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# The hidden dimension in democracy\*

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# Abstract

The multidimensional dataset provided by the Varieties of Democracy (V-Dem) project reflects the complexity of the concept of democracy. And yet, all standard democracy measures are one-dimensional indices. Through a statistics-based approach, we identify two so-far hidden dimensions in the dataset. The first dimension aligns well with the V-Dem index of Electoral Democracy but the second dimension represents the so-far overlooked trade-off between electoral control and citizen freedom, which clearly distinguishes electoral autocracies from countries in which citizens are free but which struggle with corruption and violence. We interpret this second dimension as capturing a crucial element of stability for non-democracies. Using this second dimension relative to the first, we clarify long-standing debates on ‘waves of democracy’ and open up new avenues in understanding the recent phenomenon of ‘backsliding’ among consolidated democracies.

**Keywords:** democracy, dimensions, dynamics, complexity science

# 1 Introduction

By the end of the 20th century, scholars and practitioners alike had come to see democracy not only as universally valuable, but a logical conclusion of political development (Fukuyama, 1992; Sen, 1999). However, two trends quickly sobered those optimistic views. The first was the observation of autocratic regimes with seemingly democratic institutional features, which some labeled “competitive authoritarian” regimes or “illiberal democracies” (Levitsky and Way, 2002; Zakaria, 1997).<sup>1</sup> The second was the potential for backsliding among established democracies, for which scholars lack explanations (Waldner and Lust, 2018; Hyde, 2020). Countries such as the U.S., India, Nicaragua, Poland, and Hungary are often-cited examples of possible backsliders whose decline became apparent after 2015 (Cianetti, Dawson, and Hanley, 2020; Markey, 2022; Perelló and Navia, 2022).

Both trends set off important debates about the state of democracy worldwide. Scholars questioned whether countries that seemed to be transitioning to democracy were instead adopting a new form of durable authoritarianism (Levitsky and Way, 2010) and whether formerly secure democracies were eroding—or worse, autocratizing (Haggard and Kaufman, 2021; Waldner and Lust, 2018). In part, the ability to answer those questions was limited by theoretical depictions of democracy and autocracy as two ends of a single dimension, which viewed movements away from autocracy (or democracy) as similar in type and involving whole-scale improvements (or weakening) in political institutions (Boese and Wilson, 2022).

Despite the considerable amount of literature that exists on *how* one ought to estimate democracy and the extent to which various measures appear to represent the same concept (Casper and Tufis, 2003; Elkins, 2000; Munck and Verkuilen, 2002), a question that has not been sufficiently addressed is whether a single measure is sufficient to capture the complexity of the concept of democracy—all standard democracy measures are one-dimensional indices. Implicit in a one-dimensional index is the assumption that the features that democracy exhibits can be thought of as one thing. Whether this is the case is important for understanding non-democratic regimes and their consequences. In particular, varieties of them, as we will show, complicate the aim to represent all regimes along a single dimension.

In this contribution we address this ‘dimensionality’ question explicitly with a quantitative approach. We use the multidimensional dataset provided by the Varieties of Democracy (V-Dem) project (Coppedge et al., 2022a), which is a large-scale collaborative effort that uses expert coding to generate quantitative data on the quality of various attributes of democracy (Coppedge et al., 2022b). These datasets are published on an annual basis and are publicly and freely available.<sup>2</sup> Founded in

2010, the V-Dem project provides the most comprehensive data set of attributes of democracy to date (with hundreds of variables aggregated to five main democracy indices covering most countries over a time range of between decades and two centuries) using sophisticated statistical measurement models (Pemstein et al., 2022).

By applying principal component analysis to the subset of the V-Dem data which relates to electoral qualities of democracy, covering the years 1900 to 2021, we identify a two-dimensional subspace that contains over 80% of the variance of the data. The first dimension aligns well with the V-Dem index of Electoral Democracy while the second dimension represents the so-far overlooked trade-off between electoral control and citizen freedom, which clearly separates electoral autocracies from countries in which citizens are free but which struggle with corruption and violence. This second, ‘hidden’ dimension is our main finding and contribution.

We further analyse the two dimensions from the perspective of dynamics. Here, we are able to provide firm evidence for Huntington’s well-known account of three ‘waves’ of democratization across the twentieth century. In addition to this, the second dimension introduced here shows ‘waves of autocratization’ that correspond to increasing electoralism among less democratic regimes. This finding complements empirical assessments of waves of democratization by showing that an increase in the number of democratic countries does not imply a decrease in the number of autocratic countries. It also ties together more discrete typologies of non-democracy, which aimed to identify important institutional differences among autocracies, by using continuous measures to characterize electoral autocracies. This is aligned with others who have constructed latent measures to represent attributes such as personalism (Geddes, Wright, and Frantz, 2014). More importantly, however, we demonstrate that rather than seeing democracy as a single-dimensional attribute, representing it along two or more dimensions allows one to observe movements in the multidimensional space that reveals potential trade-offs among its components. Our findings thus contribute to a general understanding of political development as well as dynamics of institutional change.

## 2 Motivation

A dominant question in comparative politics concerns the patterns by which democracy has developed and spread. Debates about how to conceptualize and measure democracy (Collier and Levitsky, 1997; Munck and Verkuilen, 2002), and the factors that make it more likely,<sup>3</sup> have both shaped and been

informed by descriptive representations of the extent to which levels of democracy changed over time. One well-known account from Huntington (Huntington, 1991) is that it occurred in three ‘waves’ across the twentieth century.<sup>4</sup> Others have explored patterns of autocratization and “reverse waves” (Lührmann and Lindberg, 2019). Conclusions about trends in democracy and autocracy remain mixed and depend in part on how those concepts are measured (Doorenspleet, 2000; Gunitsky, 2018; Strand et al., 2012).

Early empirical treatments of democracy tended to represent it in a binary fashion—e.g., Schumpeter (Schumpeter, 1950) and Huntington (Huntington, 1991)—, classifying countries as either democratic or not. Many scholars still use a binary, categorical approach to representing democracy, such as Cheibub et al. (Cheibub, Gandhi, and Vreeland, 2010) and Boix et al. (Boix, Miller, and Rosato, 2013), adhering to ‘minimal’ criteria to be considered democratic (Alvarez et al., 1996). However, the 1990s saw greater efforts to quantify democracy and widespread use of continuous measures. Improvements in data collection and aggregation methods led to indices that combined together scores representing features such as the extent of competitiveness and inclusion to gauge ‘democraticness’.<sup>5</sup>

