics in relation to their position within their country.

The regional development indicators include economic, social, and demographic dimensions. The economic dimension draws on previous studies that identify economic indicators as predictors of regional living conditions and political attitudes. These indicators include both cross-sectional and dynamic measures: GDP per capita in 2021, change in GDP per capita at fixed prices from 1993 to 2021, change in the number of jobs from 1995 to 2021, share of industrial jobs in 2019, and change in the share of industrial jobs from 1995 to 2019. The extended time frame reflects the importance of long-term dynamics for understanding political discontent (Essletzbichler et al., 2018; Dijkstra et al., 2020).

Demographic change is central to regional development, especially regarding aging and migration. Therefore, I include average net migration rates from 2011 to 2021, the share of the population aged 65 and older in 2021, and the change in this share from 2014 to 2021. These indicators show the level of demographic pressure and potential challenges for social cohesion and local economies, as well as the (perceived) residential attractiveness of a region.

The social indicators represent the regional educational and spatial context. Two measures are used: the share of individuals with tertiary education in 2021 and population density in 2021. Education levels indicate human capital and regional skill structures, while population density reflects urban–rural differences, which are often linked to access to services and infrastructure.

Election data were collected from national statistical offices and include all recent national parliamentary elections held from 2021 to 2025 (Table S2). For most European countries, NUTS-3-level electoral data were available on national websites. In some cases, municipality-level data were aggregated, and some electoral data were obtained by contacting national authorities. NUTS-3-level data were then aggregated to LMR.

This study's aim is to compare the regional basis of electoral success of different groups of parties. To this end, I rely on the concept of party families. Following from the cleavage theory (Lipset and Rokkan, 1967), party families subsume ideological profiles that persist across national boundaries and over time. Yet, there are (mostly younger) parties that challenge this concept by incorporating characteristics from different party families, e.g., economically left-wing and culturally traditionalist. This kind of party will be subsumed to “no family”. For political party classification, I use data from the Chapel Hill Expert Survey 2024 (CHES) and the Populism and Political Parties Expert Survey 2023 (POPPA). CHES distinguishes 10 party families, assigning each party

to one of these families or to a “no family” category. According to the CHES Codebook, this classification relies on analyses of each party (Marks and Wilson, 2000; Hix and Lord, 1997), with confessional and agrarian parties placed in separate categories. These categorizations base on historical cleavage structures, ideological traditions, and European Parliament party group affiliation. Recent updates use triangulation of membership or affiliation with international and EU party associations, self-identification, and existing categorizations (Rovny et al., 2025). POPPA bases its party family distinctions on the CHES classification and supplements them by filling in missing information. A full list of political parties is included in Table S3. I refrain from analyzing the electoral bases of regionalist parties as they usually do not participate in all districts of the respective country.

3.3 *K*-means clustering and standardizing weighted vote share averages

K-means clustering is one of the most widely used methods for identifying groups or types. Researchers have applied it across various disciplines, drawing on a substantial methodological literature (Anderberg, 1973; Kaufman and Rousseeuw, 1990) and application-oriented studies, such as the comprehensive R-based introduction by Landau et al. (2012). As noted above, some articles have used *k*-means clustering to identify region types (Jessen, 2024; Velthuis et al., 2025). However, this study is the first to examine 22 European countries, including the Visegrád Four, in identifying regional development types and to triangulate this classification with electoral data.

The *k*-means clustering algorithm groups observations into distinct, non-overlapping clusters by minimizing the overall within-cluster variance, which is the deviation of observations from their respective cluster means. In this study, *k*-means clustering partitions our set of 855 observations (LMRs) into *k* non-overlapping clusters, using $X = x_1 x_2 \dots x_n$, where each $x_i \in R^{10}$ is defined by 10 regional development indicators. The algorithm aims to minimize the within-cluster sum of squared distances:

$$\arg \min_c \sum_{k=1}^K \sum_{x_i \in C_k} |x_i - \mu_k|^2. \quad (1)$$

Here, $\mu_k = \frac{1}{|C_k|} \sum_{x_i \in C_k} x_i$ is the centroid (mean vector) of cluster C_k , and $|x_i - \mu_k|^2$ is the squared Euclidean distance between observation x_i and its cluster centroid μ_k .

