Inexorable Force or Dying Wave? The long term trends of democratization and the third wave of autocratization

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Inexorable Force or Dying Wave? The long term trends of democratization and the third wave of autocratization*†

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Abstract

Since 2010, the proportion of democracies has declined, and in 2019 autocracies outnumbered democracies for the first time since 2001. This "third wave of autocratization" has sparked debate over whether this represents a fundamental shift in global patterns of democratization or if it aligns with a stable but variable process producing wave-like patterns over time. This paper simulates governance trajectories for all independent states between 1789 and 2023 to evaluate whether or not democratization and autocratization is likely to follow such a stable process. The results indicate that wave-like patterns tend to naturally emerge, and declines similar to the third wave of autocratization are not implausible. Extending the simulations to 2100, show that the future trajectory of democratization remains uncertain. In the median simulation, global democracy does not surpass its 2010 peak until approximately 2042. These results reinforce the view that democratization is cyclical rather than driven by deterministic trends.

Keywords: Democratization, Autocratization, Waves, Simulation, Projections

1 Introduction

In 2010, 55% of countries and territories were governed democratically. Since then, democratic governance has declined, and by 2019, autocracies outnumbered democracies for the first time since 2001 (Maerz et al. 2020). This shift has fueled debate among democratization scholars regarding the implications of the "third wave of autocratization" for the future of democratic governance (see for instance Lührmann and Lindberg 2019; Cassani and Tomini 2020; Skaaning 2020; Tomini 2021; Tomini, Gibril, and Bochev 2023; Boese et al. 2022). While this shift in the global trend of democracy is concerning, the trend follows historical patterns where waves of democratization were followed by reverse waves of autocratization before democracy advanced further. Figure 1 illustrates the three waves of democratization and autocratization using two definitions of 'waves.' The upper pane presents the mean global level of democracy, measured by the Varieties of Democracy (VDEM) Electoral Democracy Index (Polyarchy).[1] The lower pane shows the net proportion of democratizing and autocratizing countries, calculated as the percentage of countries with a higher polyarchy score than the previous year minus the percentage of countries with a lower score.

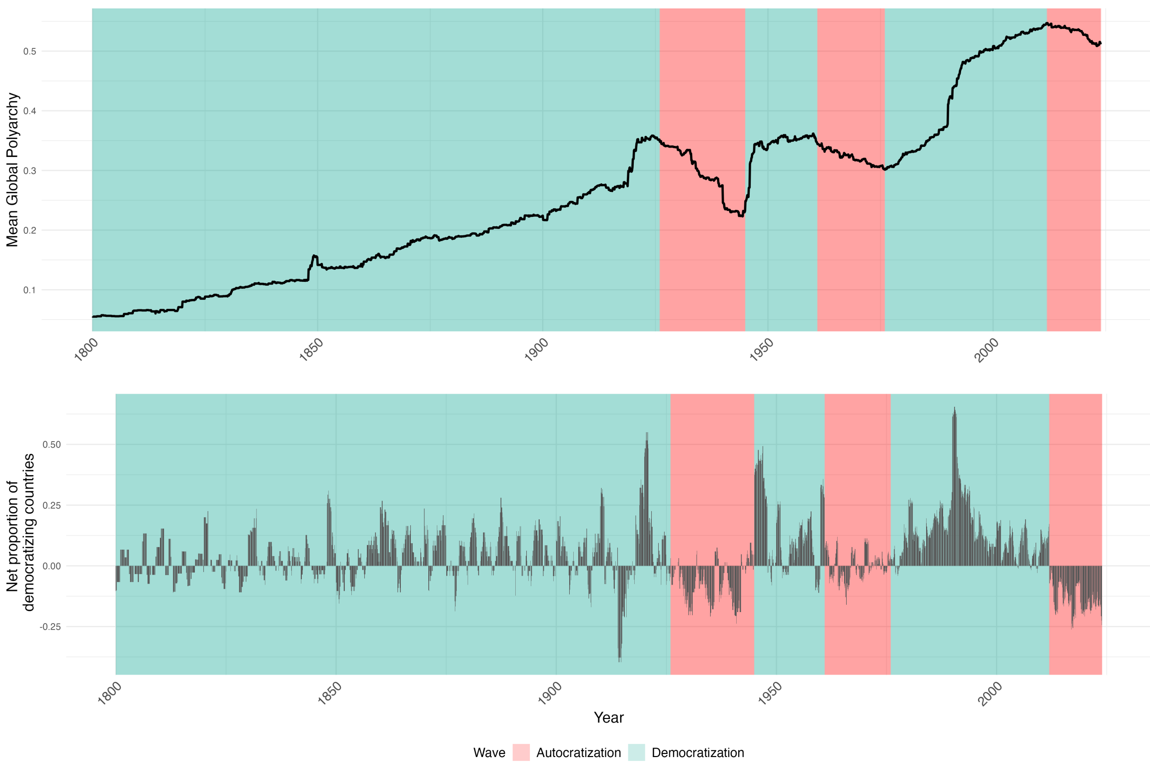

Figure 1. Mean global polyarchy (upper pane) and net proportion of democratizing countries (lower pane). The waves of democratization and autocratization superimposed.

[1]Throughout the paper, I define democracy as a confinuous concept using the v2x_polyarchy indicator in VDEM (Pemstein et al. 2023; Coppedge, et al. 2023).

The idea that democratization and autocratization occur in global "waves" and "counter-waves" was first proposed by Huntington (1991b), who noted that democratic transitions tended to cluster in time and space. Huntington identified three democratization waves: the first began in the early 19th century and persisted until the 1920s before being reversed; the second followed World War II and receded in the 1950s–1960s; and the third began with Portugal's Carnation Revolution in 1974, spreading through Southern Europe and South America before accelerating with the post-Cold War democratization of former communist states.

Despite its intuitive appeal, the "waves" concept has faced criticism. First, defining waves using different democracy measures—mean global scores, proportion of democratic countries, or net transitions—produces varying wave timelines and magnitudes (Doorenspleet 2000, 2005; Skaaning 2020; Przeworski et al. 2000). Second, while numerous mechanisms have been proposed to explain wave-like democratization, no consensus exists on the driving forces. Thus, some scholar scholars argue that while "waves" remain a useful descriptive concept, they lack explanatory power and analytical utility (Cassani and Tomini 2020; Tomini 2021). The second of these criticisms is excacerbated by a disagreement among scholars as to whether or not autocratization and democratization are opposite sides of the same coin, or whether they are driven by different processes. This question is especially salient with regards to the ongoing third wave of autocratization, as this 'wave' is primarily driven by a gradual decline of liberal democracy rather than the breakdown of of electoral democracy (see for instance Nord et al. 2025; Wunsch and Blanchard 2023; Boese, Lindberg, and Lührmann 2021; Tomini 2021; Riedl et al. 2024; Waldner and Lust 2018; Maerz et al. 2024; Lührmann and Lindberg 2019; Druckman 2024). Furthermore, that the current wave of autocratization is driven by a decline in the *liberal* aspects of democracy has sparked a secondary debate over whether the current wave of autocratization is a 'wave' at all, or whether it is a function of the measures used to conceptualize democracy (e.g. Little and Meng 2024; Wolff 2023; Przeworski 2024; Knutsen et al. 2024; Claassen et al. 2024; Treisman 2023).

The disagreement among scholars about the nature of the "waves" raise a fundamental question: do democratization and autocratization result from shifts in the underlying process governing political transitions, or are they manifestations of a stable process that naturally produces wave-like patterns over time? This paper reevaluates the 'waves' concept by addressing this question. Specifically, it asks whether democratization's "ebbs and flows" (1) reflect shifts in the underlying process governing the development of democracy on the global level or (2) are consistent with a stable process that naturally produces wave-like patterns. A stable process, in this context, is one where democratization's fundamental drivers remain unchanged over time. Additionally, this paper investigates whether the current 'third wave of autocratization' aligns with the expected behavior of such a stable process or if its magnitude and persistence suggest a departure from historical patterns, potentially indicating a shift in the underlying democratization process.

Determining whether or not the development of democratic governance follows a stable process has significant implications. If the beginning and end of a wave signify shifts in the process, the current wave of autocratization would signal a fundamental shift in the underlying process governing the development of democratic governance, potentially indicating a long-term democratic decline with no natural end in sight. Conversely, if waves emerge naturally from a stable process, the current trend may represent a temporary setback, with democratization likely to resume once the current wave of autocratization ebbs. Identifying a plausible model of this process would also allow for simulations of future democratic trajectories and the duration of the current autocratization wave.

To assess whether democratization follows a stable process, I propose a framework linking country-level governance changes to global democratization trends through regional and global contagion mechanisms. Using this framework, I develop a simulation model that generates democratic trajectories for all independent countries from 1789 to 2023. By running 1,000 simulations and aggregating them at the global level, I evaluate whether the observed historical wave-like patterns align with a stable process by comparing the distribution of changes in the global level of democracy in the simulations to the historical record. I also count the number of 'waves' in the simulations and compare it to the historical record. Lastly, I specifically investiage whether a decline in the global level of democracy similar to the current autocratization wave is a plausible outcome under this model.

The results suggest that there is insufficient evidence against the hypothesis that democratization follows a stable process. Simulated changes in the global democracy over 10-year periods broadly match the distribution of historical fluctuations. Similarly, the number of 'waves' in the simulations also aligns well with the historical record. Lastly, the current autocratization wave appears rare but not implausible under this model.

Given this consistency with a stable process, I use the model to project democratic trajectories from 2023 to 2100. In median simulations, the current autocratization wave persists until 2042–2047, depending on the definition of a 'wave'. The global democracy peak of 2011 is not surpassed until 2055 in the median case, and in 34% of simulations, it is never reached again before 2100. Only 45%

of simulations predict higher global democracy levels in 2100 than in 2023. These results suggest that while the process governing democratization may be stable, there is little evidence to suggest that there is an underlying deterministic, or inexorable, trend towards more democratic governance over time.

The remainder of the paper proceeds as follows. First, I outline a theoretical framework explaining how waves of democratization and autocratization emerge through contagious effects at country, regional, and global levels. Second, I demonstrate how such mechanisms produce wave-like patterns when aggregated globally. I then introduce the simulation model and evaluate whether its generated trends align with historical data. The results are presented alongside projections of future democratic governance. Finally, I discuss the implications of these findings for democratization theory and the ongoing "third wave of autocratization."

2 Why waves?

Figure 1 clearly shows the existence of waves of democratization and autocratization but does not explain why this waves-like pattern occurs when aggregated at the global level. In his initial work on wave theory, Huntington suggested four main mechanisms that could account for the wave-like pattern of democratization and autocratization: parallel development, contagion (or 'snowballing'), prevailing nostrum, and single causes, such as the end of the Cold War (Huntington 1991a, 1991b).

Of these mechanisms, parallel development can only explain waves if democratization and autocratization are conceptualized as binary transitions between democracy and autocracy, since parallel development would cause multiple countries to reach these thresholds simultaneously. However, when conceptualized as gradual shifts towards democracy or autocracy, there should be little reason to assume that parallel development would lead to a wave-like pattern of democratization and autocratization. Rather, parallel development would, in line with the broader modernization theory, should lead to a more consistent inching towards further democratic govern-ance as the economic and social factors which promote democracy expand globally (Przeworski et al. 2000; Kennedy 2010).

The remaining three mechanisms—contagion, prevailing nostrum, and single causes—more plausibly contribute to wave-like patterns. Among these, contagion has been widely studied and shown to influence democratic transitions, as democratization events and mass political movements often diffuse regionally or even globally (Wejnert 2005; Levitsky and Way 2006; Miller, Joseph, and Ohl

2018). However, contagion is not a one-way process leading exclusively to democratization. Instead, it operates bidirectionally, facilitating the spread of both democratization and autocratization. A political shift in one country can trigger similar changes in its neighbors, reinforcing broader regional trends in either direction (Cassani and Tomini 2019; Ambrosio 2010; Li and Thompson 1975; Lunde 1991).

Contagion is closely linked to the prevailing nostrum and single causes mechanisms. The prevailing nostrum refers to dominant global trends in governance reforms, shaping whether democratization or autocratization is perceived as the solution to political challenges (Dahl et al. 2013). While this mechanism may appear tautological, describing whether democratization or autocratization is more likely at a given time, it can also be thought of as contagion on a wider regional or global level governing how and why diffusion succeeds: i.e. whether or not a positive or negative change in democracy is likely to spread to its neighbors.

Single causes – traditionally understood as major global disruptions such as the end of the Cold War, the Great Depression, or World War II (Huntington 1991b; Wejnert 2005; Dahl et al. 2013) – can also be viewed as contagion events with exceptionally high diffusion potential. From this perspective, single causes do not constitute a distinct mechanism but rather represent the starting point of particularly influential contagion events. Whether such events ultimately drive large-scale democratization or autocratization can only be determined retrospectively. For instance, the events at the end of the Cold War's catalyzed widespread democratization, but alternative scenarios—such as a successful 1991 military coup in Russia—could have prevented this diffusion. Similarly, the Arab Spring's democratic momentum was halted by conflicts in Libya and Syria and military coups in Egypt, but had circumstances differed, it might have generated further democratization in its geo-political neighborhood. Importantly for this mechanism is that we can only know ex-post whether the event in question was successful enough and impactful enough to qualify as a 'single cause'.