The proliferation of quantitative approaches to measuring democracy spawned interest in discerning not the average differences between democracy and dictatorship, but the relationship between the level of democracy and important outcomes, such as welfare spending (Rudra and Haggard, 2005), economic growth (Gerring et al., 2005), and conflict (Savun and Tirone, 2011). The most common continuous measure of democracy used to evaluate questions about correlates and consequences of democraticness was the Polity index (Marshall and Jaggers, 2002), which aggregated estimates of the competitiveness and openness of executive recruitment, the competitiveness and regulation participation, and constraints on the executive, to produce a continuous measure that represented patterns of authority. Conversations subsequently emerged concerning the validity of conclusions based on a continuous measure of democracy, including whether relationships are linear (Vreeland, 2008), the heterogeneity of cases across the measure (Gleditsch and Ward, 1997), and whether democracy is best represented as a single dimension (Strand et al., 2012).<sup>6</sup> Others frequently relied on the index because of its coverage of countries and years but dichotomized democracy by setting a threshold on the index (e.g., Savun and Phillips, 2009). Nevertheless, it became common practice to use a continuous index of democracy to test the impacts of being more democratic and to characterize global trends in the level of democracy. More recent efforts to improve upon the measurement of democracy include the

Varieties of Democracy Project (Coppedge et al., 2022b), a massive data-collection effort that uses advanced estimation techniques to construct high-level indices of electoral and liberal democracy.<sup>7</sup>

In large part, empirical work on causes and consequences of democracy, and depictions of trends in democracy over time, has relied on approaches that aggregate information into one dimension. Combining multiple aspects into a singular dimension implicitly makes one of two assumptions, however. The first assumption is that they correspond together, such that an observation with a higher value on the overarching index has subcomponent values that are greater than or equal to those of an observation with a lower score. An alternative assumption is that some features compensate for others—that what a regime might lack in one quality it makes up for in another, resulting in more of the given concept overall. While not necessarily incorrect, the question remains whether “all things work together for good,” and whether being stronger on some features over others matters for political development. This is central to criticisms that composite indices mask important variations in regimes (Gleditsch and Ward, 1997) and that inconsistencies between different aspects shapes countries’ prospects for democratic development (Dahl, 1971; Knutsen and Nygård, 2015).

This is particularly important for understanding variations in autocracy over time. The literature has long treated authoritarianism as “not democracy” or “less democracy.” The view of democracy as a unidimensional attribute, with more or less, contrasts with portrayals of non-democracies, which emphasize differences in institutions and support coalitions that undergird them (Geddes, 2003; Hadenius and Teorell, 2007; Cheibub, Gandhi, and Vreeland, 2010; Geddes, Wright, and Frantz, 2018). Notwithstanding questions of whether typologies of non-democratic regimes are appropriate, at a minimum scholars distinguish between non-democracies that hold elections and those that do not. The former are referred to as electoral authoritarian, as well as hegemonic-, dominant-, or one-party regimes, which became more prominent after the Cold War (Levitsky and Way, 2010; Gandhi and Lust-Okar, 2009; Lucardi, 2019). Some items that contribute to democracy—in particular, the extent to which the regime allows elections and allows the opposition to participate in them—are also part and parcel of this variety of authoritarianism. Thus, electoral authoritarian and dominant-party regimes should be more likely to score “in the middle” of indices that include that information. Conclusions about the relationship between democraticness and various outcomes could potentially confound “institutionally inconsistent” regimes with stable electoral authoritarian regimes. Some regimes that would be “more democratic” because they appear more liberal in some ways or utilize institutions that are associated with democracy might be more stable. Others that have adopted the “wrong”



institutions or liberalized “incorrectly” would be more likely to fail or experience conflict. As a result, non-democratic regimes—in particular, varieties of them—complicate the ability to represent all regimes along a single dimension.

We should therefore revisit the dimensionality question. Others have empirically explored qualities of democracy along multiple dimensions (Bollen, 1993; Coppedge, Alvarez, and Maldonado, 2008; Miller, 2015). However, previous efforts often took measures from multiple sources and forced them together, which may or may not be congruent.<sup>8</sup> Our approach is different; we use estimates for attributes from the same source (V-Dem) that were designed to go together to measure the same concept.<sup>9</sup> Doing so can help to refine our understanding not only of variations in the quality of regimes, but also how those qualities have changed over time and across space (Gleditsch and Ward, 2006; Boese et al., 2022). Many hold that the world has gotten more democratic, while there has also been an increase in the number of party-based and electoral autocracies (Boese, Lindberg, and Lührmann, 2021). It can therefore help to answer whether there is evidence for “waves” and diffusion over time. We argue that the more nuanced aggregate data created to represent democracy raise an important question concerning dimensions in the data and their value for explaining development. Have “waves” of democracy—particularly if they are based on averages and one-dimensional data—obscured important transformations in its sub-components?

## 3 Materials and Methods

### 3.1 Data

The Varieties of Democracy project is a large-scale collaborative effort that uses expert coding to generate quantitative data on the quality of various attributes of democracy (Coppedge et al., 2022b).<sup>10</sup> The project involves surveying a large number of country experts and using a Bayesian measurement model to estimate latent values for institutions that Dahl (Dahl, 1971) argued contributed to democracy. The surveys tend to ask respondents to rate the level of openness/strength of an institution, such as election intimidation or media censorship, on an ordinal scale (e.g., “low,” “intermediate,” “high”). Based on the responses, the measurement model estimates reliability between respondents and generates point estimates with uncertainty for each question. The resulting estimates are provided

on different scales—the point estimates, values converted back to the original scale (suffixed by *\_osp*), and values “ordinalized” by linking them back to the closest survey response (suffixed by *\_ord*).

The project also combines information for different attributes into indices that represent specific concepts such as the freedom of expression and election quality. These “mid-level indices” are also used to produce superordinate indices that represent democracy more generally. One of the primary indices that V-Dem publishes is the Electoral Democracy Index (EDI, *v2x\_polyarchy*), which aims to represent the combined institutional guarantees suggested by Dahl (Dahl, 1971).<sup>11</sup> The EDI is created by aggregating together five items: an index of the extent to which officials are elected (*v2x\_elecoff*), indices for the freedoms of expression and association (*v2x\_freexp-altinf* and *v2x\_frassoc\_thick*), an index representing the quality of elections (*v2xel\_frefair*) and an estimate of the share of the population with suffrage (*v2x\_suffr*). The aggregation method used by V-Dem is a compromise between a multiplicative and additive approach.<sup>12</sup>

In all, the EDI comprises information on approximately 45 different measures: 20 related to elected officials; 9 pertaining to free expression; 6 components of the freedom of association; 8 attributes for clean elections, and suffrage.<sup>13</sup> Because all of the measures that make up the elected officials index are binary variables (e.g., whether the head of state is directly elected or not), we focus our analysis on the 24 remaining indicators (omitting whether the regime is an electoral regime, which is also binary). Our analysis involves examining variation within the remaining components that compose the indices for free association and expression, clean elections, and suffrage. Because election variables are only coded for the years in which there were elections,<sup>14</sup> we filled in missing values for up to five years between elections. We also omitted missing values through listwise deletion, ensuring that there are values for each variable for all observations in the sample.