The input vector x_i consists of the following standardized regional indicators: GDP per capita, GDP-per-capita change (1993–2021), employment change (1995–2021), share of industrial employment (2019), change in industrial employment share (1995–2019), share of tertiary-educated population (2021), net migration balance (2011–2021), share of population aged 65+ (2021), change in the share of population aged 65+ (2014–2021), population density (2021), and

the number of regions per country. Each variable enters the distance function as a component of x_i so that clustering is based on Euclidean distances in this multivariate space. As data on internal migration were missing for two Belgian regions (BE224, BE225), these regions are subsequently omitted from all analytical steps.

When using this method, researchers must specify the desired number (*k*) of clusters. Selecting the optimal number requires balancing interpretability and statistical justification. Makles (2012) provided a Stata-based approach for generating comparison statistics to evaluate solutions with different cluster counts. The within sum of squares (WSS) or its logarithm ($\log(\text{WSS})$) is often used in the “elbow criterion”, which identifies the point where adding another cluster does not substantially change WSS or $\log(\text{WSS})$. Additional criteria for determining the optimal number of clusters include the η^2 coefficient and the proportional reduction in error (PRE) coefficient (Makles, 2012). For our data, all tests indicated that 4, 6, or 10 clusters were statistically most appropriate (Fig. S1). Because the six-cluster solution is the most interpretable, it is presented in the results section.

To compare electoral results across different region types, the average vote share of each party family is calculated for each cluster. Because the number of regions varies significantly across countries, simple averages would overrepresent countries with more regions. To correct for this imbalance, vote shares are weighted by country, ensuring that each country contributes equally to the overall results. The election results for each party family in the last national parliamentary election (until March 2025) are visualized in maps (Figs. S2–S10).

Cluster-specific effects are estimated using weighted linear models with country fixed effects so that cluster coefficients indicate average deviations from country-specific party means. This approach isolates within-country differences in party support across region types and prevents countries with many regions from disproportionately influencing the estimates. Because the primary aim is to identify the relative strongholds of party families rather than absolute vote levels, the resulting cluster-level deviations are standardized within each party. Z-standardization expresses each cluster’s deviation in units of the party-specific standard deviation, enabling comparison of the relative strength or weakness of party support across region types within the typical national context of each party family. The following section presents the findings resulting from this analytical strategy.

4 Results

The following section first presents the outcome of the cluster analysis by describing each of the resulting region types. Then, electoral outcomes of each party family across the region types are explored.

4.1 Six clusters of regional development

The six clusters identified in the analysis show high internal heterogeneity. Their descriptions rely on mean values and mean deviations from national standards. Thus, the following summaries represent generalizations of a diverse set of regions across Europe. However, this approach offers a useful framework for understanding broader patterns of regional development and their socio-political implications in Europe. Table 1 provides summary statistics for each cluster, and Fig. 1 maps the regional distribution of these clusters across Europe.

4.1.1 Cluster 1: capitals and high performers

Cluster 1 comprises the most prosperous regions in each country, which consistently outperform others in GDP per capita, educational attainment, and positive migration balance. These regions are major economic centers, with average employment growth by 36 % from 1995 to 2021. The demographic structure consists of relatively few older adults, with individuals aged 65 and over representing only 19 % of the population. Average GDP per capita increased by 1.2 % per year from 1993 to 2021, which is the highest regional growth across all clusters. Positive migration balance is most likely driven by young and highly educated individuals moving to these regions. Most capital regions are in Cluster 1, along with other metropolitan areas, such as Hamburg (Germany), Lyon (France), Kraków (Poland), Cluj-Napoca (Romania), and Burgas (Bulgaria). From this exemplary list, it becomes obvious that the cluster is internally heterogeneous. Nevertheless, the relative position of the listed regions in the national context remains comparable.

4.1.2 Cluster 2: deindustrialized metropolises

Cluster 2 consists of urban centers and is the most densely populated. These regions are relatively affluent, with high GDP-per-capita values and a large proportion of highly educated residents. Unlike Cluster 1, Cluster 2 experienced the largest decline in industrial employment among all clusters (9.7 %) between 1995 and 2019. However, the GDP-per-capita growth rate was relatively low. In-migration to these areas was moderate, indicating that although they remain economically important, their attractiveness for mobility is close to the national average. Cluster 2 is also the smallest cluster, comprising only 21 regions, such as Barcelona (Spain), Porto (Portugal), Paris (France), Naples (Italy), Cologne (Germany), and Katowice (Poland).

The reader might be surprised to see Barcelona and Paris (Île-de-France) grouped into the same region type as Katowice, as internal heterogeneity is prevalent here as well. Since Barcelona and Île-de-France remain major economic centers of their respective countries, one might expect both regions to fall into Cluster 1 instead. However, the equal weighting of all 11 input indicators during the cluster analysis means

that longitudinal aspects – such as internal migration rates, job change, deindustrialization, and GDP change – carry as much weight as static, cross-sectional indicators. It is this emphasis on dynamic rather than static indicators that results in classifying economic centers such as Paris and Barcelona alongside Katowice in Cluster 2.