Together, contagion, prevailing nostrum, and single causes may theoretically explain why democratization and autocratization cluster in time and space. However, these explanations have limitations. First, all three are external mechanisms, assuming that regime change results from external pressures (contagion), global ideological trends (prevailing nostrum), or major global events (single causes). Second, while these mechanisms describe how waves spread, they do not explain why waves begin, end, or reverse. Third, they do not account for why democratization and autocratization waves tend to follow one another. To address these gaps, I propose pairing these mechanisms with domestic-level processes related to regime change, critical junctures, and regime consolidation.

2.1 Regime change, critical junctures, and consolidation

For a 'wave' of democratization or autocratization to occur, a sufficient number of countries must simultaneously shift in a democratic or autocratic direction.[2] Therefore, any explanation of waves must connect global patterns of democratization and autocratization to the individual country level. On the individual countrly level, democratization and autocratization generally unfold gradually. Sometimes, however, these changes happen rapidly. Such rapid changes in governance are often associated with a regime change, such as a coup, revolution, or the abdication (or death) of a ruler, which either allows or causes the country to rapidly move in a democratic or autocratic direction (Djuve, Knutsen, and Wig 2020).

When a regime change happens, the rules of politics are changed and the country will be more likely to enter into a period of uncertainty which allows greater and more rapid changes in the governance as the new and old elites compete for power in the new regime. These regime change events can in this conttext be thought of as *critical junctures* for the governance structure of the country as the decisions taken during such critical junctures will affect the individual country's democratic or autocratic trajectory both in the short term, but may also cause institutional changes which bring the country on the path towards further increased democratization or autocratization through path dependency (Robinson and Acemoglu 2012; Capoccia and Ziblatt 2010).

However, the outcomes of these critical junctures are highly uncertain. Political leaders may attempt to prevent democratization or autocratization but inadvertently accelerate it instead (Treisman 2020). For instance, the Carnation Revolution in Portugal, which sparked the third wave of democratization, began as a military coup against a ruling junta. The new military regime initiated reforms that led to rapid democratization, though alternative paths, such as prolonged military rule, remained possible. Similarly, attempted counter-coups by both right- and left-wing factions of the military could have produced very different political outcomes. The decisions made by the actors at each of these stages could have led to different outcomes, with a successful transition to a fully functioning democracy only being one of multiple options.

[2] This holds regardless of how a wave is defined, as no single country alone can significantly alter the global mean level of democracy.

Another illustrative example of this process is Egypt following the Arab Spring, where the military dictator Hosni Mubarak was initially ousted in a military coup following large scale protests against his regime. The new military regime in Egypt also began a series of political reforms and later handed over political power to a democratically government. However, following the handover of power to the democratically government, tensions increased between the government and the armed forces, which resulted in the armed forced overthrowing the democratic government and re-instituted military rule. Again, we see a chain of events where at each juncture a different outcome could have been achieved. Figure 2 below shows the polyarchy score of Egypt and Portugal since 1900, with the dashed lines indicating times of regime change according to VDEM.[3]

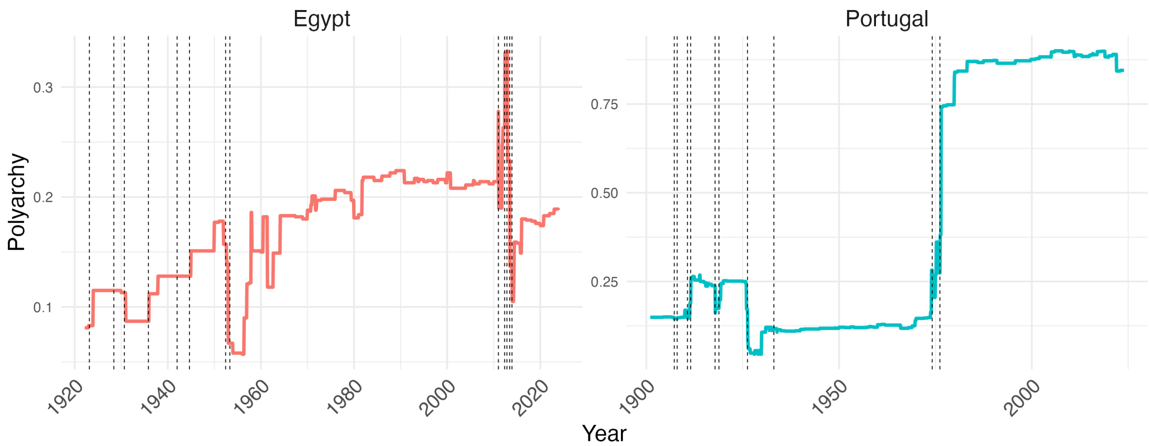

Figure 2. VDEM Polyarchy score 1900-2023 for Egypt (left) and Portugal (right) with times of regime change shown with dashed vertical lines.

The figure highlights two key features of the regime change-democratization relationship. First, rapid governance changes tend to follow regime changes. Second, regime changes themselves appear to cluster in time, increasing the likelihood of additional transitions. This latter point connects to the final theoretical component of how individual-country governance shifts aggregate into global waves: regime consolidation.

Regime consolidation is a gradual process whereby political elites increasingly accept existing rules for leader selection and maintenance as "the only game in town," operating within them rather than seeking to overturn them. Research on regime consolidation has primarily focused on democratic consolidation as a safeguard against autocratic reversals (see for instance Diamond 1994; Svolik 2008).

[3]Note that regime changes here are again defined as in Djuve et. al. (2020), and are based on the v2reginfo indicator in VDEM, not the categorical indicator of democratic and autocratic regimes in the 'Regimes of the World' indicator, v2x_regime (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, Grahn, et al. 2023; Lührmann, Tannenberg, and Lindberg 2018).

However, autocratic regimes also consolidate when ruling elites entrench patron-client networks or institutionalize authoritarian governance (Göbel 2011). China, North Korea, and Cuba exemplify consolidated autocratic regimes.

Overall, this argument suggests that democratization and autocratization are generally slow-moving processes, except during critical junctures marked by regime changes. At such junctures, the likelihood of rapid shifts, and additional regime changes, greatly increases. Empirical patterns support this: Figure 3 shows that both the magnitude of governance changes (polyarchy score shifts) and the probability of further regime change are highest shortly after a regime change, tapering off over time.

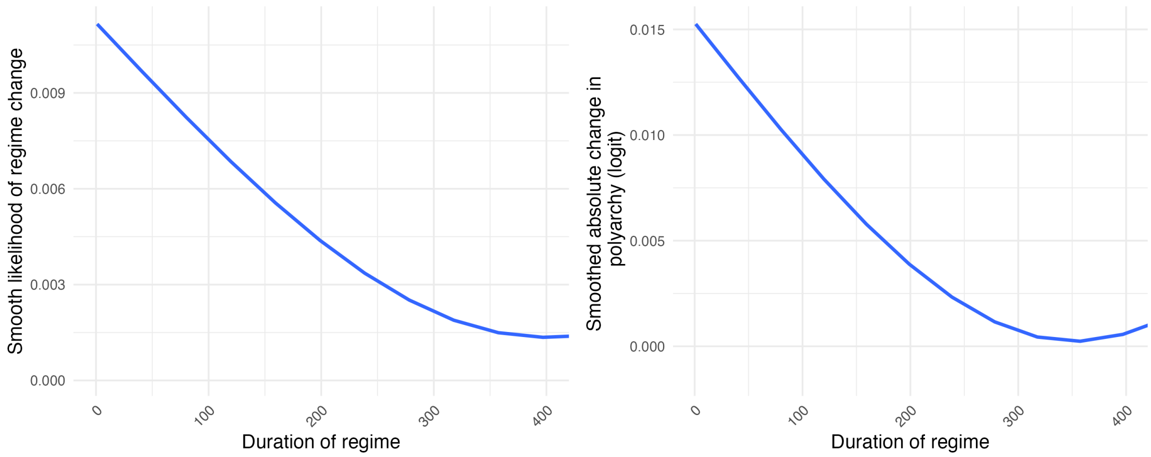

Figure 3. Smoothed monthly probability of regime change (left) and smoothed average absolute change in the logit of the polyarchy score (right) and the age of the regime (months) for all political regimes 1789-2023

Figure 3 show that regime changes tend to cluster temporally, as new regimes are most vulnerable in their early years. Likewise, rapid democratization and autocratization follow a similar pattern, concentrating around regime changes. These findings echo Figure 2, where Egypt and Portugal experienced stability except during periods of regime transition. By linking these country-level processes with contagion and prevailing nostrum mechanisms, we can better understand how waves of democratization and autocratization emerge and dissipate.

2.2 Contagious regime change and the prevailing nostrum

To explain how individual-country governance shifts aggregate into global waves, we must integrate the regime change mechanisms discussed above with Huntington's (1991a) notions of contagion and "prevailing nostrum". In Huntington's original formulation these two mechanisms focused specifically on the diffusion of democratic and autocratic rule. Subsequent studies have repeatedly shown that countries tend to have an increased likelihood of democratization when its neighbors are democratic or when the global trend is towards democratization (see for instance Dahl et al. 2013; Gleditsch and Ward 2006; Levitsky and Way 2006; Brinks and Coppedge 2006).

Contagion, however, also applies to regime change itself. The Arab Spring exemplifies this: protests in Tunisia triggered regime changes in Egypt, Libya, and Bahrain. Similarly, the "color revolutions" in former Soviet republics in the early 2000s spread following Georgia's 2003 transition. Empirical studies confirm that regime changes, whether through protests, coups, or other means, tend to cluster in both time and space (Hale 2013; Bamert, Gilardi, and Wasserfallen 2015; Li and Thompson 1975).

Empirically, we can investigate these relationships by analyzing how regional and global changes in polyarchy correlate with individual-country governance shifts and regime change likelihoods. Figure 4 illustrates these relationships, plotting smoothed average monthly polyarchy changes and regime change probabilities against regional governance trends.[4]

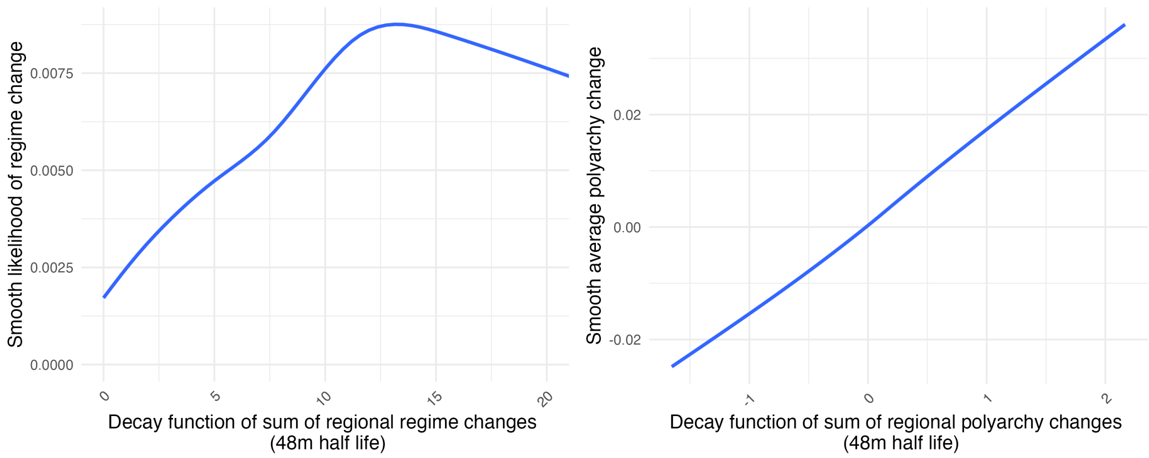

Figure 4. Smooth average (monthly) likelihood of regime change and average change in polyarchy against decay functions of sum of regional changes in polyarchy and regional regime changes.

In sum, these patterns indicate that regime changes are pivotal moments that not only drive rapid shifts in governance at the individual country level but also have the potential to propagate spatio-temporally in the region or neighborhood where the country is located, creating clusters of political transformation. A single regime change can thus act as a catalyst for a further 'wave' of regime change and associated rapid changes in governance. If these cascading changes align with overarching global governance trends, i.e. what Huntington termed the 'prevailing nostrum', then

[4]Equivalent figures for global changes can be made available on request.

country-level regime shifts can collectively shape the global pattern of democratic and autocratic waves.

However, while this framework explains how waves emerge and spread, it does not answer how and why the 'prevailing nostrum' changes, and does not provide a satisfactory theoretical answer to whether this process is a stable process or an ever-changing process.

3 Waves in a stable process

The preceding section argued that the wave-like patterns of democratization and autocratization could emerge through a combination of cross-border contagion, the prevailing nostrum, i.e., regional and global democratization trends, and the rapid shifts at critical junctures in individual countries. However, whether democratization or autocratization in a single country spreads to others can largely be though of as a random process, as seemingly minor events can trigger widespread change while major events sometimes remain isolated. Similarly, the occurrence of critical junctures, and the direction taken at each critical juncture, can also be thought of as a random process as the different actors within each country take actions which may push the country in either a more democratic or more autocratic direction, whether willingly or not (similar to Treisman 2020).

Judged in the light of these arguments, waves of democratization and autocratization can be understood as self-reinforcing periods within a stable global process, rather than as indicators of fundamental shifts in the underlying process itself. These waves arise from three sources of randomness: (1) the occurrence of critical junctures at the country level, (2) the magnitude and direction of governance changes at these junctures, and (3) the extent to which democratization or autocratization spreads beyond the initiating country.