## 4 Methods

To evaluate the extent to which there are underlying dimensions in the data, we use principal component analysis (PCA). PCA is one of the most simple and robust techniques for dimensionality reduction. It is one of a family of statistical techniques for representing high-dimensional data on a lower-dimensional linear subspace with as little information loss as possible. The technique uses the covariance matrix of the data, whose (always orthogonal) eigenvectors are the so-called *principal components*. These eigenvectors span a new coordinate system which is rotated relative to the old one and

translated such that the mean of the data is at the origin. The variance retained by projecting onto any one of the *principal components* is given by the corresponding eigenvector's eigenvalue. Given a  $p$ -dimensional data set, the technique projects the data onto the first  $q$  eigenvectors, ordered by decreasing eigenvalue, choosing  $q$  such that a sufficiently large total amount of variance is retained. In other words, the total amount of variance retained (explained) by the first  $q$  components is given by the relative proportion of the sum of the corresponding  $q$  eigenvalues.<sup>15</sup>

The first two principal components account for almost 80 percent of variation in the data. Values for the loadings between V-Dem variables and the first two components are summarized by Figure 1. PC1 and PC2 roughly fall between -11 and 7, and -5 and 5, respectively. For easier comparability of the components, we rescaled the component values to fall within the interval  $[-1, 1]$  while preserving the mean of zero. Figure A1 in the Appendix shows the cumulative variance retained as a function of the number of principal components  $q$  that are included and how the original variables load onto these first two components.

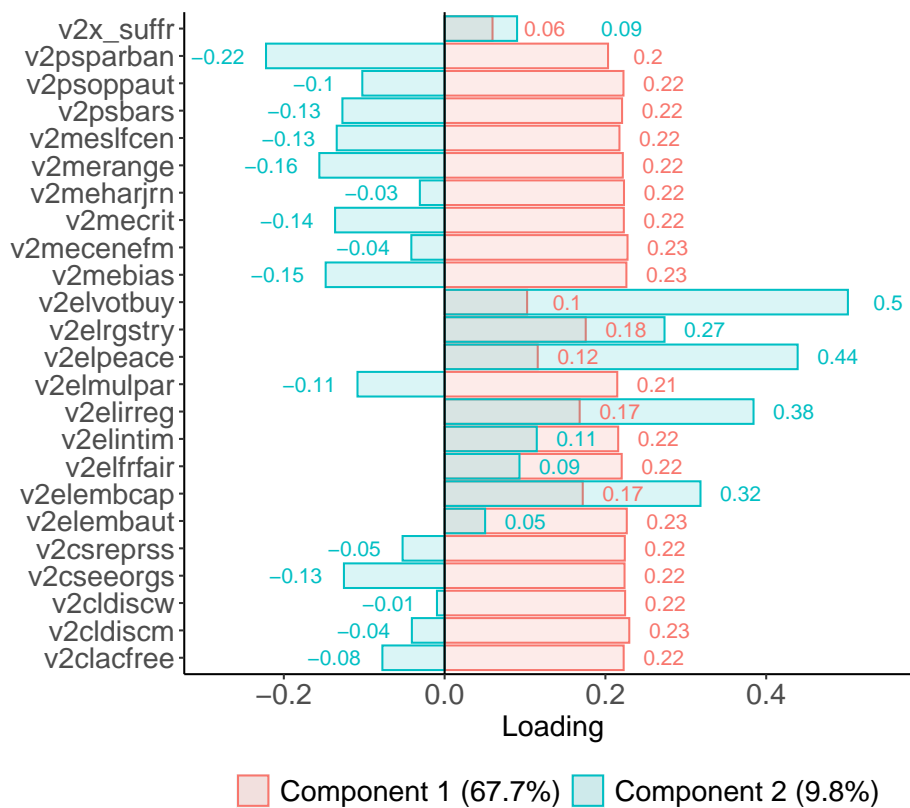


Figure 1. Variable loadings on first two components.

As the component loadings indicate, the first component more strongly aligns with measures representing civic freedoms such as the freedom of expression and association. Component 2, by

contrast, is more strongly associated with aspects related to election quality and election management capacity that have a positive loading. and specifically with the absence of vote buying, election irregularities and violence. Measures representing civic freedoms show a negative loading on the second component. Though interpreting the meaning of latent estimates is often subjective, the association between the first two components and the variables suggests that the first component more closely represents the quality of civil rights and liberties, while the second indicates the state’s ability to effectively carry out elections. This is supported by the observation that some election variables that are particularly important for respecting citizens’ preferences, such as the autonomy of election management, election fairness, and absence of intimidation, are more strongly associated with the first component.

## 5 Results

Figures 2A and B show the V-Dem Electoral Democracy Index (EDI, *v2.polyarchy*) plotted against each of the first two principal components. The Pearson product-moment correlation between PC1 and EDI is very high ( $\rho = 0.941$ ). The scoring of variables is designed such that a high score indicates ‘democraticness’ and a low score indicates the lack thereof. Thus, the high correlation between PC1 and the EDI is consistent with the fact that the first component has positive correlations with all 24 of the variables. It confirms that, overall, the EDI is well-designed as a measure of democracy. Higher values on the Electoral Democracy Index tend to be associated with higher values across all of the variables used to represent it. Notably, the second component is very weakly correlated with the EDI ( $\rho = 0.124$ ), due to the fact that the relationship follows a C-shaped curve.<sup>16</sup> Above the midpoint of the democracy index, higher levels of democracy are positively associated with higher values for the second component. The relationship is less clear below the middle, however, as less-democratic regimes span almost the entire unit interval for component 2. This would suggest that more democratic regimes are more likely to be able to effectively carry out elections, but that some very non-democratic countries—which would be quite low on the first component—are also associated with capable elections.

The relationship between the two principle components is shown in Figure 2C. Compared against each other, the first two components show a U-shaped relationship. Among observations with positive values for component 1, there is a tighter, positive relationship with component 2, in which countries