4.1.3 Cluster 3: modern industry

Cluster 3 is characterized by a strong and modern industrial base, with industry providing 30 % of all jobs, more than any other cluster. These regions also have the highest GDP-per-capita growth rates, matching Cluster 1, which reflects their strong economic performance. Their combination of industrial strength and economic growth indicates ongoing innovation and competitiveness in manufacturing and related sectors. These areas likely benefit from advanced technologies and participation in global value chains, which support both employment and productivity growth. Although they are not leaders in services or education levels, their economic model remains resilient, and they serve as key pillars of national growth. Cluster 3 regions include large parts of southern Germany, the area around Warsaw (Poland), southern and eastern Czechia, western Romania, the area around Porto (Portugal), Vestland (Norway), and large parts of Lombardy (Italy).

4.1.4 Cluster 4: gaining ground

Cluster 4 includes regions experiencing socioeconomic improvement and upward development. Employment grew by 28 % from 1995 to 2021, indicating strong job growth. Although industrial employment declined by 5 %, this change reflects a shift toward service- or knowledge-based economies. These regions have an above-average proportion of highly educated people (26.4 %) and a significantly positive migration balance, which suggests increasing attractiveness, particularly for skilled workers. Both GDP per capita and its growth exceed the national average, while the industrial sector remains relatively small. Overall, Cluster 4 covers areas that are successfully transitioning and narrowing the gap with more advanced regions by balancing economic growth and rising human capital. Cluster 4 includes several coastal regions, such as those in southeastern and southwestern France, southeastern Spain, western Lithuania, and Burgas (Romania). Large parts of the central Netherlands and parts of Götaland (Sweden) are also part of Cluster 4.

4.1.5 Cluster 5: aging, emigration, and job loss

Cluster 5 includes the most structurally challenged regions, marked by ongoing demographic and economic decline. It is the only cluster that saw an absolute decrease in jobs from 1995 to 2021, which highlights its limited potential for economic renewal. Migration balances remain slightly positive (0.5) but are the lowest among all clusters, indicating low at-

Table 1. Characteristics of regional clusters in Europe: nationally standardized scores and mean values.

Cluster	(1) Capitals and high performers	(2) Deindustrialized metropolises	(3) Modern industry	(4) Gaining ground	(5) Aging, emigration, and job loss	(6) Weak economy
GDP per capita, 2021	1.91 (44 213.42)	0.9 (36 174.31)	0.5 (32 102.28)	0.38 (32 539.71)	−0.48 (25 604.71)	−0.6 (23 664.97)
GDP-per-capita change, 1993–2021 (growth rate per year, %)	0.82 (1.22)	−0.07 (0.61)	0.82 (0.93)	0.47 (0.68)	−0.53 (0.52)	−0.61 (0.48)
Change in number of jobs, 1995–2021 (%)	1.23 (36.03)	0.16 (18.81)	0.45 (15.91)	0.66 (28.25)	−1.04 (−3.80)	−0.42 (3.36)
Share of industrial jobs, 2019 (%)	−0.63 (0.13)	−0.15 (0.17)	1.27 (0.3)	−0.51 (0.14)	0.11 (0.2)	−0.17 (0.17)
Change in share of industrial jobs, 1995–2019 (%)	−0.61 (−6.62)	−1.24 (−9.67)	0.63 (−0.72)	−0.25 (−4.90)	0.62 (−0.74)	−0.34 (−5.34)
Share of more educated population, 2021 (%)	2.27 (34.49)	0.55 (27.03)	−0.2 (20.77)	0.44 (26.41)	−0.19 (22.91)	−0.46 (21.31)
Net migration balance, 2011–2021	1.23 (5.4)	−0.2 (2.10)	0.13 (2.84)	0.73 (5.02)	−0.7 (0.5)	−0.38 (0.7)
Share of age 65+, 2021 (%)	−0.96 (0.19)	−0.51 (0.2)	−0.51 (0.21)	−0.35 (0.22)	1.29 (0.26)	0.04 (0.22)
Change in share of age 65+, 2014–2021 (%)	−1.05 (0.01)	−0.59 (0.02)	−0.14 (0.02)	−0.33 (0.02)	1.2 (0.03)	−0.12 (0.02)
Population density, 2021 (inhabitants per km ²)	2.10 (502.67)	3.77 (1062.2)	−0.18 (148.63)	0.05 (206.42)	−0.47 (90.69)	−0.30 (112.47)
Number of regions	47	21	162	189	147	289