A 'wave' will then randomly emerge when democratization or autocratization diffuses across multiple countries, gaining momentum as more states are drawn in through the contagion mechanism. The wave persists until it either exhausts itself, as newly established regimes consolidate and the rate of change slows, or is countered by a sufficiently strong opposing (randomly emergin) trend that stifles or reverses it. Thus, even if the fundamental process of democratization and autocratization remains stable over time, its inherent randomness and self-reinforcing properties can still produce wave-like patterns at the global level.

Determining whether the observed waves of democratization and autocratization are consistent with a stable process requires counter-factual global trajectories generated by such a stable process to compare the historical record against. To generate such counter-factual trajectories, I propose setting up a dynamic simulation model which replicates the mechanisms of contagion, consolidation, and critical junctures, while incorporating the inherent randomness that shapes country-level political trajectories.

By repeatedly simulating counter-factual global trajectories of governance, we can compare observed reality with simulated outcomes. If the historical record aligns with the simulation results, this would suggest that waves of democratization and autocratization arise naturally from a stable underlying process. Conversely, if the simulated outcomes consistently fail to replicate the observed waves, this would indicate that the waves likely reflect structural changes in the underlying democratization process.

It is important to emphasize that the goal of this simulation is **not** to determine the **true** process governing democratization and autocratization on the global level. Rather, the aim is to assess whether the historical record is plausibly consistent with a stable process. If a relatively parsimonious simulation model can reproduce wave-like patterns similar to those observed historically, this would provide evidence that waves emerge from a stable process rather than from exogenous structural shifts.

4 Methodology

To evaluate the hypothesis of a stable process of democratization and autocratization, this paper employs a dynamic simulation approach (Hegre et al. 2013) to model governance trajectories at the country-month level for all independent states from 1789 to 2023 using data from the V-Dem project (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, God, et al. 2023). Dynamic simulation is particularly useful for assessing processes where future outcomes depend on past states. The monthly level is chosen over the yearly in order to allow diffusion, both within and between countries, to happen within years.

This approach works by simulating the entire time-chain for the outcome(s) one step at the time. For each step, the model estimates the predicted value or probability, of some outcome variable(s) at time t. A random draw for this outcome variable is then made based on the predicted value and the (assumed) distribution of the variable, after which the data are updated based on this random draw.

The model can then make a prediction for the outcome variable(s) at time $t+1$ using the updated data from time t as the input features. This updating of the data is the *dynamic* part of the simulation, which allows the model to take account the history of the process in each simulation.

Within this framewwork, each simulation represents a single counterfactual reality. By generating a large number of such simulations and comparing the resulting democratization and autocratization patterns with historical data, we can assess whether the observed historical record aligns with a stable underlying process.

The simulated process in this paper aims to model all three sources of randomness outlined in Section 3: the occurrence of regime change at the country level, the effects of regime change within the country, and the effects of these changes on neighboring states and beyond.

Regime change is defined following Djuve et al. (2020) as any change in 'the set of rules that are essential for selecting political leaders and for maintaining them in power.' Different types of regime change are expected to have distinct effects on a country's polyarchy score and varying impacts on surrounding states. Thus, regime changes are categorized into three broad groups based on Djuve et al.'s classification: (1) coups, including military coups, self-coups, and other forms of extra-constitutional power grabs[5]; (2) liberalization, whether guided by incumbents or driven by external actors[6]; and (3) other regime changes [7]. Democratic governance is measured using V-Dem's Electoral Democracy Index (Polyarchy score)[8], which ranges from 0 (least democratic) to 1 (most democratic) (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, Grahn, et al. 2023). Given the natural ceiling and floor effects of this index, a logit transformation is applied, allowing it to range from $-\infty$ to ∞.

4.1 Simulation setup

The simulation model itself is structured as a two-stage process. In the first stage, a set of parametric models is estimated using a bootstrapped sample of the historical country-month data. The estimated coefficients are then used in the second stage to simulate the polyarchy trajectories of individual countries. Figure 5 provides a visual overview of this simulation process.

[5] Categories 0-2 in V-Dem's v3regendtype classification

[6] Categories 9 and 11 in V-Dem's v3regendtype classification

[7] Encompassing the remaining transition types in v3regendtype

[8] v2x_polyarchy

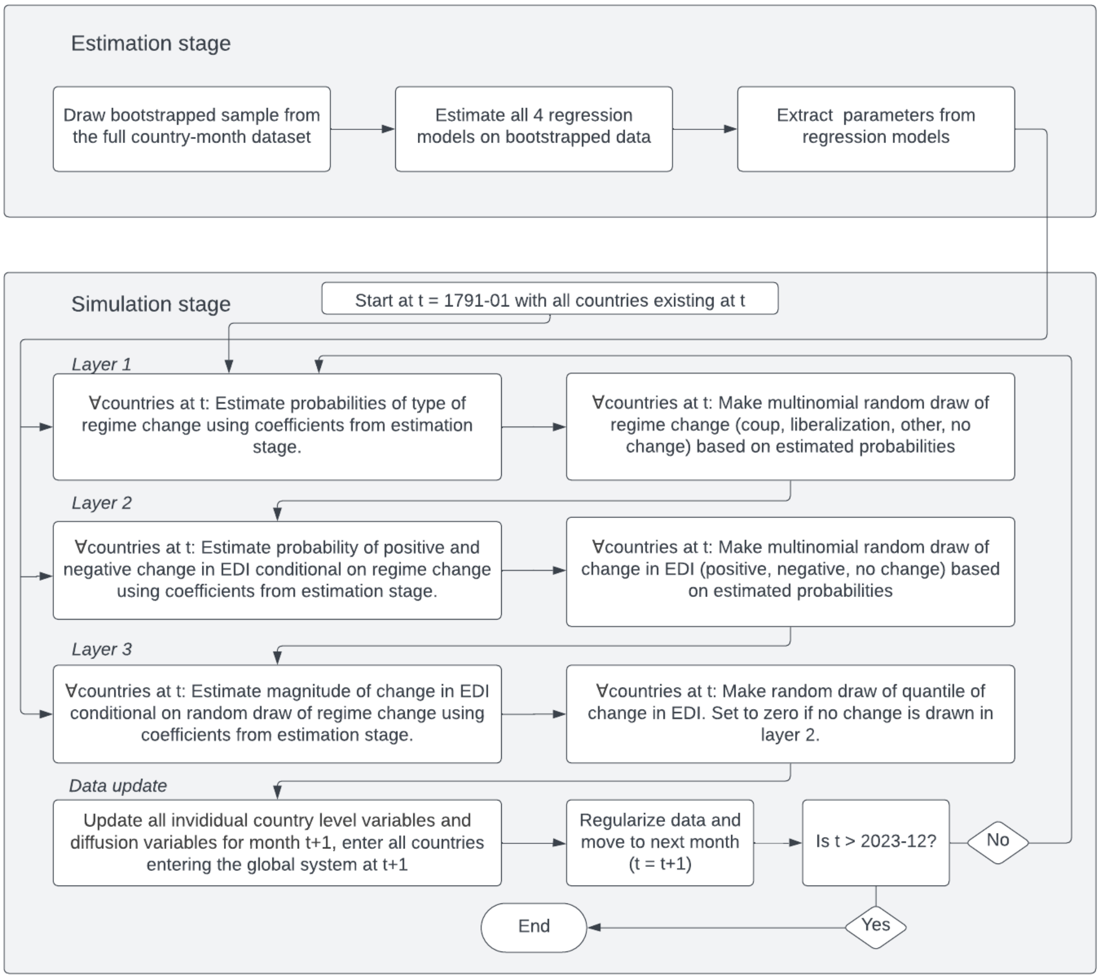

Figure 5. Flowchart of the simulation process. The regression estimates for the models of layers 1-3 can be found in Appendix A.

The first stage involves estimating four parametric models. First, a multinomial logistic regression model to predict the likelihood of the three different types of regime change. Second, as the vast majority[9] of country-months do not entail any change in the polyarchy score, a multinomial logistic regression model to predict the likelihood that either a positive change or a negative change in the polyarchy score happens for each country-month. Lastly, a set of two linear quantile regression models are estimated to predict the distribution of positive and negative change in the polyarchy score, if a change has happened.

For each simulation run, a unique bootstrapped sample is drawn to estimate the model coefficients, ensuring that parameter variation is accounted for across simulations and that the inherent randomness of observed relationships is incorporated.

In the second stage, the actual simulation is conducted using the coefficients from the models in the first stage. Each simulation begins with all independent states as of January 1791[10] and progresses one month at a time. The simulation process for each month consists of:

1. Estimating the probabilities of different regime change categories.
2. Drawing a random outcome for regime change based on these probabilities.
3. Estimating and drawing whether the polyarchy score increases, decreases, or remains unchanged, taking the random draw from 2 into account.
4. If a change occurs, determining its magnitude by drawing from the quantile regression estimates.
5. Updating the dataset with these new values before proceeding to the next month.[11]

Countries enter the simulation in the month they gain independence[12] and exit when they cease to exist or lose independence (e.g., Poland from 1796 to 1918, or German constituent states after 1871). In total, 1,000 simulations were conducted using the KTH/Dardel high-performance computing cluster, with each run utilizing approximately 1 core-hour.

[9] Approximately 94.4%

[10] The start date is adjusted due to missing data or computational constraints on diffusion variables.

[11] A regularization process ensures that the simulations do not deviate unreasonably from the historical record. More details on the regularization procedure is available in Appendix A.

[12] As coded in V-Dem's v2svindep variable.

4.2 Parametric model specification

To ensure genuinely stochastic country-level trajectories, the simulation includes only variables dynamically updated within the model, i.e. variables related to regime change and change in the polyarchy score, and their diffusion, omitting external factors such as technological, economic, or population developments. This ensures that every run of the simulation will charter its own trajectory for each country and in aggregate without being influenced by external trends that would otherwise push the simulated trajectories towards the historical ones. The only exogenous input is the timing of a country's entry into the international system.

The regression models incorporate several variables to capture the sources of randomness outlined above.

- To identify *critical junctures* at the country level, the models include dummy variables for regime change, coups, and liberalizations, along with decay functions measuring the time elapsed since the last occurrence of each event, as well as since the last change in the polyarchy score. Additionally, a decay function for the cumulative change in the polyarchy score is used to represent the *prevailing nostrum at the country level.*

- To account for *democratic consolidation*, an interaction term between time since the last regime change and the polyarchy score is included in the regime change model.

- To capture *contagion* effects and the *prevailing nostrum at the regional and global levels*, the models incorporate decay functions for the total number of regime changes, coups, and liberalizations within a region and globally. Similarly, decay functions for the cumulative change in the polyarchy score at both levels are included. Finally, dummy variables indicate whether a country's polyarchy score is above or below the regional and global averages, allowing the model to account for relative positioning within broader democratization trends.

Changes in the polyarchy score in V-Dem tend to be disproportionately recorded in January[13]. To account for this, a dummy variable for January is included in the models predicting changes in the polyarchy score. Additionally, the frequency of reported changes in V-Dem has increased over time, potentially introducing a systematic bias in the time series. To correct for this, an external time trend

[13]Approximately 58% of country-months have no change recorded in January, compared to over 96% for all other months

is estimated, and the likelihood of any change in the polyarchy score is scaled accordingly.[14] Further details on variable operationalization, data regularization, time-trend scaling, as well as full regression results can be found in Appendix A.

4.3 Evaluating the existence of waves and wave-like patterns

To assess whether the wave-like patterns of democratization and autocratization are consistent with a stable process, a systematic approach is required to compare historical trajectories with simulated ones. The primary focus is on evaluating whether the global trajectory, rather than individual country trajectories, aligns between the simulations and observed historical data. However, comparing multiple time-series originating from different stochastic processes presents challenges (see for instance Clauset 2018; Morse and Patel 2007).

A further complication arises from the expectation that simulated trajectories will exhibit variation across runs due to the random global and regional trends introduced in each simulation. While both the historical and simulated trajectories should display democratization and autocratization waves, these waves may not necessarily occur at the same time or with identical magnitudes. To address this, I propose three key criteria for evaluating the consistency of the simulated trajectories with the historical record: (1) the distribution of changes in the global level of polyarchy, (2) the occurrence of a wave-like pattern in the global trajectory of polyarchy, and (3) the presence of a 'third wave of autocratization' in the last thirty years of the time series.

4.3.1 Distribution of change in the global level of polyarchy

The first criterion examines whether the distribution of changes in the mean global level of polyarchy over multiple time intervals is similar between simulated and historical trajectories. If this condition is met, it indicates that the aggregate distribution of democratic governance developments in the simulations closely resembles the historical record.

To test this, I calculate the mean global polyarchy score at the end of each year from 1789 to 2023 in each simulation. I then compute year-to-year changes for up to ten-year intervals and compare the resulting distributions with those observed in historical data. To prevent distortions

[14]Without this adjustment, the probability of polyarchy score changes would be overestimated in the early years of the dataset and underestimated in later years, distorting the simulation results. The external time-trend is neutral to the direction of the change and thus does not push the simulations in either direction.

from changes in the number of independent states, only countries existing in both years are included in the calculations.