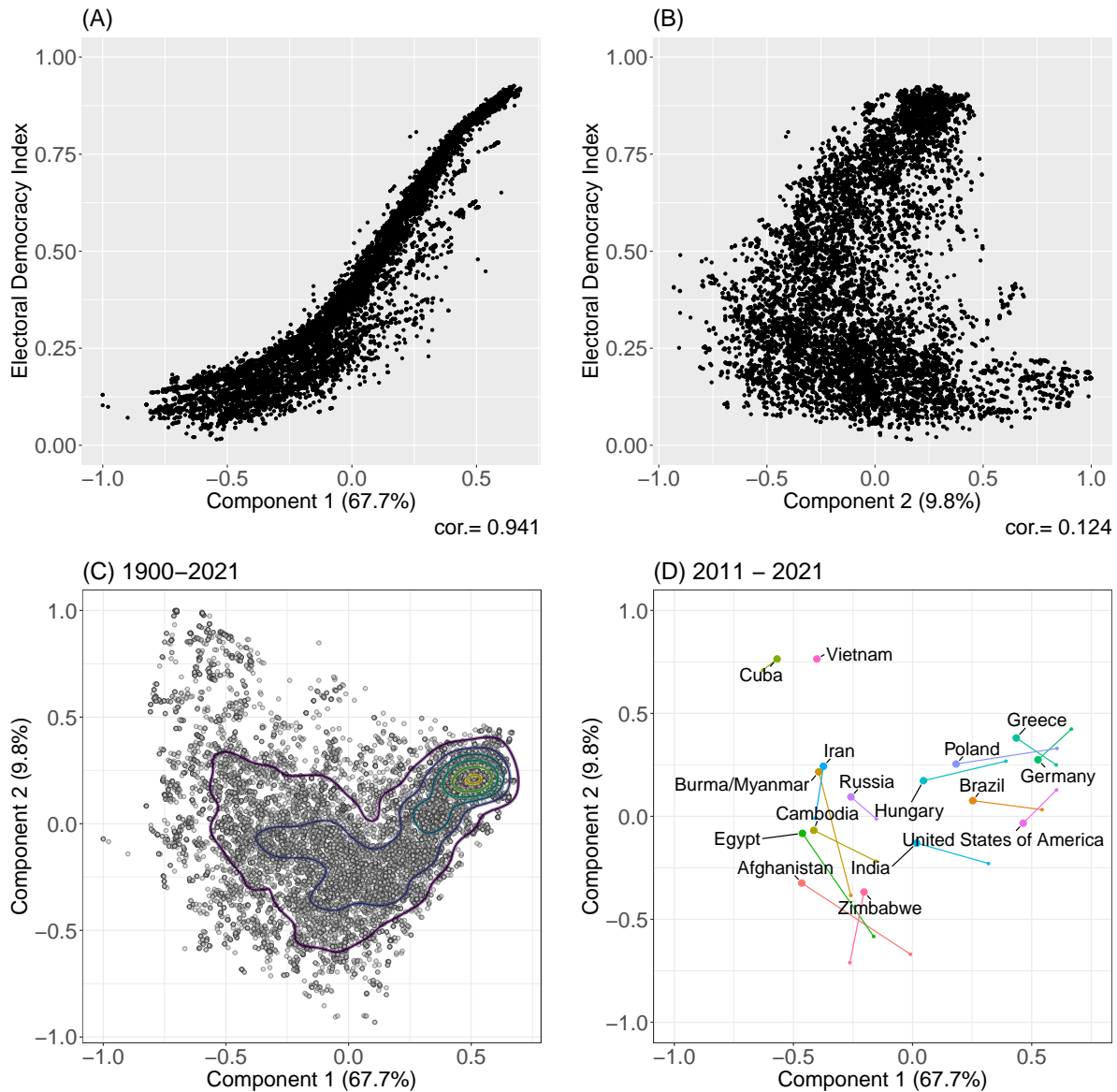


Figure 2. Relationships between each component and the Electoral Democracy Index (A and B); first two components (C) with kernel-density estimates and (D) positions at 2021 (large circle) and 2011 (small circle) for select countries.

that safeguard civil liberties also tend to deliver relatively effective elections. Towards more negative values of component 1, observations are much more spread out—many observations that would score very low on civil liberties or democracy overall are associated with capable elections.

Figure 2D shows the location of specific countries on these two dimensions in 2021 and the extent of changes over a decade. One group, of which Greece, Brazil and India are examples, start out from a relatively high level of EDI ( $> 0.7$ ) and have increased in PC2 value since 2011. In contrast, Poland, Hungary, and the United States of America, also start out from a relatively high level of EDI ( $> 0.7$ ) and have decreased in PC2. Thus, among democratic backsliders, some show increased

control over the dimension representing election capacity, while others do not. A third group, of which Russia, Zimbabwe, Afghanistan, Egypt, Cambodia, Burma/Myanmar and Iran are examples, started out relatively low on the EDI ( $< 0.4$ ) and shows a marked increase in PC2. Some less democratic countries seem to be autocratizing while also enhancing control over elections. Positive changes in the second dimension are evident both in countries that are becoming less democratic according to the EDI and those that have become more democratic over the last decade, such as Iran, Zimbabwe, Cuba, and Vietnam. Egypt has decreased only slightly in its EDI (less than Germany) while having moved a considerable distance in both PC1 and PC2.

This supports several observations. First, more stable democracies tend to score high on component 1 and in the middle of component 2, while countries known to be electoral and one-party autocracies, such as Cuba and Vietnam, score high on component 2 and low on component 1. Second, across the last decade substantial declines have occurred in EDI for all shown countries except Iran, Cuba, and Vietnam. At the same, however, many countries saw an increase in the second component, which corresponds to increased control over the conduct of elections. Taken together (third), such changes did not necessarily involve decreases in both components but instead exhibit a clock-wise trend that may depend on the start position of the observation in this two-dimensional space. Evaluating democratic improvements based solely on the EDI may therefore disguise changes in countries that are adopting a more stable form of autocracy by seeking to carry out controlled elections; it may also confound such cases with democratizing countries that are improving the quality of elections.

The non-linear relationship between the second principal component and democracy, and its association with strong one-party states, suggests that—by distinguishing between low-democracy regimes—it picks up a potentially meaningful quality of political regimes that would otherwise be obscured by the single dimension represented by the EDI. As illustrated in Figure A1, the first component has only positive loadings but variables load both positively and negatively on the second. Principal component 2 separates countries that hold better organised elections but that potentially suppress opposition, civil organizations, and the media to deliver the outcome from those that hold freer elections but are at the same time more affected by violence and corruption. This distinction may therefore separate out strong autocratic regimes that govern through controlled elections from other forms of non-democracy.

## 5.1 Evaluating construct validity

The claim that differences between the first and second principal components characterize party-based or electoral authoritarian rule is a conjecture—inferred based on relationships between the components and the variables that were used to construct them. One way of validating this claim is to examine the placement of observations that are categorically distinct. Nominal classifications of regime type aim to distinguish between regimes that are institutionally different. Though valuable for marking important distinctions and testing theoretical questions about those differences, they also run the risk of concealing important nuances among the items within each category. Considering the extent to which categorical regime depictions overlap on the first two dimensions from the EDI components thus serves to both confirm whether the continuous measures tell us anything distinct about differences among regimes as well as to highlight meaningful variations within regime categories.

Figure 3 shows how observations are plotted along the dimensions represented by the first two components according to four nominal/ordinal measures of regime type. The top row of the figure distinguishes between democracies and non-democracies; the bottom row pertains exclusively to differences among non-democracies. The upper-left panel (A) of Figure 3 shows differences between democracies and non-democracies as coded by Boix, Miller, and Rosato (2013) based on whether political leaders are chosen through free and fair elections and there is a minimal level of suffrage. The plot shows fairly clear separation between regimes that the authors coded as democracies versus non-democracies—democracies tend to score higher on the first component than non-democracies but can score both negatively and positively on the second, whereas autocratic regimes tend to score negatively on the first component and span the range of the second component.