Note: nationally z-standardized scores and mean cluster values in brackets. GDP-per-capita change refers to annual growth rates from 1995 to 2021. Job changes indicate the percentage increase from 1995 to 2021. Industrial job shares represent the proportion of employment in industry and manufacturing among all employment. Education refers to adults with tertiary education. Net migration is measured as annual crude rates per 1000 inhabitants from 2011 to 2021. Change in age structure is the difference in the share of the population aged 65 years or older between 2014 and 2021. Population density is measured as number of inhabitants per square kilometer. Bold cells indicate standard deviation from the mean of > 0.5. For data sources, see Table A1.

tractiveness and significant out-migration, especially among younger, skilled individuals. These regions are the most rural and sparsely populated, with the highest proportion of adults over 65 (26 %), and this share increased by three percentage points from 2014 to 2021. The combination of an aging population, youth out-migration, and low human capital creates major barriers to development, making economic revitalization both urgent and difficult. Cluster 5 regions include northwestern Spain, central French regions, rural eastern Germany, western Pomerania (Poland), western Latvia, central–southern Austria, and the Belgian coast.

4.1.6 Cluster 6: weak economy

Cluster 6 includes regions that continue to face economic challenges following industrial decline. These areas have the lowest GDP-per-capita levels and the weakest GDP-per-capita growth since 1993, which indicates persistent regional economic deprivation. Employment growth has been limited, with only a 3 % increase from 1995 to 2021. A central char-

acteristic is ongoing deindustrialization, shown by a 5 % decrease in industrial employment. Unlike more dynamic clusters, these regions have shown little ability to adapt to structural economic changes, reflecting limited resilience and diversification. However, unlike Cluster 5, population aging is not a defining characteristic, so demographic pressures are less severe. Despite this, economic revitalization remains a pressing issue because of deep-rooted structural weaknesses. Regions in this cluster include Castilla-La Mancha (Spain), Ulster and Connacht (Ireland), Sicily (Italy), northern parts of France, Sweden and Norway, large parts of eastern Poland, western Denmark, much of Estonia, and central and eastern Slovakia (Fig. 1). After defining the six regional development clusters, the following analysis explores how electoral support for different party families varies across these region types.