The similarity of distributions is evaluated using a permutation-based two-sample Kolmogorov-Smirnov (KS) test (Dowd 2023), rejecting the null hypothesis if the p-value falls below 0.05. As a robustness test, I use the Cramer von Mies (CvM) test which is more sensitive to differences in the tails than the KS test (For comparisons of the available tests, see for instance Guatelli et al. 2004; Lanzante 2021). The KS test is applied to all 1,000 simulations, and the proportion of non-rejected cases for each of the ten time steps serves as the evaluation measure.

4.3.2 The occurrence of a wave-like pattern

The second criterion assesses whether the simulated trajectories exhibit a wave-like pattern comparable to the historical record. As discussed in Section 1, defining democratization and autocratization waves can vary. Here, I evaluate the simulations against two conceptualizations: one based on changes in the mean global polyarchy score and another based on the net proportion of democratizing countries. A country is classified as democratizing in any month where its polyarchy score is higher than one year prior and as autocratizing if its score is lower.

To reduce short-term fluctuations, both measures are smoothed using a five-year moving average to capture sustained global trends. A 'wave' is defined as any period where the moving average moves in the same direction for at least five consecutive years, and is only 'broken' when reversed for at least five consecutive years.

Using these definitions, empirical waves align broadly with existing classifications, such as those in Skaaning (2020). When measured by changes in global polyarchy, three waves of democratization and four waves of autocratization emerge. When using the net proportion of democratizing/autocratizing countries, the first wave of democratization is split into two by a brief autocratic wave (1825–1830), resulting in four democratic and five autocratic waves.

If the simulation model is consistent with historical reality, the number of waves detected in the simulations should, on average, approximate those observed in the historical record. To evaluate this, I compute the median number of waves across all simulations, along with the 5th and 95th percentiles, to determine whether the simulations consistently generate wave-like patterns.

4.3.3 The occurence of a third wave of autocratization

The final criterion examines whether the simulated trajectories produce a trend comparable to the 'third wave of autocratization' observed in recent decades.

Beyond assessing general wave-like behavior, this study also investigates whether the recent global autocratization trend aligns with patterns expected under a stable process. Two indicators are used to evaluate this:

1. The proportion of simulations in which an autocratization wave occurs in the latter part of the time series.

2. The magnitude of autocratization in the tail of the simulations, comparing simulated declines in global polyarchy to the historical record.

If the third wave of autocratization is consistent with a stable process, waves of autocratization of comparable magnitude should not be rare in the final portion of the simulations. In the historical data, global polyarchy peaked in 2010, and the subsequent third wave of autocratization led to a 0.038-point decline. However, since waves in the simulations do not need to align temporally with historical waves, I define a 'third wave of autocratization-like' event in the simulations as any wave of autocratization that begins after 2000 and results in a maximum decline of at least 0.038 points.

The chosen cutoff year of 2000 is essentially arbitrary but is positioned well after the last major wave of state independence in the late 1980s and early 1990s, ensuring that simulated trends are not confounded by shifts in the number of independent states.

4.4 Robustness tests

To assess the robustness of the simulation model to alternative specifications, two alternative simulation models were tested. In the first alternative specification, the regime change models (first layer of the modeling framework) were excluded from the estimation, and all variables related to regime change and diffusion were removed from the second and third layers. This modification allows for an evaluation of whether the inclusion of regime change dynamics is essential for replicating historical patterns.

In the second alternative specification, newly independent countries were introduced into the global system at the regional mean of the polyarchy score rather than at their actual historical values.

If a country was the first to enter the global system within a region, it was initialized at the global mean of polyarchy at that time. This test examines whether the observed patterns in the simulations are significantly influenced by the historical entry values assigned to new states.

These alternative models provide a means to determine whether all three layers of the simulation—regime change, diffusion, and consolidation—are necessary for accurately capturing historical democratization and autocratization trends, or whether the results are driven primarily by the fixed entry conditions of states into the global system.

5 Simulation Results

Figure 6 presents the 1,000 simulated trajectories of mean global polyarchy over the full simulation period, with the observed historical trajectory superimposed in black. While this figure does not explicitly reveal whether 'waves' of democratization and autocratization emerge in the simulations, it demonstrates that the simulated trajectories broadly align with the historical record in terms of long-term governance trends. However, for the simulations to be considered consistent with historical patterns, they must not only replicate the general trajectory but also conform to the three evaluation criteria outlined in the previous section.

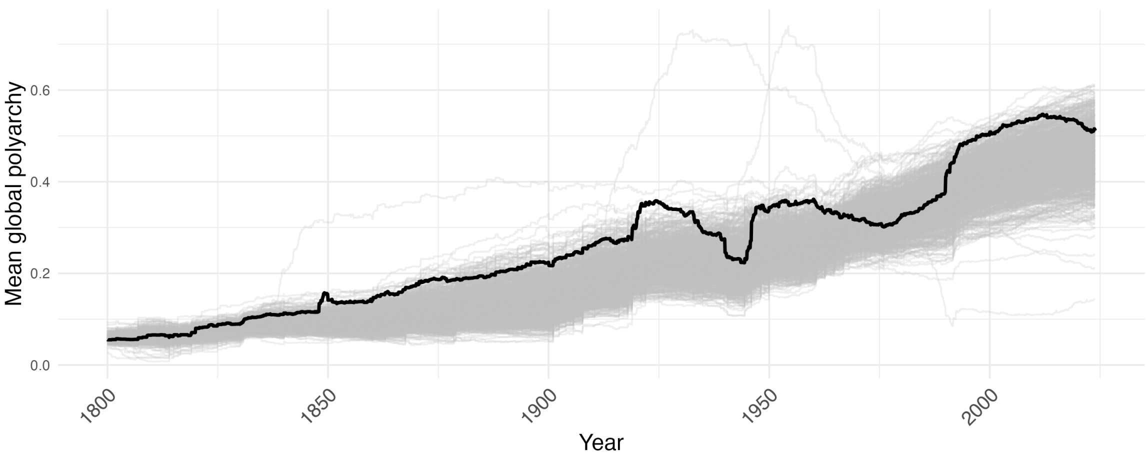

Figure 6. Simulated and observed trajectories of mean global polyarchy. Thick black line represents the observed historical record while the thin gray lines each represent one of the 1,000 simulated trajectories.

5.1 Distribution of change in the global level of polyarchy

To assess the first criterion, I examine the proportion of Kolmogorov-Smirnov tests that fail to reject the null hypothesis when comparing the distribution of changes in global polyarchy over time intervals ranging from 1 to 10 years between the simulations and the historical record. These results are presented in Figure Figure 7.

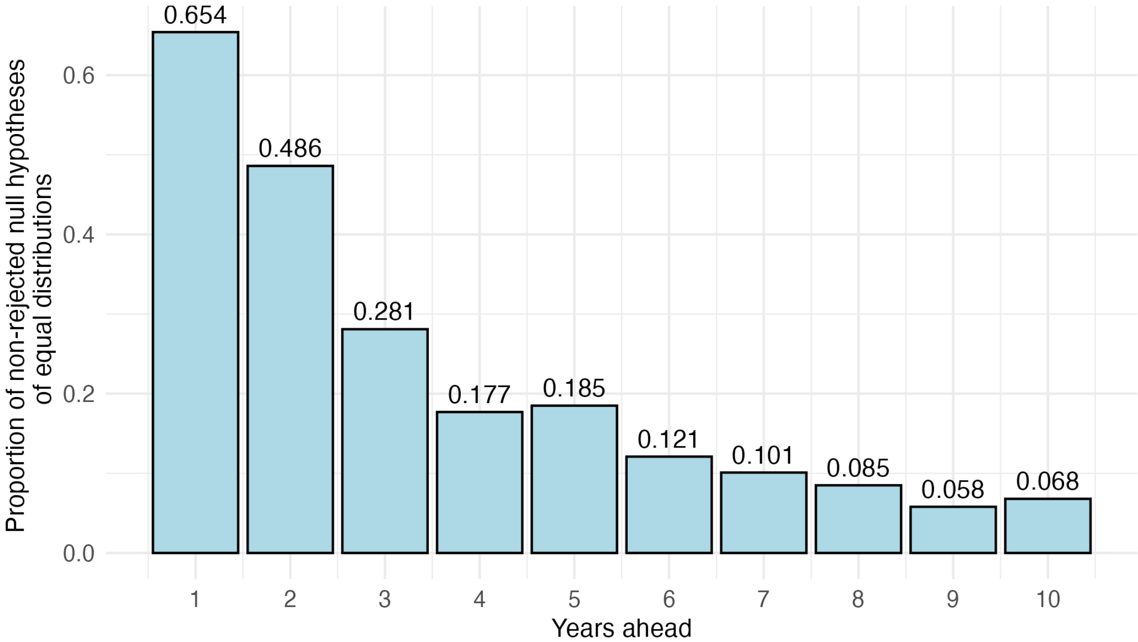

Figure 7. Proportion of non-rejected Kolmogorov-Smirnov tests for different number of time steps

This evaluation reveals that as the time horizon increases, the divergence between the simulated and observed trajectories becomes more pronounced. However, at conventional significance levels, there is insufficient evidence to reject the null hypothesis that the distributions of change in polyarchy for all ten years examined. Given that the objective of this simulation is to test whether a simple model can reproduce observed trends rather than identify the 'true' underlying model, these results suggest that there is no strong evidence to conclude that the proposed simulation model is inconsistent with historical reality.

5.2 Number of observed waves

The second evaluation criterion concerns the number of observed waves in the simulations. Figure 8 presents the density distributions of democratic and autocratic waves across simulations, with the observed historical values indicated by red lines.

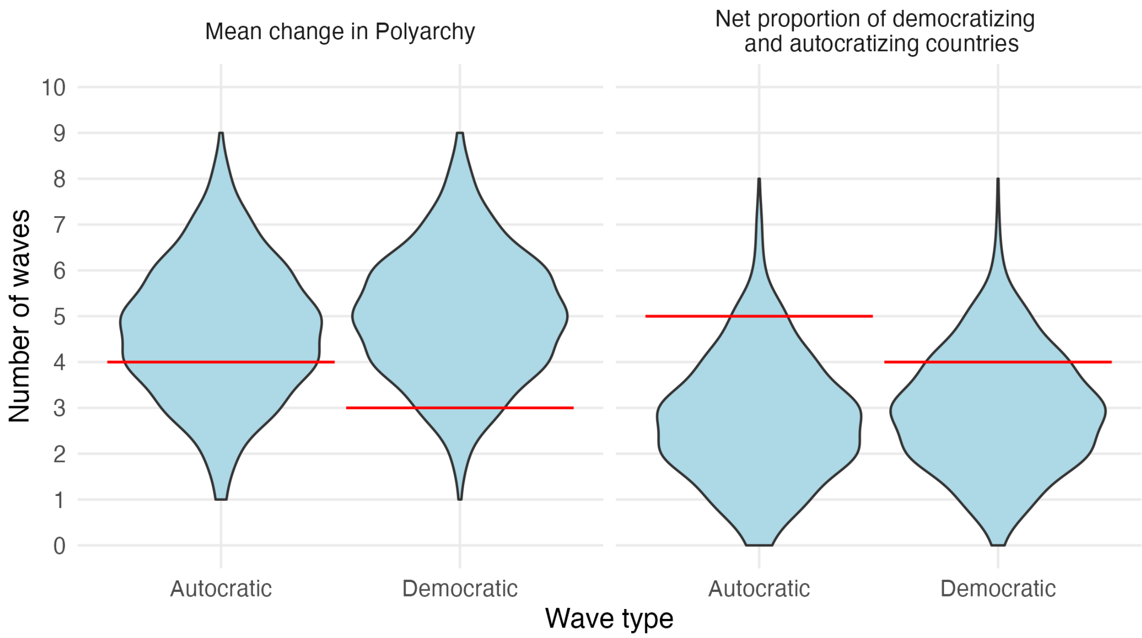

Figure 8. Densities of the number of democratic and autocratic waves in the simulation using different conceptualizations. The observed number of waves in the historical record are denoted with red lines.

This figure shows that the number of waves generated in the simulations aligns well with historical observations. When waves are defined based on changes in mean polyarchy, the median simulation produces five democratic and five autocratic waves, compared to the observed historical record of three and four, respectively. However, the historical numbers fall well within the 90% confidence interval of the simulated results. When waves are defined in terms of the net proportion of democratizing and autocratizing countries, the median simulation produces four democratic and three autocratic waves, compared to five and three in the historical record, again with historical values falling comfortably within the 90% confidence interval. These results indicate that the simulation model captures the expected frequency of democratization and autocratization waves reasonably well.

5.3 The third wave of autocratization

The final criterion evaluates whether the simulation model reproduces a 'third wave of autocratization' in the latter part of the time series. To assess this, we analyze the last 24 years of the simulation period (2000–2023) and calculate the proportion of simulations that experience an autocratization wave, as well as the magnitude of these waves—measured as the maximum drop in mean global polyarchy during this period.

When waves are defined in terms of mean polyarchy change, 31.2% of simulations exhibit an autocratization wave at some point after 2000. When defined based on the net proportion of autocratizing countries, the figure is 33.4%. However, most of these waves are relatively shallow: only 1.4% of simulations produce an autocratization wave with a decline of at least 0.035 points in global polyarchy, the observed magnitude of the current third wave of autocratization.

Overall, these findings suggest that the emergence of an autocratization wave after 2000 is not an unlikely occurrence under the proposed stable process. While the probability of a wave as severe as the current third wave of autocratization is relatively low, its occurrence remains within the realm of plausible outcomes generated by the simulation model.