The upper-right panel (B) shows differences between regimes classified by Lührmann, Tannenburg, and Lindberg (2018), who distinguish between closed autocracies, electoral autocracies, and electoral and liberal democracies. Boix, Miller, and Rosato (2013), who relied on more discrete, user-determined responses to separate regimes, the *Regimes of the World* categorization is defined by how observations score on different continuous measures that are part of the V-Dem dataset. Notably, the distinction between electoral democracies and between closed and electoral autocracies concerns the extent to which elections are multiparty.<sup>17</sup> As with the Boix, Miller, and Rosato (2013) coding, both electoral and liberal democracies score above zero on the first principal component and cluster more tightly around zero on the second. Closed autocracies—less democratic regimes that held elections but restricted multiparty participation—score lower on the first component and tend to oc-

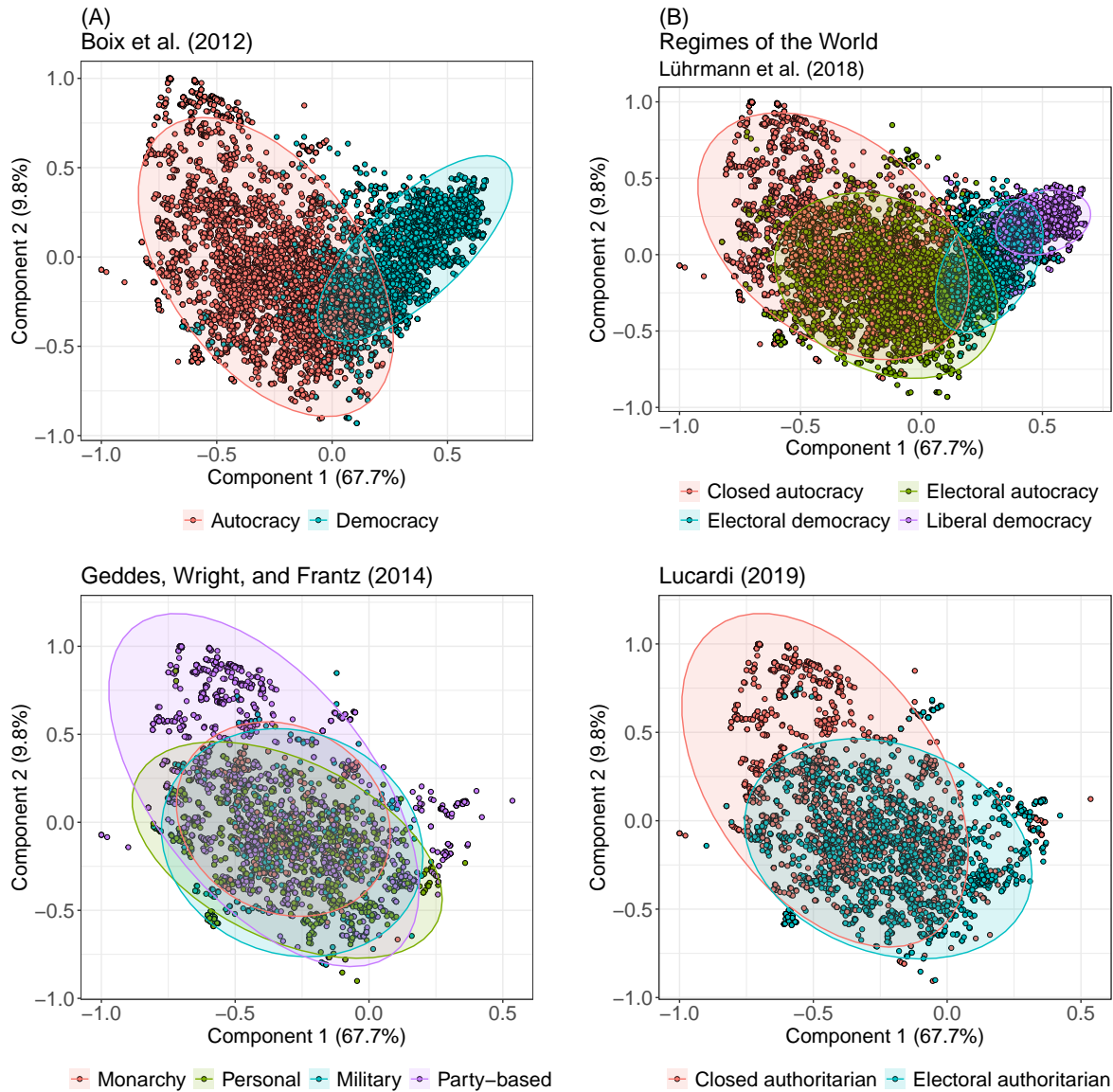


Figure 3. Regime categories mapped onto principal components.

occupy the upper-left corner in the two-dimensional space. Both Boix, Miller, and Rosato (2013) and Lührmann, Tannenburg, and Lindberg (2018) show considerable differences between democracies and non-democracies.

There are also clear differences in regime-type classifications that focus on autocracies. The widely regarded nominal distinctions by Geddes, Wright, and Frantz (2014), which built on and expanded the categories originally described by Geddes (2003), identify monarchies, personalist, military-led, and party-based regimes as forms of dictatorship whose institutional differences help to explain variations in outcomes for non-democracies.<sup>18</sup> The bottom-left panel (C) shows that, while all four types occupy similar space in the plot, those observations that are highest on principal component 2



and lowest on principal component 1 are party-based dictatorships. Lucardi (2019) further built on the regimes coded by Geddes, Wright, and Frantz (2014), distinguishing between what they called *closed autocracies* and *electoral authoritarian regimes*. The bottom-right panel (D) of Figure 3 would appear contradictory to our expectations that electoral authoritarian regimes would score higher on the second component. However, a careful reading of their operationalization suggests that the distinction really reflects the degree of *competitiveness* of elections.<sup>19</sup> Thus, among non-democracies coded by Geddes, Wright, and Frantz (2014) that held elections, those that either restricted elections to the legislature or held less competitive elections were among the observations that tended to score higher on the second dimension and lower on the first. Figure A2 in the Appendix also shows differences among observations coded based on a lexical index of democracy (Skaaning, Gerring, and Bartusevičius, 2015), showing that this corresponds to regimes that qualified as no party or one-party rule.

## 5.2 Spatial dynamics

The second dimension that we have identified within the Electoral Democracy Index and that corresponds to electoral authoritarianism allows us to evaluate how observations have moved over time along these two dimensions. Although the principal-component data are relative data, in the sense that the value zero is the mean of the data across all years and countries, the mean is a good reference point to consider changes across the temporal domain, which spans 1900–2021. Figure 4 shows country-year events in the PC1–PC2 plane, binned by decade. The number of points in each plot increases over time simply because the number of countries in the world has increased by almost a factor of 6 between 1900 and 2021. Contour lines show a standard 2-D kernel density estimate.

A feature that is more or less steady across the plots is the cluster of points in the upper right quadrant of the plane (between  $PC2=0$  and  $PC1=PC2$ ). This cluster is present in all plots and gaining mass almost every decade. All countries that are considered consolidated (established) democracies are part of this cluster, such as Denmark since 1900 (with the exception of the period just before and during WWII, partly due to its occupation by Nazi-Germany over 1940–1945), France, Switzerland and the United States since the 1970s, to mention a few.