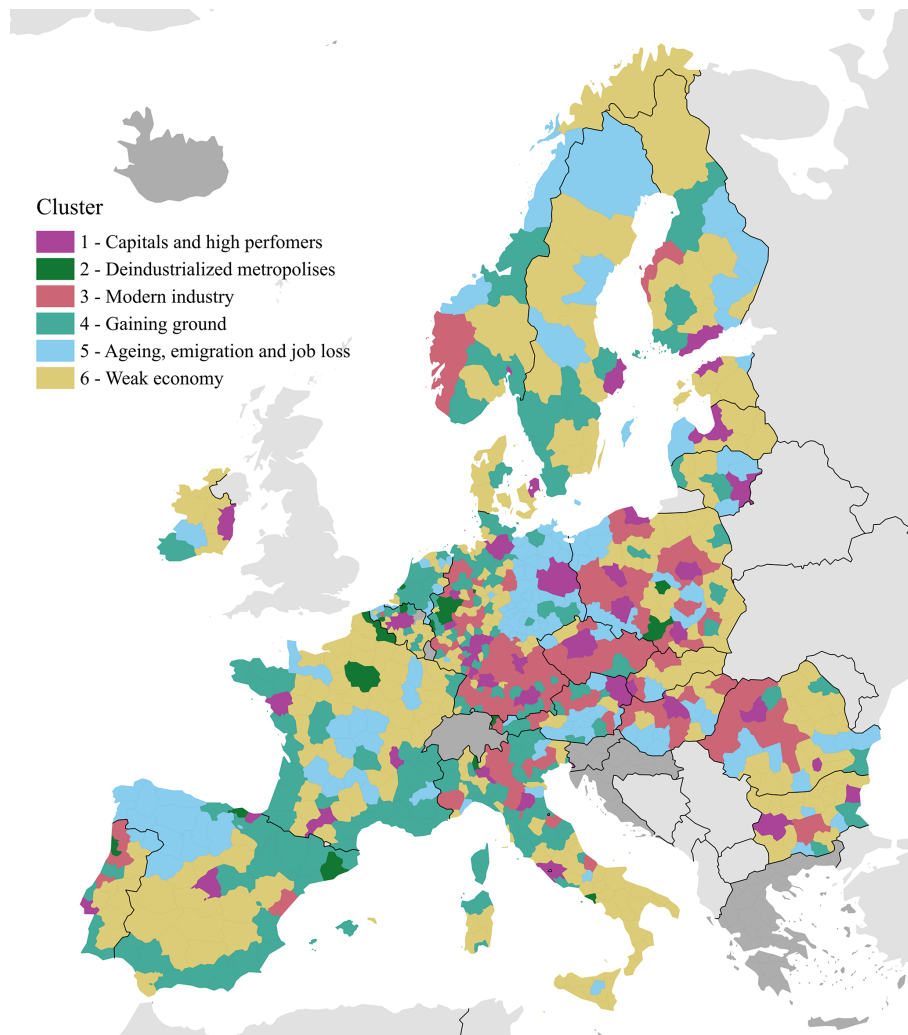


Figure 1. Cluster analysis: region types across Europe.

4.2 Support for party families by cluster

How do the different party families perform in national elections in each of the clusters? Figure 2 shows the country-weighted average regional vote shares for each party family in the most recent national parliamentary elections (as of March 2025) across the six regional clusters. The vote share reflects the average across regions where the parties participated. Each country with valid data contributes equally to the results, regardless of the number of regions in the country. If a party did not participate in a region or country, those values are recorded as missing.

Figure 3 shows deviations in vote share in percentage points. However, because average vote shares vary significantly across party families, these absolute deviations are not directly comparable. Figure 4 instead displays standard deviation from the mean, which standardizes the scale and enables easier comparison across party families. Radical-right parties achieve their highest support in Cluster 5, with av-

erage vote shares 0.91 standard deviations above the overall mean. Support for these parties is also above average in Clusters 3 (*modern industry*) and 6 (*weak economy*), while lower support appears in the more urban Clusters 1 (*capitals and high performers*) and 2 (*deindustrialized metropolises*). Agrarian parties show a similar pattern, but at a lower electoral level, with an average vote share of 9.4 %. They perform weakest in Cluster 1 and strongest in Cluster 5 (*aging, emigration, and job loss*), while Cluster 6 shows relatively low support, and Cluster 4 (*gaining ground*) aligns with the overall average.

Green and radical-left parties show different patterns from radical-right and agrarian parties. Their strongest support is in Cluster 2, with above-average results in Cluster 1. Green parties perform weakest in Cluster 6, while radical-left parties have their lowest support in Cluster 3 and also underperform in Cluster 6. Social-democratic parties receive their lowest vote shares in Cluster 3 (1.77 standard deviations below the mean) and their highest support in Cluster 6. Liberal



Figure 2. Country-weighted average vote shares by party family across regional clusters.

parties have a clear urban focus, with peak support in Cluster 1 and low support in Cluster 5.

The most pronounced effect across all party families is the markedly low support for conservative parties in Cluster 2, which consists of urban and progressive regions. Conservative parties retain strong support in Cluster 3 and are otherwise distributed relatively evenly across the other clusters.

To make sure that results are not driven by single countries or countries with a higher number of regions, sensitivity analyses were conducted (documented in replication code and data). These show that the resulting patterns are broadly generalizable across Europe, although the results for party families that compete in only a small number of countries are somewhat more sensitive to the exclusion of individual countries from the analysis. The results for the Christian-democratic party family are disproportionately driven by Germany, which is also a special case given that the Christian Social Union is particularly successful in Bavaria, where most regions are classified as Cluster 3 (modern industry). The following section discusses these findings in relation to previous research and outlines limitations of the analysis.

5 Discussion

The results have several implications worth discussing in light of previous research. In line with the geography of discontent argument (e.g., Dijkstra et al., 2020), the most disadvantaged regions in Clusters 5 and 6 are the main strongholds of radical-right party support. This confirms previous studies on spatial dimensions of far-right mobilizations. Levels of support for anti-EU (Dijkstra et al., 2020), anti-establishment parties (Koeppen et al., 2021) or populist radical-right parties (Arzheimer et al., 2024) have been shown to be highest in deprived regions. Yet, these studies analyze influence of single indicators, rather than exploring configurations of these (often correlating) indicators. However, the relatively prosperous, industry-based Cluster 3 regions also showed high radical-right-party support, despite positive development and benefits from industrial transformation. The strong radical-right support in Cluster 3 challenges the geography of discontent argument, which interprets anti-system voting behavior as revenge for deindustrialization-associated regional decline (Rodríguez-Pose, 2018; Ejrnæs and Jensen, 2024; Bekhtiar, 2025) and suggests two interpretations. First, the low proportion of highly educated people and the importance