5.4 Robustness checks

To evaluate the robustness of the simulation model, I examined two alternative specifications: one excluding the regime change layer and another where newly independent countries entered at the regional mean polyarchy score rather than their historical values. The results indicate that removing the regime change layer weakens the model's ability to replicate historical patterns. Specifically, the proportion of non-rejected Kolmogorov-Smirnov (KS) tests is lower in this specification, with several time steps falling below the 0.05 threshold, indicating significant divergence from the historical record.

When countries enter the system at regional mean polyarchy levels rather than their historical values, the proportion of non-rejected KS tests is also lower but remains above 0.01 across all time steps. Notably, in this specification, the model without the regime change layer exhibits substantially lower proportions of non-rejected tests, further suggesting that the regime change mechanism plays a critical role in maintaining historical consistency.

As an alternative to the KS test, I also tested the equality of distributions using the Cramér–von Mises (CVM) test, which is more sensitive to changes outside the center of the distribution. Using this test, the proportion of non-rejected tests is consistently higher than for the KS test and remains above 0.05 for both the historical entry and regional mean entry models. However, when the regime change layer is removed and countries enter at regional mean polyarchy scores, the proportion of non-rejected tests drops below 0.05 for several time steps, reinforcing the conclusion that regime change dynamics are essential for accurately capturing historical democratization and autocratization trends.

The number of democratization and autocratization waves remains consistent across all robustness models, indicating that the overall wave-like pattern is not sensitive to alternative specifications.

However, the likelihood of a third wave of autocratization varies across models. In models without the regime change layer, the probability of an autocratization wave of similar magnitude to the ongoing third wave of autocratization remains low and comparable to the main model. However, in the specification where countries enter at regional means, the likelihood of a third wave of autocratization becomes highly implausible, occurring in less than one percent of simulations. This suggests that the initial entry conditions of new states exert at least some influence on the likelihood of observing a third wave of autocratization. The fact that the probability drops so drastically in the regional mean entry model indicates that historical entry conditions play an important role in shaping long-term political trajectories.

Furthermore, for simulations without the regime change layer, the proportion of simulations experiencing a third wave of autocratization in the latter part of the time series varies significantly between the two conceptualizations of wave measurement. Specifically, the mean polyarchy change model produces a higher proportion of autocratization waves than the net proportion of democratization conceptualization. In contrast, for both the main model and the mean entry model, the two conceptualizations yield similar results.

Full results for the robustness checks are available in Appendix B.

6 Future developments of democratic governance

Since there is insufficient evidence to reject the hypothesis that the historical record is inconsistent with a stable democratization process, the simulation model can be extended to project future governance trajectories. By applying the same dynamic framework used to evaluate past democratization and autocratization patterns, we can generate plausible scenarios for the evolution of global democracy.

These projections allow us to assess not only the expected long-term trends in These projections allow us to assess not only the expected long-term trends in democratic governance but also the likely duration and severity of the current third wave of autocratization. Moreover, by analyzing the variability across simulations, we can estimate the range of potential outcomes and assess how long, on average, it will take for the global level of democracy to surpass its peak in 2010—if at all.

These future trajectories are generated using the same simulation process outlined in Section 4.1 and Figure 5 above, with the starting point set in January 2024. The initial conditions are based on the observed values for all independent countries as of December 2023. A total of 1,000 simulations are run up to December 2099, assuming no further additions to the international system.

The results of this simulation exercise are presented in Figure 9 below. The figure displays each future simulation as a gray line, with the median trajectory, along with the 25th and 75th percentiles in red.

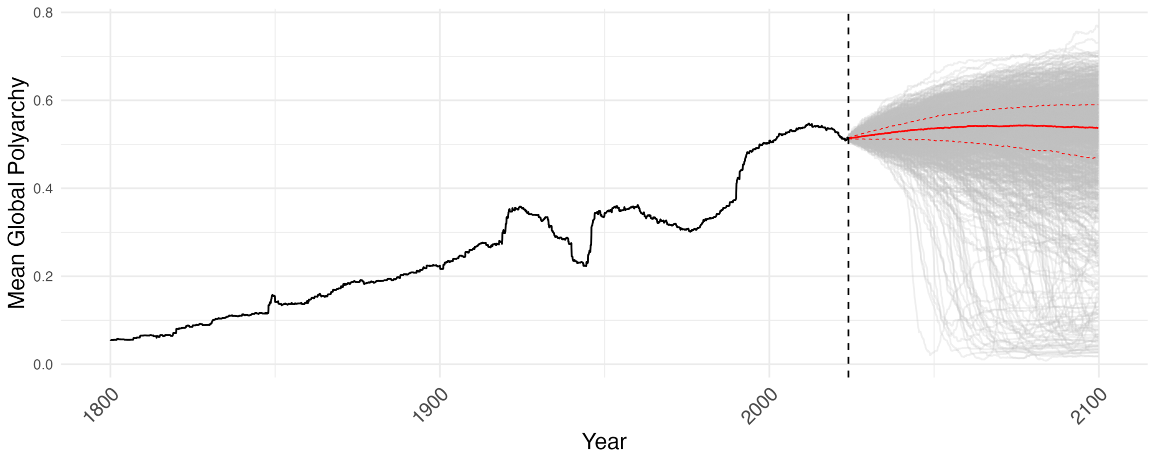

Figure 9. Simulated trajectories of mean global polyarchy 2023-2100. Thin gray lines each represent one of the 1,000 simulated trajectories, the solid line the median across simulations and the dashed lines the 25th and 75th percentiles respectively.

The evaluation of future trajectories presents mixed results regarding the long-term development of global democracy. In the median simulation, democracy gradually recovers toward the levels observed in the early 2010s but stagnates just below this peak in the latter half of the 21st century. In 50% of the simulations, the global democracy level in 2100 remains within the range observed between the mid-1990s and early 2010s. However, a significant proportion of simulations project a decline below the levels seen at the end of the Cold War,

Regarding the ongoing third wave of autocratization, the simulation model indicates that, in the median case, the lowest point is reached in 2024. However, in 25% of simulations, this low point is not reached until 2034, and in 10% of simulations, it extends as far as 2062. Additionally, only 66% of simulations show the global democracy level surpassing the 2010 peak at any point, while 45% and 62% of simulations end with a higher level of global democracy in 2100 than in 2010 and 2023, respectively. In the median simulation, the 2010 peak is not exceeded until 2042, indicating that a full democratic recovery may take several decades.

The wave-like pattern of governance development is also expected to persist according to the simulations. In the median simulation, one democratic wave and two autocratic waves occur by 2100.

Across 90% of simulations, the number of democratic waves ranges from 0 to 3, while the number of autocratic waves ranges from 1 to 4 (including the ongoing third wave of autocratization), regardless of the definition of a wave. These results suggest that governance transitions will continue to follow cyclical patterns, with alternating periods of democratization and autocratization shaping the global trajectory of democracy.

7 Conclusions

This study set out to evaluate whether the observed waves of democratization and autocratization are best understood as outcomes of structural shifts in the underlying democratization process or as manifestations of a stable process that naturally produces wave-like patterns over time. Using a dynamic simulation model replicating key mechanisms of regime change, contagion, and consolidation, the results suggest that there is insufficient evidence to reject the hypothesis that the historical record is consistent with a stable process. The simulation model successfully replicated many of the key features of the historical record, including the distribution of changes in the global level of democracy, the number of observed waves, and—albeit with lower frequency—the emergence of an autocratization wave similar in magnitude to the ongoing third wave of autocratization.

The findings indicate that even in a stable democratization process, waves of democratization and autocratization naturally emerge due to the interplay of internal country-level changes and cross-border contagion effects. The results further show that while democratization has historically been the stronger force, this is not an inexorable trend towards ever greater levels of global democracy. Rather, the process seems to be defined by a dynamic where democratic and autocratic trends interact in complex and sometimes unpredictable ways.

In assessing the future development of global democracy, the extended simulations up to 2100 indicate that while democratic recovery is plausible, the likelihood of surpassing the peak level of democracy observed in 2010 is uncertain. In a substantial portion of simulations, democracy stagnates or continues to decline, suggesting that the current third wave of autocratization may have long-lasting consequences. However, the persistence of wave-like patterns suggests that periods of democratization may follow, though their timing and magnitude remain highly uncertain.

These findings carry important implications for the study of democratization and autocratization. First, they deal yet another blow against the deterministic ‘end of history’-perspective that view democratization as an inevitable trajectory, emphasizing instead the contingent and cyclical nature of governance transitions. Second, they show that the wave-like pattern of democratization and autocratization seen historically can plausibly occur and be modeled within a stable process taking cross-border contagion effects into account. Lastly, the findings also highlight the importance and contagion of *regime change* as a potential driver of the ebbs and flows of these 'waves'.

While this study provides a novel framework for understanding democratization and autocratization through a stable process perspective, it also has limitations. The simulation model, by necessity, abstracts from many real-world complexities, such as economic shocks, geopolitical interventions, and technological developments that may influence democratization trajectories. Furthermore, this study does not claim that the suggested model represents the *true model* of demcoratization and autocratization. Rather, the simulation exercise can be thought of as a though experiment for how the real-life process behave. Future research could build on this framework by incorporating additional structural factors or exploring alternative simulation approaches to assess the robustness of the findings.

In conclusion, the evidence presented in this paper suggests that the wave-like patterns of democratization and autocratization do not necessarily indicate fundamental shifts in the underlying democratization process. Instead, they may be natural fluctuations within a stable process driven by regime changes, contagion dynamics, and consolidation mechanisms. However, the future trajectory of global democratization remains uncertain, and these findings further weaken the notion that democratization is an 'inexorable force' of historical progress. A deeper understanding of the mechanisms behind these waves remains essential for anticipating shifts in global governance and informing policy responses to emerging democratic and autocratic trends.

References

Ambrosio, Thomas. 2010. "Constructing a framework of authoritarian diffusion: Concepts, dynamics, and future research." *International Studies Perspectives* 11 (4): 375–92. https://doi.org/10.1111/j.1528-3585.2010.00411.x.

Bamert, Justus, Fabrizio Gilardi, and Fabio Wasserfallen. 2015. "Learning and the diffusion of regime contention in the arab spring." *Research and Politics* 2 (3). https://doi.org/10.1177/2053168015593306.

Boese, Vanessa A, Staffan I Lindberg, and Anna Lührmann. 2021. "Waves of Autocratization and Democratization: A Rejoinder." *Democratization* 28 (6): 1202–10.

Boese, Vanessa A, Martin Lundstedt, Kelly Morrison, Yuko Sato, and Staffan I Lindberg. 2022. "State of the World 2021: Autocratization Changing Its Nature?" *Democratization* 29 (6): 983–1013.

Brinks, Daniel, and Michael Coppedge. 2006. "Diffusion Is No Illusion." *Comparative Political Studies* 39 (4): 463–89. https://doi.org/10.1177/0010414005276666.

Capoccia, Giovanni, and Daniel Ziblatt. 2010. "The historical turn in democratization studies: A new research agenda for Europe and beyond." *Comparative Political Studies* 43 (8): 931–68. https://doi.org/10.1177/0010414010370431.

Cassani, Andrea, and Luca Tomini. 2019. *Autocratization in post-Cold War Political Regimes.* Springer International Publishing. https://doi.org/10.1007/978-3-030-03125-1.

———. 2020. "Reversing regimes and concepts: from democratization to autocratization." *European Political Science* 19 (2): 272–87. https://doi.org/10.1057/s41304-018-0168-5.

Claassen, Christopher, Kathrin Ackermann, Eri Bertsou, Lucas Borba, Ryan E Carlin, Amnon Cavari, Sirianne Dahlum, et al. 2024. "Conceptualizing and Measuring Support for Democracy: A New Approach." *Comparative Political Studies*, 00104140241259458.

Clauset, Aaron. 2018. "Trends and Fluctuations in the Severity of Interstate Wars." *Science Advances* 4 (2): eaao3580.

Coppedge, Michael, John Gerring, Carl Henrik Knutsen, Staffan I. Lindberg, Jan Teorell, David Altman, Michael Bernhard, Agnes Cornell, M. Steven Fish, Lisa Gastaldi, Haakon Gjerløw, Adam Glynn, Sandra Grahn, et al. 2023. "V-Dem Codebook V13." Varieties of Democracy (V-Dem) Project.

Coppedge, Michael, John Gerring, Carl Henrik Knutsen, Staffan I. Lindberg, Jan Teorell, David Altman, Michael Bernhard, Agnes Cornell, M. Steven Fish, Lisa Gastaldi, Haakon Gjerløw, Adam

Glynn, Ana Good God, et al. 2023. "V-Dem [Country-Year/Country-Date] Dataset V13." Varieties of Democracy (V-Dem) Project. https://doi.org/10.23696/vdemds23.

Dahl, Marianne, Scott Gates, Havard Hegre, and Havard Strand. 2013. "Why Waves? Global Patterns of Democratization, 1820-2008." Typescript, Peace Research Institute Oslo; Citeseer.

Diamond, Larry. 1994. "Rethinking Civil Society: Toward Democratic Consolidation." *Journal of Democracy* 5 (3): 4–17. https://doi.org/10.1353/jod.1994.0041.

Djuve, Vilde Lunnan, Carl Henrik Knutsen, and Tore Wig. 2020. "Patterns of Regime Breakdown Since the French Revolution." *Comparative Political Studies* 53 (6): 923–58. https://doi.org/10.1177/0010414019879953.