The remaining density of points exhibits some interesting non-stationary features. The upper-left corner, for example, is empty until the 1940s, when a cloud of points starts to move toward it,

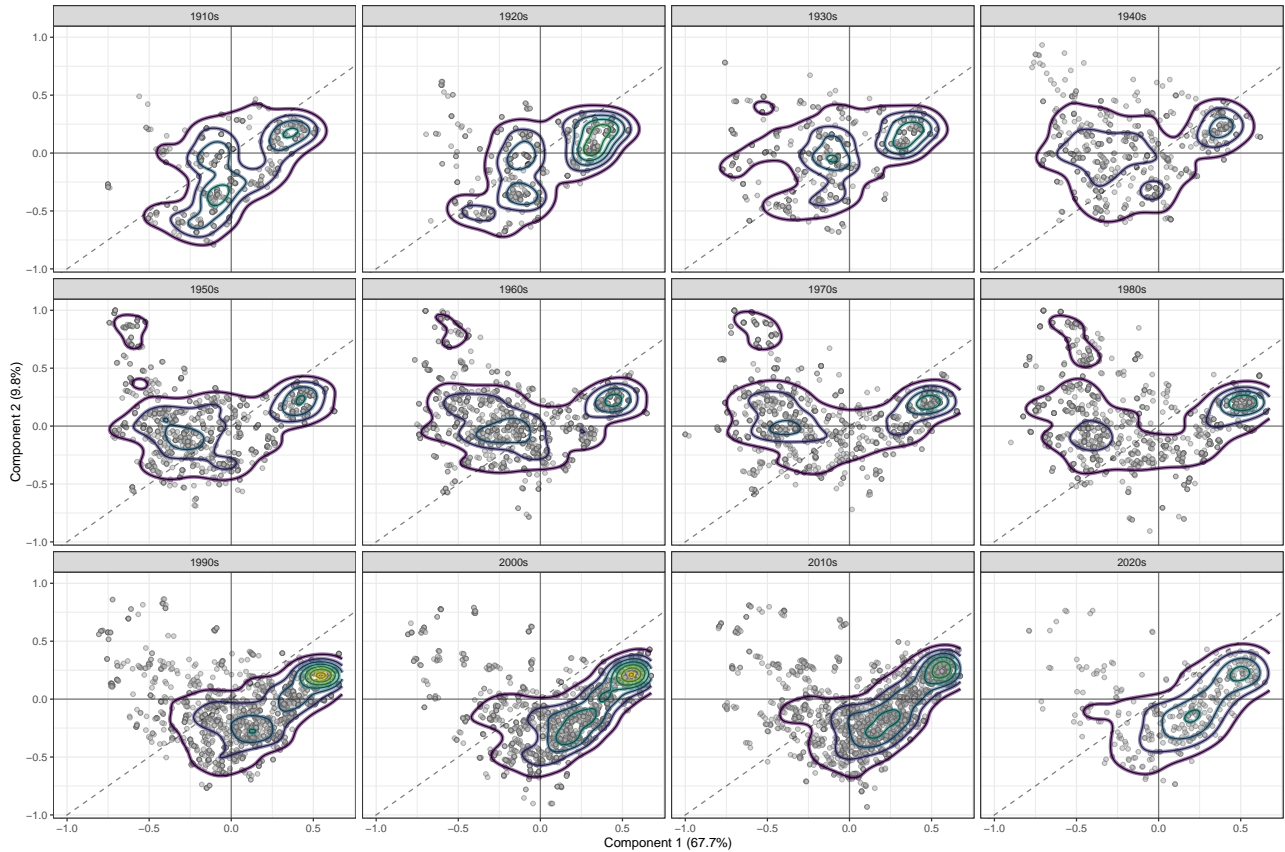


Figure 4. Density plot of countries across the first two components, by decade. Percentages in axis labels give the proportion of variance explained by each component. The (dashed) line  $PC1 = PC2$  is added as visual guide.

having formed into a considerable density by the 1960s. Non-democracies that hold elections, referred to as electoral authoritarian, or hegemonic-, dominant-, or one-party regimes, became more prominent after the Cold War (Levitsky and Way, 2010; Gandhi and Lust-Okar, 2009; Lucardi, 2019). This leads to a markedly U-shaped distribution overall between the 1950s until the 1990s. As we previously noted, the cluster in the upper-left predominately contains electoral autocracies. This development illustrates the emergence of a relatively new state form toward the end of the first half of the 20th century which did not exist early on. The U shape among observations begins to dissolve in the 1990s, and from 2000 on, the bulk of countries is located below where  $PC1$  equals  $PC2$ .

The positions of observations in each decade reveal that starting in the 1950s—which inaugurated decolonization across much of Africa and Asia—, a mass of countries developed that was less democratic overall but that ruled through elections. Corresponding with the fall of the Soviet Union, the bulk of countries shifted in a counter-clockwise fashion towards higher values of  $PC1$  and lower values of  $PC2$ . Popular examples in this group include Mexico and South Africa, which saw transitions away from one-party rule. Among those that scored low on  $PC1$ , points that are lowest on

PC2 include Afghanistan, Somalia, and the Republic of Congo, which have been considered neither very democratic nor stable autocracies either. Rather, they have been embroiled in violent internal conflicts and marred by corruption that contribute to state weakness. In addition to showing the rise of “quasi-democratic” states that challenged predictions about democratization, the second dimension helps to distinguish less democratic regimes that also have lower levels of state capacity.

### 5.3 Waves of Democracy

We now return to the question whether levels of democracy have changed in a wave-like fashion over time. One well-known account from Huntington (1991) says that democratization occurred in three ‘waves’ across the twentieth century. Based on the results shown in the previous section, the diagonal  $PC1=PC2$  provides an informative divide between more democratic regimes and those that are less democratic but exert greater control over elections. We therefore use this line to denote democratization events as the crossing from  $PC1 < PC2$  to  $PC1 > PC2$ . Crossing in the opposite direction defines a transition toward (electoral) autocracy. This choice also captures the essence of the various classifications shown in Fig. 3.

In Fig. 5 on the left (A), we show the absolute number of countries above (red) and below (blue) the  $PC1=PC2$  line. On the right (B), we show the same data but as relative numbers. Concentrating on the left figure, we see the number of countries in blue (below the diagonal) changing in three major wave-like movements over the course of the twentieth century. The first wave is an increase in the number of democratic (blue) countries up to WWI, followed by a decline and a subsequent collapse during WWII. It should be noted that the total number of countries also collapses during WWII, which is mostly driven by hostile occupation. The second wave starts after WWII when we see a steady increase of countries below the diagonal again, followed by a slight decline in the 1970s. The third and strongest wave starts in the 1990s, mostly due to the collapse of the Soviet Union, and continues until the 2010s. These three movements broadly agree with Huntington’s account of the three ‘waves’ across the twentieth century.