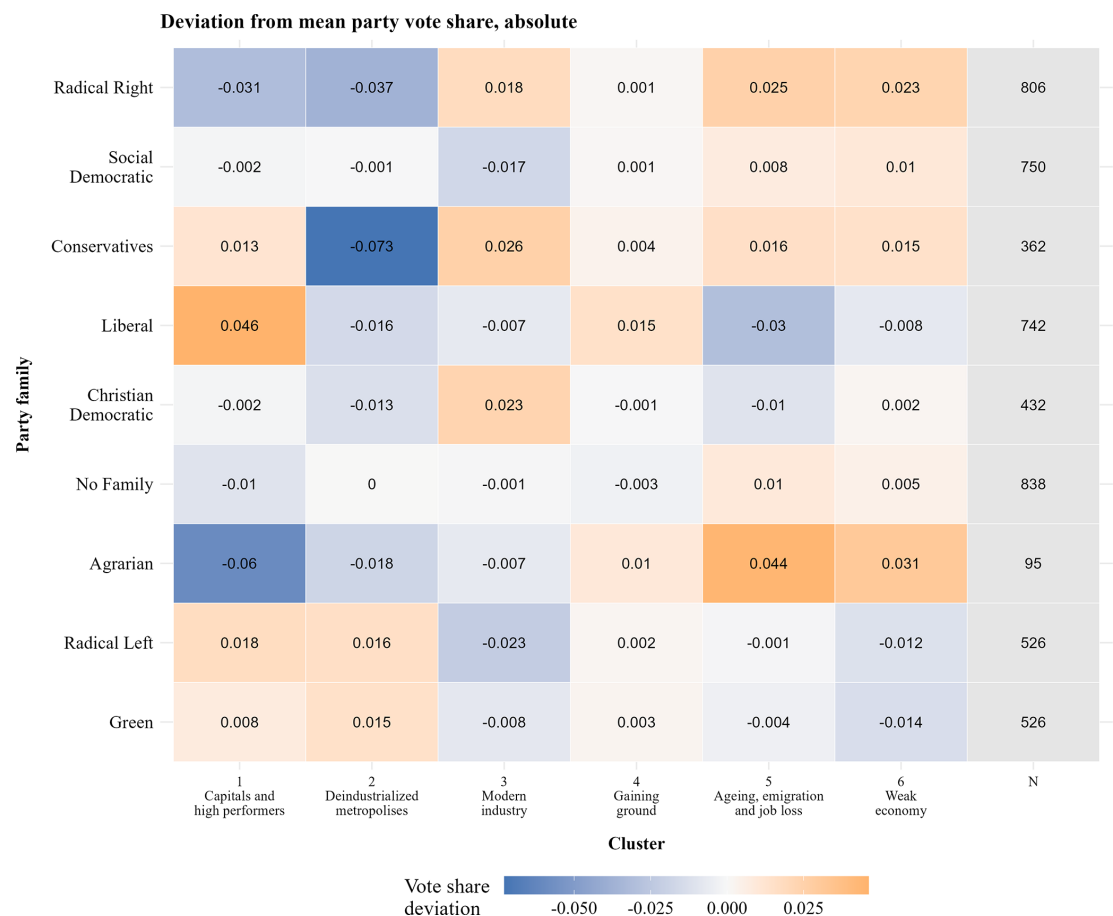


Figure 3. Deviations in party family vote shares by regional cluster (percentage points).

of manufacturing jobs in Cluster 3 indicate composition effects. Individual-level studies have consistently found that workers and people with lower education are more likely to support right-wing populist parties (Gidron and Hall, 2017; Oesch, 2008). Second, previous research has found that many populist radical-right voters have not experienced downward mobility but perceive their status as threatened (Kurer, 2020; Hartmann et al., 2022). Global competition puts pressure on the industrial sector in Europe, which may increase fears of status loss in Cluster 3 and, in turn, raise radical-right voting (Caselli et al., 2020, 2021; Bayerlein et al., 2026). Therefore, both regional opportunity structures and expectations about their future development influence party preferences. It is important to note that other mechanisms not included in this analysis, such as long-standing political culture, networks, or place-based attitudes, also affect electoral patterns (Huijsmans and van der Brug, 2025). These findings can be considered in relation to the mechanisms discussed earlier: while context and composition effects are most directly supported, local culture and history may also help explain persistent regional voting patterns, especially where historical legacies or governance issues influence political attitudes. Previous stud-