Doorenspleet, Renske. 2000. "Reassessing the three waves of democratization." *World Politics* 52 (3): 384–406. https://doi.org/10.1017/S0043887100016580.

———. 2005. *Democratic Transitions: Exploring the Structural Sources of the Fourth Wave.* Lynne Rienner Publishers Boulder, CO.

Dowd, Connor. 2023. *Twosamples: Fast Permutation Based Two Sample Tests.* https://CRAN.R-project.org/package=twosamples.

Druckman, James N. 2024. "How to Study Democratic Backsliding." *Political Psychology* 45: 3–42.

Gleditsch, Kristian Skrede, and Michael D. Ward. 2006. "Diffusion and the international context of democratization." *International Organization* 60 (4): 911–33. https://doi.org/10.1017/S0020818306060309.

Göbel, Christian. 2011. "Authoritarian consolidation." *European Political Science* 10 (2): 176–90. https://doi.org/10.1057/eps.2010.47.

Guatelli, S, B Mascialino, A Pfeiffer, MG Pia, A Ribon, and Paolo Viarengo. 2004. "Application of Statistical Methods for the Comparison of Data Distributions." In *IEEE Symposium Conference Record Nuclear Science 2004.*, 4:2086–90. IEEE.

Hale, Henry E. 2013. "Regime change cascades: What we have learned from the 1848 revolutions to the 2011 Arab uprisings." *Annual Review of Political Science* 16: 331–53. https://doi.org/10.1146/annurev-polisci-032211-212204.

Hegre, Håvard, Joakim Karlsen, Håvard Mokleiv Nygård, Håvard Strand, and Henrik Urdal. 2013. "Predicting Armed Conflict, 2010–2050." *International Studies Quarterly* 57 (2): 250–70.

Huntington, Samuel P. 1991a. "Democracy's Third Wave." *Journal of Democracy* 2 (2): 12–34. https://doi.org/10.1353/jod.1991.0016.

———. 1991b. *The third wave : democratization in the late twentieth century*. Norman: University of Oklahoma Press,.

Kennedy, Ryan. 2010. "The contradiction of modernization: A conditional model of endogenous democratization." *Journal of Politics* 72 (3): 785–98. https://doi.org/10.1017/S0022381610000162.

Knutsen, Carl Henrik, Kyle L Marquardt, Brigitte Seim, Michael Coppedge, Amanda B Edgell, Juraj Medzihorsky, Daniel Pemstein, Jan Teorell, John Gerring, and Staffan I Lindberg. 2024. "Conceptual and Measurement Issues in Assessing Democratic Backsliding." *PS: Political Science & Politics* 57 (2): 162–77.

Lanzante, John R. 2021. "Testing for Differences Between Two Distributions in the Presence of Serial Correlation Using the Kolmogorov–Smirnov and Kuiper's Tests." *International Journal of Climatology*.

Levitsky, Steven, and Lucan A. Way. 2006. "Linkage versus leverage: Rethinking the international dimension of regime change." *Comparative Politics* 38 (4): 379–400. https://doi.org/10.2307/20434008.

Li, Richard P Y, and William R Thompson. 1975. "The "Coup Contagion" Hypothesis." *Journal of Conflict Resolution* 19 (1).

Little, Andrew T, and Anne Meng. 2024. "Measuring Democratic Backsliding." *PS: Political Science & Politics* 57 (2): 149–61.

Lührmann, Anna, and Staffan I. Lindberg. 2019. "A third wave of autocratization is here: what is new about it?" *Democratization* 26 (7): 1095–1113. https://doi.org/10.1080/13510347.2019.1582029.

Lührmann, Anna, Marcus Tannenberg, and Staffan I Lindberg. 2018. "Regimes of the world (RoW): Opening new avenues for the comparative study of political regimes." *Politics and Governance* 6 (1): 60–77. https://doi.org/10.17645/pag.v6i1.1214.

Lunde, Tormod K. 1991. "Modernization and Political Instability: Coups d'Etat in Africa 1955-85." *Acta Sociologica* 34 (1): 13–32. https://doi.org/10.1177/000169939103400102.

Maerz, Seraphine F, Amanda B Edgell, Matthew C Wilson, Sebastian Hellmeier, and Staffan I Lindberg. 2024. "Episodes of Regime Transformation." *Journal of Peace Research* 61 (6): 967–84.

Maerz, Seraphine F, Anna Lührmann, Sebastian Hellmeier, Sandra Grahn, and Staffan I Lindberg. 2020. "State of the world 2019: autocratization surges–resistance grows." *Democratization* 27 (6): 909–27. https://doi.org/10.1080/13510347.2020.1758670.

Miller, Michael K, Michael Joseph, and Dorothy Ohl. 2018. "Are Coups Really Contagious? An Extreme Bounds Analysis of Political Diffusion." *Journal of Conflict Resolution* 62 (2): 410–41. https://doi.org/10.1177/0022002716649232.

Morse, Michael D, and Jignesh M Patel. 2007. "An Efficient and Accurate Method for Evaluating Time Series Similarity." In *Proceedings of the 2007 ACM SIGMOD International Conference on Management of Data*, 569–80.

Nord, Marina, Fabio Angiolillo, Martin Lundstedt, Felix Wiebrecht, and Staffan I Lindberg. 2025. "When Autocratization Is Reversed: Episodes of u-Turns Since 1900." *Democratization*, 1–24.

Pemstein, Daniel, Kyle L. Marquardt, Eitan Tzelgov, Yi-ting Wang, Juraj Medzihorsky, Joshua Krusell, Farhad Miri, and Johannes von Römer. 2023. "The V–Dem Measurement Model: Latent Variable Analysis for Cross-National and Cross-Temporal Expert-Coded Data" *VDEM Working Paper 21*.

Przeworski, Adam. 2024. "Who Decides What Is Democratic?" *Journal of Democracy* 35 (3): 5–16.

Przeworski, Adam, Michael E Alvarez, Jose Antonio Cheibub, and Fernando Limongi. 2000. *Democracy and Development: Political Institutions and Well-Being in the World, 1950-1990*. Cambridge, MA: Cambridge University Press. https://doi.org/10.2307/3177153.

Riedl, Rachel Beatty, Paul Friesen, Jennifer McCoy, and Kenneth Roberts. 2024. "Democratic Backsliding, Resilience, and Resistance." *World Politics*.

Robinson, James A, and Daron Acemoglu. 2012. *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. Profile London.

Skaaning, Svend Erik. 2020. "Waves of autocratization and democratization: a critical note on conceptualization and measurement." *Democratization* 27 (8): 1533–42. https://doi.org/10.1080/13510347.2020.1799194.

Svolik, Milan. 2008. "Authoritarian Reversals and Democratic Consolidation." *Source: The American Political Science Review* 102 (2): 153–68. https://doi.org/10.1017/S0003055408080143.

Tomini, Luca. 2021. "Don't think of a wave! A research note about the current autocratization debate." *Democratization* 28 (6): 1191–201. https://doi.org/10.1080/13510347.2021.1874933.

Tomini, Luca, Suzan Gibril, and Venelin Bochev. 2023. "Standing up Against Autocratization Across Political Regimes: A Comparative Analysis of Resistance Actors and Strategies." *Democratization* 30 (1): 119–38.

Treisman, Daniel. 2020. "Democracy by Mistake: How the Errors of Autocrats Trigger Transitions to Freer Government." *American Political Science Review* 114 (3): 792–810.

———. 2023. "How Great Is the Current Danger to Democracy? Assessing the Risk with Historical Data." *Comparative Political Studies* 56 (12): 1924–52.

Waldner, David, and Ellen Lust. 2018. "Unwelcome Change: Coming to Terms with Democratic Backsliding." *Annual Review of Political Science* 21 (1): 93–113.

Wejnert, Barbara. 2005. "Diffusion, development, and democracy, 1800-1999." *American Sociological Review* 70 (1): 53–81. https://doi.org/10.1177/000312240507000104.

Wolff, Jonas. 2023. "From the Varieties of Democracy to the Defense of Liberal Democracy: V-Dem and the Reconstitution of Liberal Hegemony Under Threat." *Contemporary Politics* 29 (2): 161–81.

Wunsch, Natasha, and Philippe Blanchard. 2023. "Patterns of Democratic Backsliding in Third-Wave Democracies: A Sequence Analysis Perspective." *Democratization* 30 (2): 278–301.

Appendix A: Details on modeling and regression results

The simulation framework is structured into three layers of models: regime change models, multinomial polyarchy change models, and quantile regression models for change magnitude. Each layer contains variables relating to the country-level regime duration and polyarchy score, as well as regional and global-level variables capturing the diffusion of regime changes and changes in polyarchy.

Regime Change Models

The regime change models predict transitions between different regime types—coups, liberalizations, and other regime changes—using a multinomial logit regression. The dependent variable is the type of regime change that occurs in a given country-month, with "no change" as the reference category. Regression results for this model are presented in Table A1.

To model the contagious nature of regime changes on the national level, the model includes the inverse log time (in months) since the last regime change, coup, and liberalization. These variables capture the heightened uncertainty following recent regime shifts, reflecting how political instability can propagate within a country. The time since coup specifically accounts for the distinct dynamics of military takeovers, which may have different implications for regime stability compared to other forms of transition.

To capture regime consolidation and democratic consolidation, the model includes regime duration (logged) to account for the stabilizing effect of time on political institutions as well as the polyarchy score, its square, and its interaction with regime duration. This allows for a nuanced representation of how democratic institutions influence regime stability. These terms capture the likelihood that democracies consolidate over time, reducing the probability of regime change.

To account for regional and global contagion effects, the model includes decay functions for the cumulative number of regime changes, coups, and liberalizations at the regional and global levels. These variables reflect the diffusion of political instability across borders. The decay functions have a 48-month half-life, ensuring that regime changes in the region and globally exert a diminishing but persistent effect on future regime transitions.

Additionally, dummy variables indicate whether a country's polyarchy score is above or below the regional and global averages, capturing its relative positioning within broader democratization trends.

To model the prevailing democratic momentum or autocratic reversals, the model includes decay functions for cumulative polyarchy change at the national, regional, and global levels, along with their squared terms. These variables measure the diffusion of democratic and autocratic norms over time. The half-lives for these decay functions are set at 12 months at the national level (faster decay due to short-term political volatility), 24 months at the regional level (reflecting sustained regional democratization effects), and 48 months at the global level (capturing long-term global trends). Details on the selection of half-lives are provided in a separate section below.

This hierarchy aligns with the expectation that national changes have the most immediate effect, regional trends persist longer, and global shifts have the longest-lasting influence, capturing the dynamics of the "waves".

Multinomial Polyarchy Change Models

The multinomial change in polyarchy models predict whether a country's polyarchy score increases, decreases, or remains stable in a given month. These models are estimated using multinomial logit regression, with "no change" as the reference category. Regression results for this model are presented in Table A2.

To account for the fact that changes in the polyarchy score are expected to be most likely following a regime change or soon thereafter, dummy variables for regime change, coup, and liberalization are included in the model. Similarly, the time since regime change, coup, and liberalization variables capture the heightened uncertainty and potential for change in the aftermath of these events.

To capture regional and global contagion effects, the model includes the same decay functions for cumulative regime changes, coups, and liberalizations at the regional and global levels as in the regime change models. Similarly, the model also contain the dummy variables for whether the country has a lower polyarchy score than the regional and global average as well as the same decay functions capturing the prevailing nostrum through the cumulative national, regional, and global changes in polyarchy. These variables reflect the diffusion of political instability across borders.

To account for a systematic recording bias in V-Dem, where polyarchy changes are disproportionately recorded in January (42% January country-months have a change in polyarchy, compared to less than 4% in other months), the model includes a January dummy variable to correct for this distortion.

Quantile Regression Models for Change Magnitude

The magnitude models determine the size of a polyarchy change when it occurs, using quantile regression to estimate the distribution of changes across different levels of the polyarchy spectrum. These models ensure that political shifts are not treated as uniform but instead reflect varying degrees of democratization or autocratization. The models are estimated separately for increases and decreases in the polyarchy score, with the magnitude of change as the dependent variable. Regression results for these models are presented in Table A3 and A4. These tables show five quantiles (10th, 25th, 50th, 75th, and 90th) to capture the distribution of change magnitudes. In the model, 99 quantiles are used to capture the full distribution of change magnitudes.

In this layer, the covariates should be predictive of the magnitude of polyarchy change rather than their occurrence. To account for this, the inverse of the number of months since the last regime change is included, as well as a dummy variable for any regime change, as changes are expected to be larges immediately following a regime change. Changes are also expected to have a higher magnitude in times where there are large changes in the polyarchy score on the national, regional and global levels, so these decay functions are included as well. Lastly, the model includes a dummy variable for January to correct for the recording bias in V-Dem, and the inverse of time since the last recorded polyarchy change to account for the fact that the magnitude of change is expected to be larger in times of increased political instability.

Half-Life Calculations and Selection

All decay functions are parameterized using exponential smoothing, where the half-life of each process determines how quickly past events lose influence. Half-life values were selected to optimize the log-likelihood of the models while maintaining theoretical consistency. The selection was guided by the principle that national-level influences (e.g., past regime events, country-level polyarchy shifts) should decay more quickly (e.g., 12 months) due to the volatility of domestic politics. Regional influences (e.g., diffusion of democratization trends) should persist moderately long (e.g., 24 months), capturing sustained contagion effects. Global trends should exert the longest-lasting effects (e.g., 48 months), reflecting the inertia of worldwide democratization and autocratization waves.