The number of countries above the diagonal (in red) also shows a wave-like pattern, but not anti-symmetric to the number of countries below the diagonal. Instead, we observe the number of more autocratic countries (above the diagonal) steadily increasing until the beginning of WWII, during which it declines. This decline is mostly due to a collapse in the total number of countries. After WWII, the number increases, notably with a higher rate than the increase of the number of more

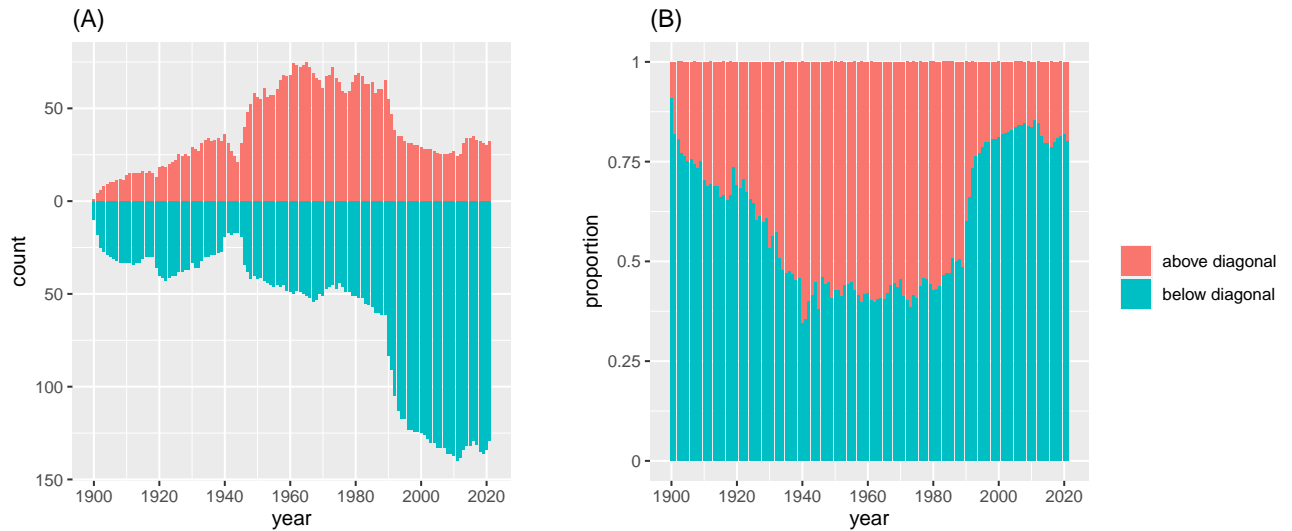


Figure 5. Countries above and below the diagonal  $PC1=PC2$  by year.

democratic countries (below the diagonal) increases. This trend then remains fairly steady across the 1970s and 1980s following decolonization in Africa and Asia. With the fall of the Soviet Union around 1990s, however, the number of countries above the diagonal between  $PC1$  and  $PC2$  sharply declined and remained fairly constant since then, though a slight increase is visible after 2012. Considering this second dimension—electoralism—against democracy more generally evidences that the regimes that emerged out of decolonization and during the Cold War spawned changes that were more democratic in some respects but that did not represent democratization in a fuller sense.

## 6 Discussion

We observed three clearly distinct features in the two-dimensional plane obtained from using principal component analysis on the V-Dem data: the comparatively stable position of a democratic cluster throughout the twentieth century, the emergence of an autocratic cluster in the 1940s, and the apparent movement from one to the other via a below-center region. In the beginning of the twentieth century, most countries were located just below and along the diagonal. Both the political developments that precipitated World War II and newly independent governments that followed decolonization across Africa and Asia between the 1950s and 1970s led to governments that ruled by elections but either did so fraudulently or by limiting the freedoms enjoyed by citizens. The widespread emergence of electoral authoritarian regimes, which included the Soviet bloc and countries such as Mongolia, Laos, Burundi, and Rwanda, shifted the mass upwards towards the upper-left corner. This occurred even as others

remained in the more fixed, democratic position in the right half of the plane. Average values of the second component increased and remained higher than those for the first component, a trend that did not reverse until dramatic regime changes in the 1990s. Transitions away from this area towards the more democratic subspace appear to involve the regime losing control over electoral outcomes at the same time that citizens gained more extensive freedoms.

The patterns that we identified exhibit qualities of a complex system and encourages scholars who are interested in political development to explore this avenue to uncover new information about the dynamics of regime change. A democratically governed society is, in essence, a self-organising system. The countries' citizens interact in a variety of ways—in political parties, non-governmental organizations, within families, cities, regions etc.—and out of these many interactions (including elections) emerges a robust structure of state institutions with judicial, legislative, and executive power. In consolidated democracies these structures are robust but never static, since they are constantly reevaluated and appointed to individuals only for a limited period of time. Furthermore, and very importantly, no decision capability is concentrated in one person or small group independent of the rest. A democratically governed country is thus an example of a self-organising, complex system (Eliassi-Rad et al., 2020).

The relatively stable position across the twentieth century of the cluster of democratic countries just above the mean value of PC2 suggests that consolidated democracies strike a balance between 'order' and 'disorder'—effectively carrying out elections and controlling violence (positive PC2 values) and respecting citizens' liberties (negative PC2 values) in a way that maximizes the overall democratic quality of government (positive PC1 values). *Civic freedom*, then, one might say, comes at the cost of (some) disorder. And this disorder might well be the insurance for the persistence of *civic freedom*.

In complexity science, it is a well-known phenomenon that complex systems self-organise into a stable structures due to, not in spite of, the presence of noise (Ladyman and Wiesner, 2020; Morin, 1977). Our results suggest that the interplay between order (effective election management) and disorder (individual freedom) in democracies is crucial for their function and resilience, confirming earlier discussions both from a complexity science (Wiesner et al., 2018; Eliassi-Rad et al., 2020) and from a political science perspective (Runciman, 2018a; Mounk, 2022). We believe this capacity for self-correction – for which our results provide the first quantitative evidence – to be crucial for a democracy's ability at sustaining free, innovative, peaceful, and prosperous societies. Runciman describes it as the following: “[t]he randomness of democracy – which remains its essential quality

– protects us against getting stuck with truly bad ideas. It means that nothing will last for long, because something else will come along to disrupt it” (Runciman, 2018b).

## 7 Conclusion

There are two major conclusions from our analysis of principal components of the V-Dem Electoral Democracy Index. The first is that, contrary to assumptions behind the constructions of single-dimensional indices, the underlying components that compose it do not necessarily have to improve together or substitute for one another. Instead, the findings suggest that there may be a trade-off between the order provided by *controlled* elections and the liberty that connotes democracy. This helps to explain why some areas of the two-dimensional space are not to be occupied.

The first dimension aligns well with the V-Dem index of Electoral Democracy. The loadings of the second component show that a positive score aligns with tightly run elections and few citizen freedoms, while a negative score aligns with a larger degree of citizen freedom and a higher degree in the potential for violence and corruption. Thus, the second component represents the so-far overlooked trade-off between state control over elections and citizen freedom and allows us to clearly separate electoral autocracies from countries in which citizens are free but that may struggle with corruption and violence. We have argued that this second dimension captures a crucial element of stability for non-democracies. The mid-range score in the second dimension of the more well-regarded democracies indicates that there may be a necessary trade-off between state control and citizen freedom for the stability of a democracy.

By examining democratic changes in a multi-dimensional space, we also highlight the potential to uncover new information about dynamics concerning how regimes change. This provides a new window into dynamics of diffusion, for example, going beyond the ways that countries influence each other over time and through geographical proximity to include institutional ‘mimicry’. Exploiting the ‘hidden’ dimensions within singularly constructed democracy indices may therefore shed new light on how qualities of democracy are in flux across space (Gleditsch and Ward, 2006; Boese et al., 2022) and contribute to explanations of both its dynamicness as well as its overall stability. Given the prominence of elections across all regimes<sup>20</sup>, this seems especially promising.