ies have shown that spatial patterns of right-wing populist party support are linked to electoral support for right-wing parties over several decades (Goerres et al., 2018; Kölzer et al., 2025). One main contribution is the demonstration that spatial differentiation is not unique to the radical right. All party families exhibit pronounced regional differences, with disproportionately high or low support in some of the six regional development types. This suggests that place should not only be conceptualized as a contextual determinant of far-right support, but increasingly as an organizing dimension of party competition itself. In this sense, the findings support the argument that place deserves higher attention as a political cleavage in contemporary party competition (Ford and Jennings, 2020). Although few parties explicitly campaign on spatial inequalities, space is particularly relevant for the understanding of electoral outcomes. Consistent with cleavage theory, the electorate of agrarian parties (representing rural and agriculture-related interests) is predominantly rural; however, this party family is present in only six countries. Radical-left and green parties display similar spatial patterns,

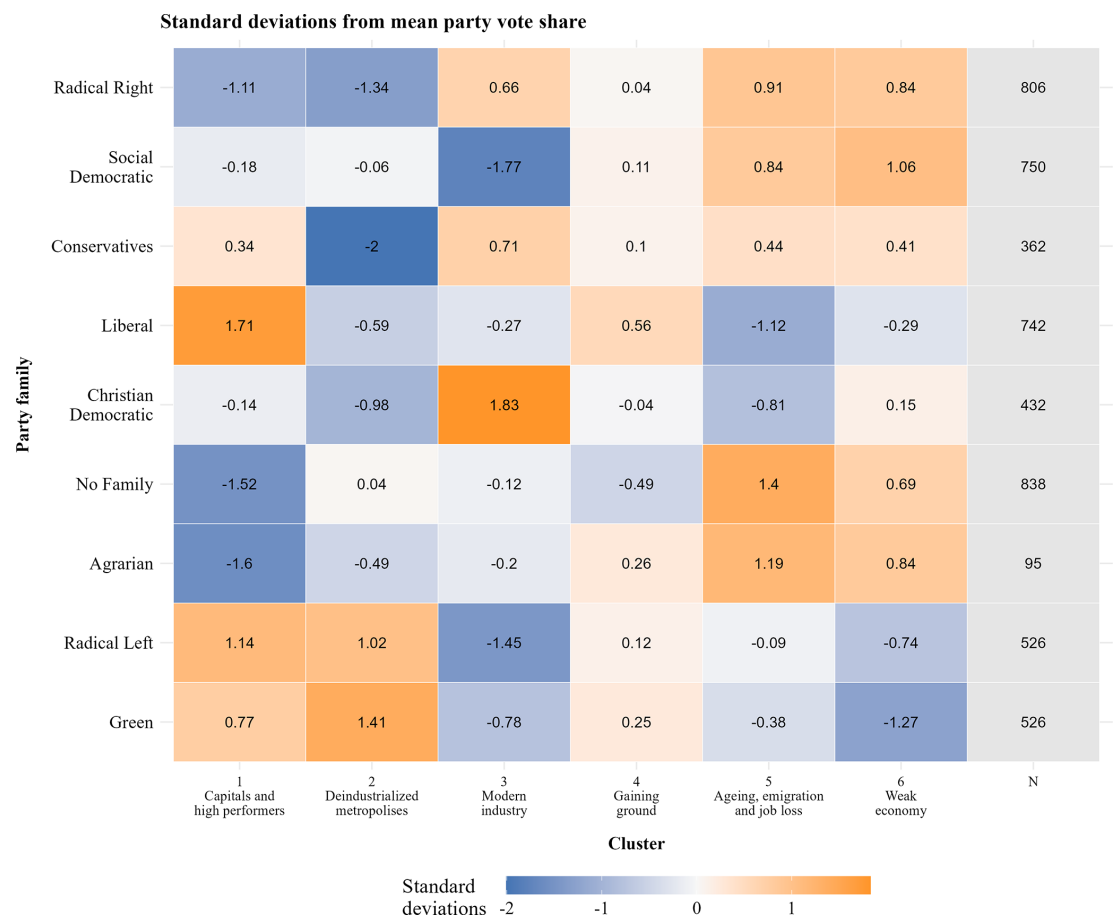


Figure 4. Deviation of vote share from mean of the party family across all regions, expressed as standard deviation.

receiving the highest support in urban regions of Clusters 1 and 2 and the least support in Clusters 3 and 6. This pattern reflects the more liberal, postmaterialist values common in metropolitan areas. These differences are unlikely to decrease as selective migration of more educated individuals (Panichella and Impicciatore, 2024) and those with pro-immigration attitudes (Maxwell, 2019), both predictors of left and green electoral preference, continue to reinforce inter-regional disparities.