A range of half-life values (12, 24, 36, and 48 months) was tested, with the final selection balancing statistical performance with theoretical expectations. The resulting specification ensures that national politics remain dynamic, regional trends exert medium-term influence, and global democratic shifts provide long-term structural pressures.

Adjusting for Temporal Reporting Bias in V-Dem Polyarchy Changes

An additional challenge in modeling polyarchy change is the systematic increase in the frequency of reported changes in V-Dem over time. This trend suggests a reporting bias, where earlier years may underreport smaller shifts in polyarchy, while later years record more frequent changes. If uncorrected, this pattern could distort the simulation results by artificially inflating the likelihood of change in the early years and underestimating it in the later years.[15]

To address this issue, an external time trend was estimated using a binary logistic regression, where the dependent variable is any recorded change in polyarchy and the independent variable is time (in years). The predicted values from this model were then used to rescale the likelihood of polyarchy changes, ensuring that the expected frequency of changes remains consistent with the historical data. Importantly, this adjustment is neutral to the direction of change, meaning that it does not bias the simulations toward democratization or autocratization but only corrects for inconsistencies in change detection.

Figure A1 illustrates the effectiveness of this correction by comparing the smoothed raw and adjusted likelihood of any polyarchy change over time to the observed data. The adjusted likelihood closely tracks the historical data, while the raw likelihood clearly overestimates the likelihood of changes in the early years and underestimates the likelihood in the later years. This discrepancy highlights the importance of correcting for temporal reporting bias to ensure that the simulated democratization and autocratization patterns accurately reflect historical dynamics.

Regularization of the Simulation Models

To prevent extreme and unrealistic trajectories in the simulation, a regularization procedure was applied to the half-life variables. This regularization ensured that the simulated values of these variables remained within empirically plausible bounds.

Specifically, the values of the half-life variables in the simulations were constrained such that they did not exceed the maximum historically observed values, rounded up to the nearest significant

[15] No similar trend was observed for the occurrence of regime changes, suggesting that this bias is specific to polyarchy changes.

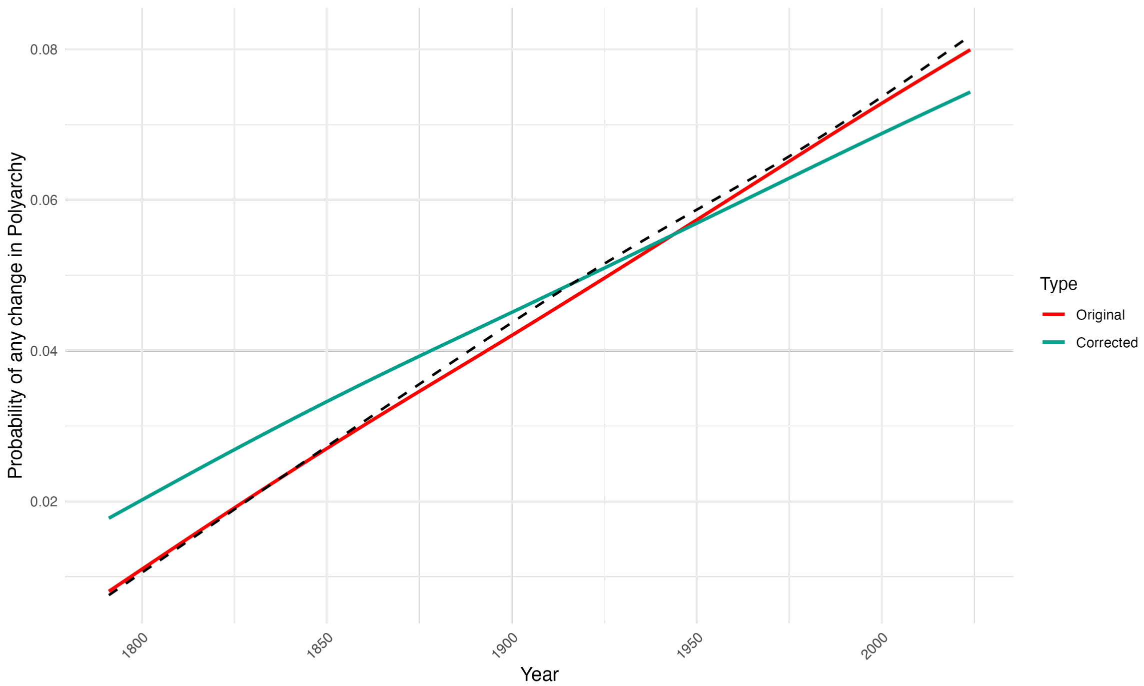

Figure A1. Temporal Reporting Bias Correction for Polyarchy Changes

digit. This approach prevented the simulation from producing self-reinforcing feedback loops that could drive global polyarchy to either zero or one, an outcome unsupported by historical trends.

Importantly, this regularization had a minimal impact on the overall simulation dynamics, affecting only a small fraction of simulation runs. The constraints primarily acted as a safeguard against runaway democratization or autocratization, ensuring that the modeled political evolution remained consistent with observed patterns while still allowing for substantial stochastic variation.

By applying these limits, the simulation maintains realism and stability, capturing the natural ebb and flow of democratization and autocratization without introducing artificial constraints that would distort the underlying mechanisms of political change.

Table A1. Multinomial Regression Results for Regime Change Types, no change as reference category

	Regime Change		
	Coup	Liberal	Other
Intercept	-4.095***	-4.736***	-3.926***
	(0.865)	(1.271)	(0.687)
Polyarchy (lag)	-0.439*	-0.761*	-0.612***
	(0.200)	(0.306)	(0.159)
Polyarchy^2 (lag)	-0.181***	-0.509***	-0.176***
	(0.029)	(0.070)	(0.023)
Polyarchy (lag) x Regime duration (log)	-0.040	0.054	-0.022
	(0.033)	(0.056)	(0.025)
Regime duration (log)	-0.629***	-0.215*	-0.307***
	(0.094)	(0.098)	(0.072)
1/Regime duration (log)	-6.890***	-2.359+	-0.201
	(1.277)	(1.306)	(0.553)
1/Time since coup (log)	1.797*	2.139*	-0.178
	(0.777)	(0.919)	(0.497)
1/Time since liberalization (log)	3.966***	-10.129***	-8.857***
	(0.982)	(1.945)	(2.001)
Cumulative polyarchy change (12 month half-life)	-0.993***	3.030***	0.165
	(0.212)	(0.381)	(0.132)
Cumulative polyarchy change^2 (12 month half-life)	0.092	-0.579*	0.451***
	(0.146)	(0.234)	(0.074)
Cumulative global polyarchy change (48 month half-life)	-0.624	1.273	-1.020+
	(0.635)	(1.325)	(0.561)
Cumulative global polyarchy change^2 (48 month half-life)	-2.720	-4.352	8.810***
	(2.392)	(3.922)	(1.822)
Cumulative regional polyarchy change (24 month half-life)	1.886**	2.378**	0.698
	(0.585)	(0.906)	(0.470)
Cumulative regional polyarchy change^2 (24 month half-life)	-0.736	-1.638*	-0.762
	(0.750)	(0.708)	(0.587)
Lower polyarchy (global, lag)	0.536***	0.193	0.074
	(0.159)	(0.204)	(0.148)
Lower polyarchy (regional, lag)	-0.251*	0.107	0.161
	(0.124)	(0.164)	(0.121)
Cumulative regional regime change (48 month half-life)	-0.371*	-0.598*	0.469***
	(0.167)	(0.247)	(0.131)
Cumulative regional liberalization (48 month half-life)	-0.027	0.828***	-0.415***
	(0.121)	(0.175)	(0.106)
Cumulative regional coup (48 month half-life)	0.771***	0.169	-0.322**
	(0.143)	(0.202)	(0.113)
Cumulative global regime change (48 month half-life)	0.969**	0.612	0.168
	(0.348)	(0.548)	(0.288)
Cumulative global liberalization (48 month half-life)	-0.433**	-0.484*	-0.058
	(0.156)	(0.228)	(0.137)
Cumulative global coup (48 month half-life)	-0.725**	-0.252	-0.374+
	(0.237)	(0.358)	(0.212)
Num. Obs.	222436		
AIC	17583.8		
BIC	18264.4		

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table A2. Multinomial Regression Results for change in Polyarchy, no change as reference category

	Change in Polyarchy	
	Negative	Positive
Intercept	-6.752***	-7.417***
	(0.224)	(0.216)
January	3.708***	3.710***
	(0.032)	(0.029)
Regime change	0.857***	0.899***
	(0.231)	(0.208)
Coup	0.536+	-0.281
	(0.302)	(0.325)
Liberalization	-0.211	1.333***
	(0.484)	(0.279)
1/Regime duration (log)	3.607***	3.389***
	(0.141)	(0.130)
1/Time since coup (log)	1.561***	-0.404*
	(0.161)	(0.188)
1/Time since liberalization (log)	-1.270***	0.442*
	(0.283)	(0.188)
1/Time since polyarchy change (log)	0.605***	0.829***
	(0.078)	(0.069)
Cumulative polyarchy change	-0.488***	0.349***
(12 month half-life)	(0.074)	(0.072)
Cumulative polyarchy change^2	-0.138*	-0.140*
(12 month half-life)	(0.064)	(0.056)
Cumulative global polyarchy change	-2.998***	-1.313***
(48 month half-life)	(0.245)	(0.245)
Cumulative global polyarchy change^2	-4.729***	-4.507***
(48 month half-life)	(0.837)	(0.797)
Cumulative regional polyarchy change	-0.170	1.131***
(24 month half-life)	(0.193)	(0.201)
Cumulative regional polyarchy change^2	0.833***	-0.232
(24 month half-life)	(0.227)	(0.207)
Lower polyarchy (global, lag)	-0.252***	-0.223***
	(0.040)	(0.037)
Lower polyarchy (regional, lag)	-0.231***	0.145***
	(0.038)	(0.035)
Cumulative regional regime change	0.347***	0.249***
(48 month half-life)	(0.051)	(0.046)
Cumulative regional liberalization	-0.006	-0.052
(48 month half-life)	(0.041)	(0.037)
Cumulative regional coup	-0.224***	-0.082*
(48 month half-life)	(0.045)	(0.041)
Cumulative global regime change	-0.248+	0.026
(48 month half-life)	(0.134)	(0.126)
Cumulative global liberalization	1.036***	0.728***
(48 month half-life)	(0.056)	(0.050)
Cumulative global coup	-0.049	0.033
(48 month half-life)	(0.085)	(0.078)
Num. Obs.	222436	
AIC	80434.0	
BIC	80908.4	

Note: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A3. Quantile Regression Results for positive changes in polyarchy. Only five quantiles are shown. Original model estimated on 99 quantiles from 0.01 to 0.99.

	Quantile (τ)				
	0.1	0.25	0.5	0.75	0.9
Intercept	0.003***	0.000	-0.017**	0.006	0.040**
	(0.001)	(0.002)	(0.006)	(0.012)	(0.015)
January	0.000	-0.002**	-0.016***	-0.060***	-0.081***
	(0.000)	(0.001)	(0.002)	(0.007)	(0.008)
1/Regime duration (log)	0.015***	0.070***	0.294***	0.489***	0.764***
	(0.003)	(0.011)	(0.030)	(0.052)	(0.083)
1/Time since polyarchy change (log)	0.002**	0.007**	0.024**	0.068***	0.059***
	(0.001)	(0.003)	(0.008)	(0.016)	(0.016)
Regime change	0.002	0.006	0.086**	0.148***	0.219+
	(0.003)	(0.014)	(0.031)	(0.032)	(0.118)
Cumulative polyarchy change	-0.001	-0.010	-0.030*	-0.035	-0.021
(12 month half-life)	(0.002)	(0.007)	(0.015)	(0.037)	(0.040)
Cumulative polyarchy change^2	0.010**	0.053**	0.147***	0.297***	0.450***
(12 month half-life)	(0.003)	(0.017)	(0.026)	(0.065)	(0.087)
Cumulative global polyarchy change	-0.003	-0.002	0.011	-0.016	0.045
(48 month half-life)	(0.002)	(0.005)	(0.012)	(0.047)	(0.076)
Cumulative global polyarchy change^2	0.020+	0.030	0.000	0.189	-0.264
(48 month half-life)	(0.010)	(0.020)	(0.054)	(0.168)	(0.256)
Cumulative regional polyarchy change	0.000	0.009*	0.003	-0.027	0.046
(24 month half-life)	(0.002)	(0.004)	(0.015)	(0.043)	(0.074)
Cumulative regional polyarchy change^2	0.008	0.004	0.022	0.235*	0.279+
(24 month half-life)	(0.008)	(0.009)	(0.046)	(0.093)	(0.166)
Lower polyarchy (global, lag)	0.000	-0.002**	-0.003	0.026**	0.125***
	(0.000)	(0.001)	(0.002)	(0.008)	(0.017)
Lower polyarchy (regional, lag)	0.001***	0.003***	0.014***	0.052***	0.106***
	(0.000)	(0.001)	(0.002)	(0.008)	(0.014)
Num. Obs.	6811	6811	6811	6811	6811
AIC	-12692.7	-10725.8	-6877.9	-1408.5	4275.7
BIC	-12603.9	-10637.1	-6789.2	-1319.8	4364.4

Note: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A4. Quantile Regression Results for negative changes in polyarchy. Only five quantiles are shown. Original model estimated on 99 quantiles from 0.01 to 0.99.