Using the second dimension relative to the first, we clarified long-standing debates on ‘waves of democracy’ by providing quantitative evidence for Huntington’s waves. We further contributed to

the debate by providing quantitative evidence for ‘waves of autocracy’. An increase in the number of autocratic countries is not simply the consequence in the decrease of the number of more democratic countries but exhibits its own wavelike pattern across the twentieth century. Notwithstanding other institutionalized forms of autocratic rule, relationships in the data suggest that the development of electoral authoritarian regimes—particularly among newly decolonized countries—contributed to this trend. The role of elections in supporting and sustaining non-democracy is therefore an important element that correlates with democracy but that is potentially obscured by measures that collapse democraticness into one dimension.

In the last decade, we have observed a ‘backsliding’ among democracies such as Hungary, Poland, and the United States, which we lack theories to explain (Waldner and Lust, 2018). Hyde (2020), reviewing reasons for backsliding, speaks about ‘pseudo-democracies’, hybrid regimes that combine aspects of democracy and authoritarianism. According to Hyde, measuring the extent of ‘pseudo-democracy’ is fundamental to understanding of backsliding. It is our hidden dimension of democracy that might well be able to stand as a measure of ‘pseudoness’ in Hyde’s conceptualization. Incorporating a *second dimension of democracy* that taps into regimes’ ability to control the outcome of elections may help explain the ways in which the qualities of democracy are in flux and contribute to explanations of both its dynamicness as well as its overall stability.

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# Appendix

## Principle component analysis

Figure A1 (left side) shows the cumulative variance retained as a function of the number of principal components  $q$  that are included, for the 24-dimensional data set. The first two principal components account for almost 80 percent of variation in the data. Including the third principal component increases the amount of variance retained by about 5 percent. This component is almost exclusively aligned along the suffrage dimension of the original data (loading of  $-0.84$ ) and thus adds little information. We therefore focus our analysis on the linear subspace spanned by the first two principal components (PC1 and PC2). The right side of Figure A1 shows how the original variables load onto these first two components, coloured according to V-Dem's variable classification.

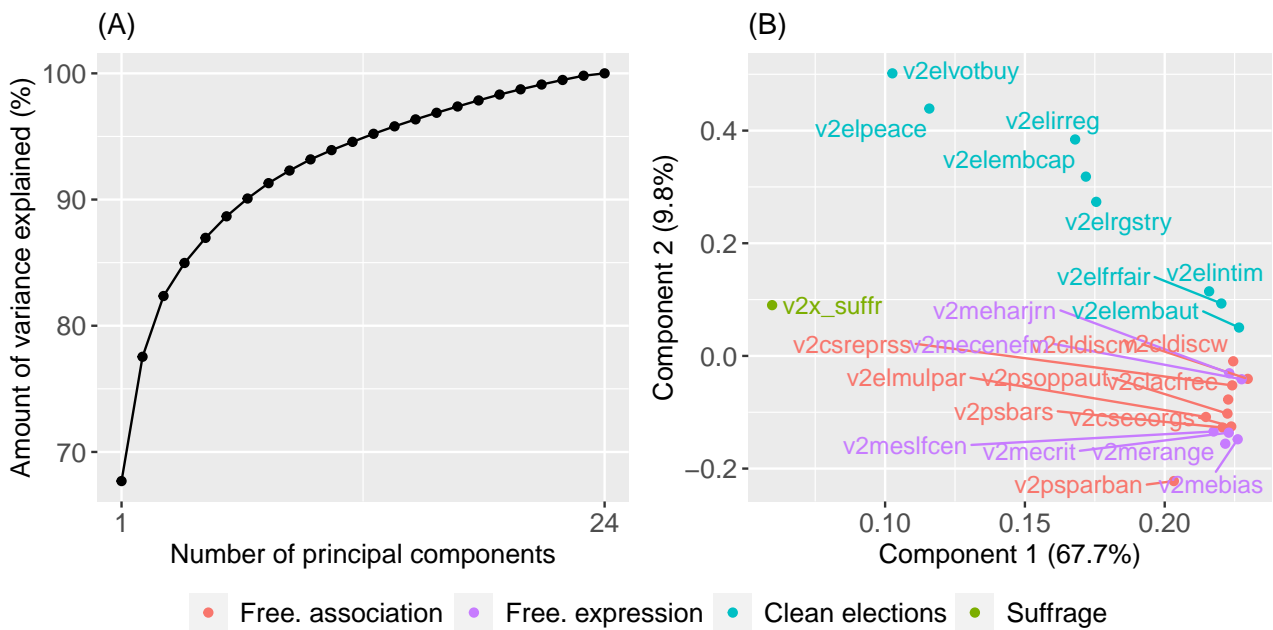


Figure A1. Result of principal component analysis. Variance explained by number of components (left) and variable loading on first two components (right). Colours refer to variable groups relating to elections, media etc.

## Additional regime type validation

Lexical Index of Democracy  
Skaaning et al. (2015)

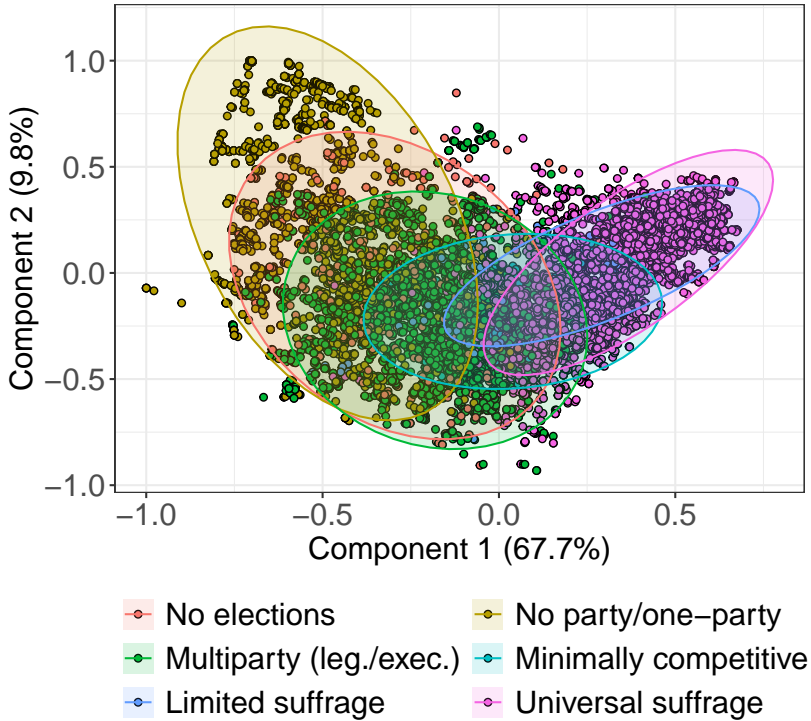


Figure A2. Lexical index of democracy mapped onto principal components.