The relative weakness of social-democratic parties in Cluster 3 supports previous findings that import shocks from low-wage countries most negatively affect social-democratic election results in industry-based areas, while right-wing parties benefit most from this trend (Mádr, 2025). Social-democratic parties, as former main representatives of the working class, have faced particular challenges from offshoring and outsourcing of manual work to low-wage countries. Despite general struggles of social-democratic parties, the analysis revealed that these parties perform best in the most disadvantaged region types (Clusters 5 and 6). In contrast, conservative and Christian-democratic parties are

strongest in Cluster 3 regions, which include small-town and mainly rural industry-based growth areas.

The second main contribution is of methodological nature. The findings illustrate the potential of a methodological approach that combines regional typologies with electoral results. Most research examines the relationships between individual indicators or indices and election results (or political attitudes). Regional typologies instead capture combinations of demographic, economic, and social characteristics that jointly constitute regional contexts. Electoral behavior is more likely to be influenced by multidimensional configurations that shape regional living conditions and their perception than by isolated context factors.

There are some limitations to this analysis. Including as many countries as possible, especially central and eastern European countries, resulted in restricted data availability. Data on unemployment and poverty were not available for all countries in the analysis. Thus, the cluster analysis lacked an important dimension of regional left-behindness (Bernard et al., 2025) as developments of regional unemployment influence EU support (Katsanidou and Mayne, 2024). Public service provision is another politically relevant aspect of re-

gional inequalities (Stroppe, 2023; Fregoni and Leonardi, 2025), which could not be included because comparable data across Europe were unavailable.

Data limitations also affected party classification, as some successful parties with heterogeneous profiles were included in the “no family” category. Examples include ANO 2011 (CZ), Dawn of Nemunas (LT), and Movimento 5 Stelle (IT). The heterogeneous profiles of these parties reflect the flexible party systems in contemporary European politics. Country-specific analyses (such as for the Czech ANO party; Dvořák et al., 2022) can provide a more detailed understanding. Another limitation of our analytical strategy is the lack of inter-country comparison. Although this perspective is valuable, the study does not compare how clusters form within European countries or how associations between voting patterns and regional clusters differ by country.

6 Conclusion

This study contributes both conceptually and methodologically to research on regional inequalities of voting behavior in Europe. Using *k*-means clustering on country-specific data, I identified six region types that reflect within-country disparities across Europe. This approach enabled the identification of nationally advantaged and disadvantaged regions in 22 European countries, extending previous research focused on the EU15 (Velthuis et al., 2025). Combining the resulting types with electoral outcomes showed that radical-right parties receive most support in the most disadvantaged and in comparatively well-off industry-based regions, while support for green and radical-left parties is concentrated in urban and deindustrialized metropolitan areas. Social-democratic parties are weakest in regions of cluster “modern industry”, while these regions are the strongholds of Christian-democratic and conservative parties.

Methodologically, the analysis demonstrates the value of multidimensional regional typologies for comparative electoral research. As shown above, this typological approach captures configurations of regional characteristics rather than isolated indicators. Grouping regions with similar profiles across multiple dimensions, even when these patterns are not strictly linear, reveals complex spatial structures that conventional methods such as correlations or multivariate regressions may miss. However, regional typologies necessarily use simplified categories that cannot fully reflect the internal heterogeneity within clusters.

Conceptually, the widened focus on all major party families is an insightful expansion of the debate: distinct regional development types are associated with systematic over- or underperformance not only of radical-right or anti-EU parties, but of all party families. Hence, the idea developed above that place functions as an increasingly relevant cleavage in party competition (Ford and Jennings, 2020) is reinforced. Consequently, I recommend broadening research

perspectives and suggest a shift in the guiding question. Instead of only examining the conditions under which voters reject democratic norms, research and policymakers should also address regional factors that foster support for pro-democratic actors. Another future research avenue can be the investigation of inter-country differences in associations of regional characteristics with support of different party families. Also, applying regional typologies for in-depth analysis of single elections or political attitudes seems a promising strategy.

Code and data availability. Data and replication code are available in a public open-access repository: <https://doi.org/10.17605/OSF.IO/W5T6D> (Refisch, 2026).

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