	Quantile (τ)				
	0.1	0.25	0.5	0.75	0.9
Intercept	-0.035	0.044***	0.039***	0.012***	-0.002+
	(0.024)	(0.009)	(0.005)	(0.002)	(0.001)
January	0.030*	0.010*	0.003	-0.001+	0.000**
	(0.014)	(0.005)	(0.002)	(0.000)	(0.000)
1/Regime duration (log)	-0.935***	-0.757***	-0.427***	-0.149***	-0.027***
	(0.072)	(0.036)	(0.027)	(0.013)	(0.006)
1/Time since polyarchy change (log)	-0.067	-0.044**	-0.026***	-0.007***	-0.002*
	(0.044)	(0.017)	(0.006)	(0.002)	(0.001)
Regime change	-0.657**	-0.224+	-0.087	-0.014	0.000
	(0.214)	(0.122)	(0.065)	(0.011)	(0.001)
Cumulative polyarchy change	-0.009	0.021	0.026**	0.016***	0.004***
(12 month half-life)	(0.039)	(0.027)	(0.009)	(0.003)	(0.001)
Cumulative polyarchy change^2	-0.278***	-0.139*	-0.030+	-0.006+	-0.003+
(12 month half-life)	(0.039)	(0.056)	(0.017)	(0.004)	(0.001)
Cumulative global polyarchy change	0.415*	0.102+	0.009	0.001	0.001
(48 month half-life)	(0.163)	(0.053)	(0.015)	(0.003)	(0.002)
Cumulative global polyarchy change^2	-1.615*	-0.237	-0.007	-0.001	0.007
(48 month half-life)	(0.738)	(0.214)	(0.058)	(0.012)	(0.005)
Cumulative regional polyarchy change	-0.042	0.091+	0.048***	0.013**	0.002
(24 month half-life)	(0.105)	(0.052)	(0.014)	(0.005)	(0.002)
Cumulative regional polyarchy change^2	0.045	-0.064	-0.029	-0.012	-0.006
(24 month half-life)	(0.129)	(0.159)	(0.022)	(0.010)	(0.004)
Lower polyarchy (global, lag)	0.001	0.011*	0.011***	0.004***	0.001**
	(0.014)	(0.005)	(0.002)	(0.001)	(0.000)
Lower polyarchy (regional, lag)	0.036*	0.011*	0.002	0.000	0.000+
	(0.014)	(0.005)	(0.002)	(0.001)	(0.000)
Num. Obs.	5579	5579	5579	5579	5579
AIC	2211.2	-3248.4	-7625.3	-10368.8	-11792.3
BIC	2297.3	-3162.3	-7539.2	-10282.6	-11706.2

Note: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B: Robustness tests

To evaluate the robustness of the simulation model, three alternative specifications were tested. The first excluded the regime change layer (the first layer of the modeling framework) and removed all regime change and diffusion-related variables from the second and third layers. This modification assesses whether regime change dynamics are essential for replicating historical democratization and autocratization trends.

The second alternative specification altered how newly independent states were initialized in the global system. Instead of entering at their historical polyarchy values, they were assigned the regional mean polyarchy score at the time of entry. If a country was the first in its region to enter, it was initialized at the global mean. This test evaluates whether observed patterns in democratization and autocratization are influenced by initial entry values rather than emergent dynamics within the model. The third alternative specification combined the first two modifications, removing the regime change layer and initializing new states at the regional mean polyarchy score.

Together, these robustness tests provide insight into whether all three layers of the simulation—regime change, diffusion, and consolidation—are necessary for accurately capturing historical patterns or whether results are primarily driven by the fixed entry conditions of states into the global system.

Distribution of change in the global level of polyarchy

To assess whether the alternative model specifications capture the historical distribution of change in the global level of polyarchy, I examined the proportion of Kolmogorov-Smirnov tests that fail to reject the null hypothesis when comparing the distribution of changes in global polyarchy over time intervals ranging from 1 to 10 years between the simulations and the historical record. The results of these tests are presented in Figure B1 where the values of the original model is shown in the top left panel for comparison.

The proportion of non-rejected KS tests is lower in the model without the regime change layer, with several time steps falling below the 0.05 threshold, indicating significant deviations from the historical record. Similarly, the regional mean entry model produces fewer non-rejected KS tests, though they remain above 0.01 across all time steps. Notably, when both modifications are applied simultaneously—removing the regime change layer and using regional mean entry—the proportion

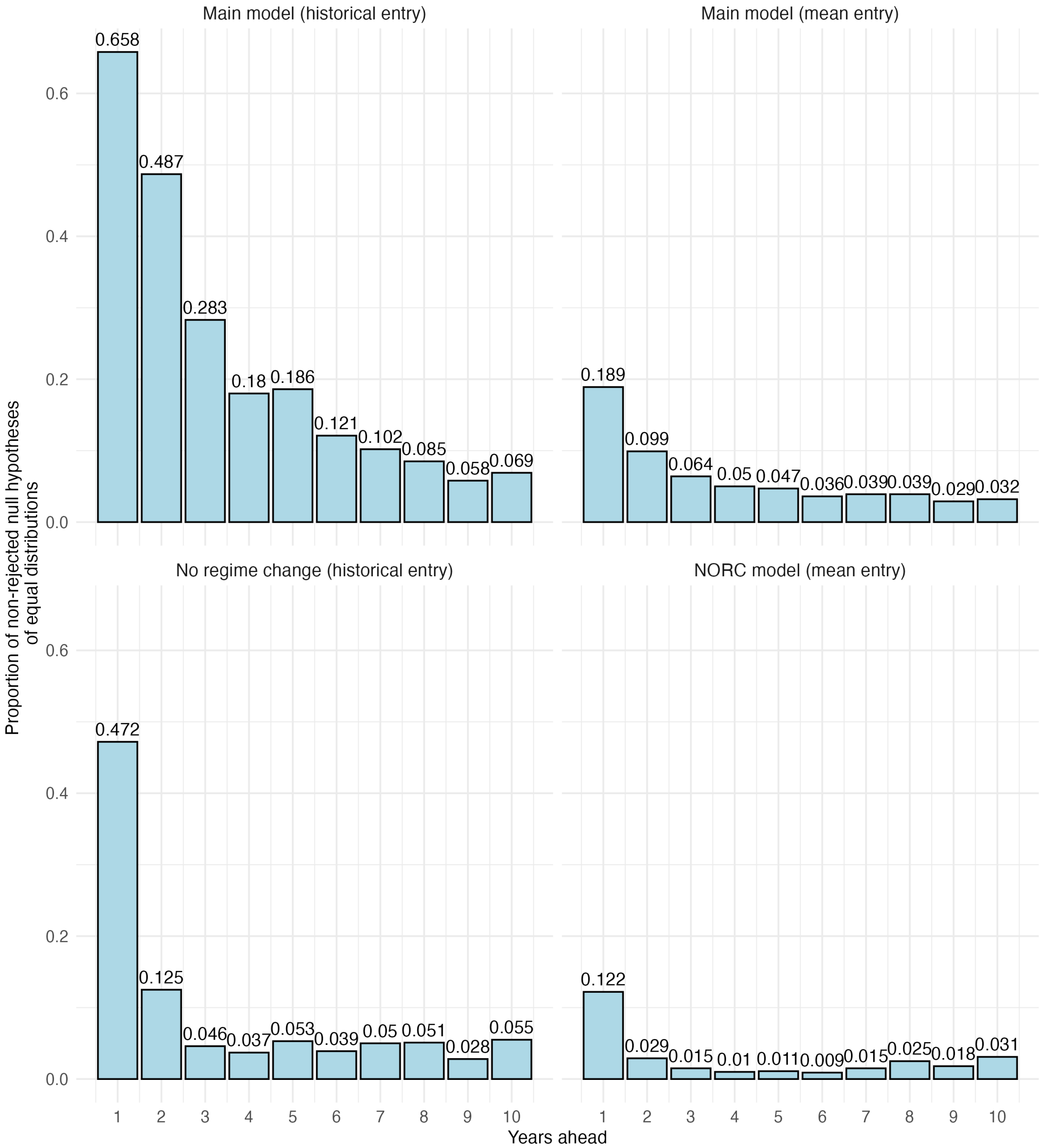

Figure B1. Proportion of non-rejected KS tests for the alternative model specifications.

of non-rejected KS tests drops substantially, further highlighting the importance of including regime change dynamics.

Cramér–von Mises Tests

As a further robustness check, I tested the distribution of changes in global polyarchy using the Cramér–von Mises (CVM) test which is more sensitive to differences in the tails of the distribution. The results of these tests are presented in Figure Figure B2.

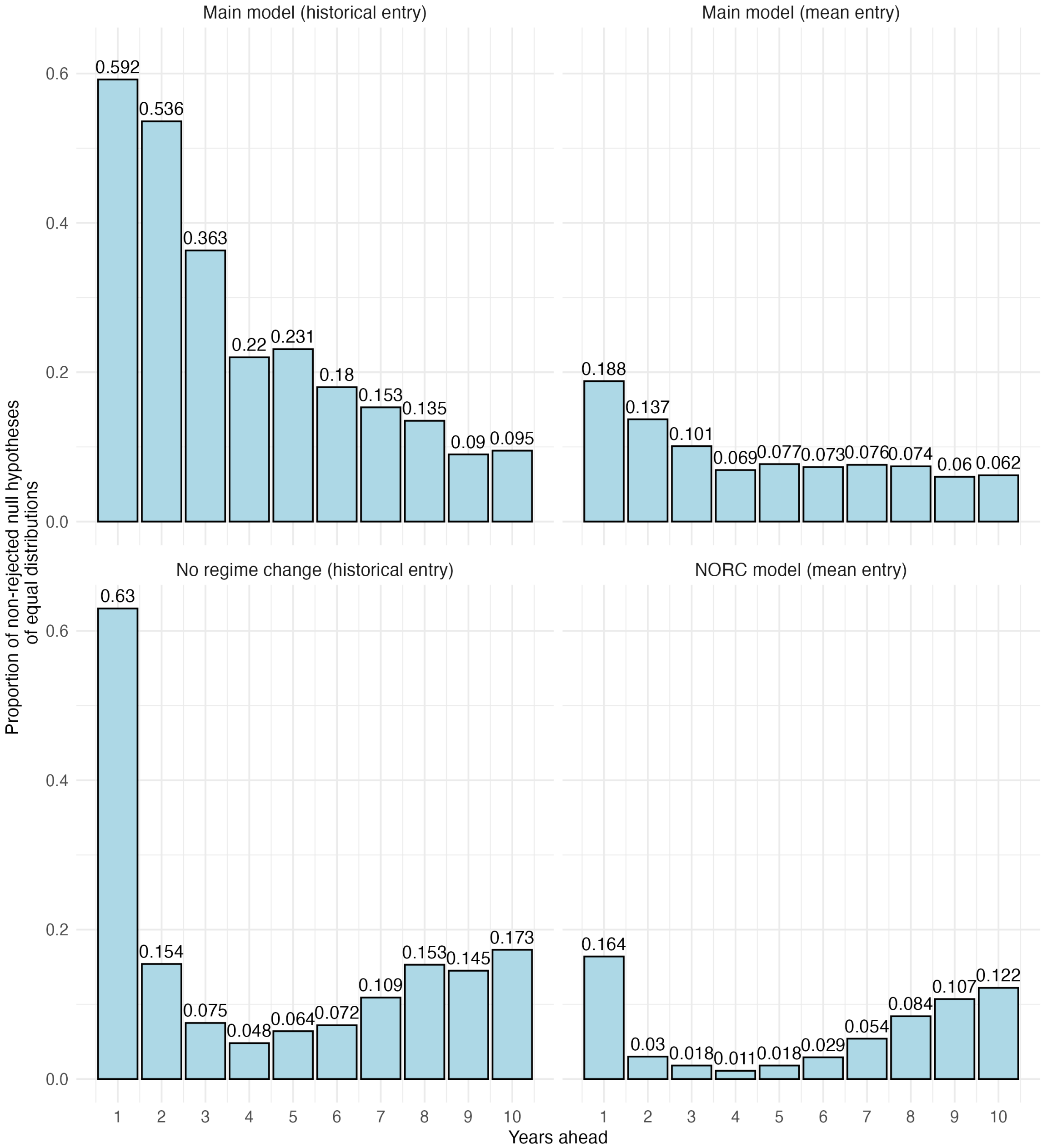

Figure B2. Proportion of non-rejected CVM tests for the alternative model specifications.

The CVM test consistently yields higher proportions of non-rejected tests compared to the KS test. For both the historical entry model and regional mean entry model, the proportion of non-rejected CVM tests remains above 0.05 throughout. However, comparing the results of the models with and without the regime change variables show a substantially higher proportion of non-rejected tests in the former. This further supports the conclusion that removing regime change dynamics reduces the model's ability to replicate historical democratization and autocratization trends.

Number of Democratization and Autocratization Waves

The number of democratization and autocratization waves remains consistent across all robustness models, indicating that the overall wave-like pattern is not sensitive to alternative specifications. The number of waves in each model is presented in Figure Figure B3.

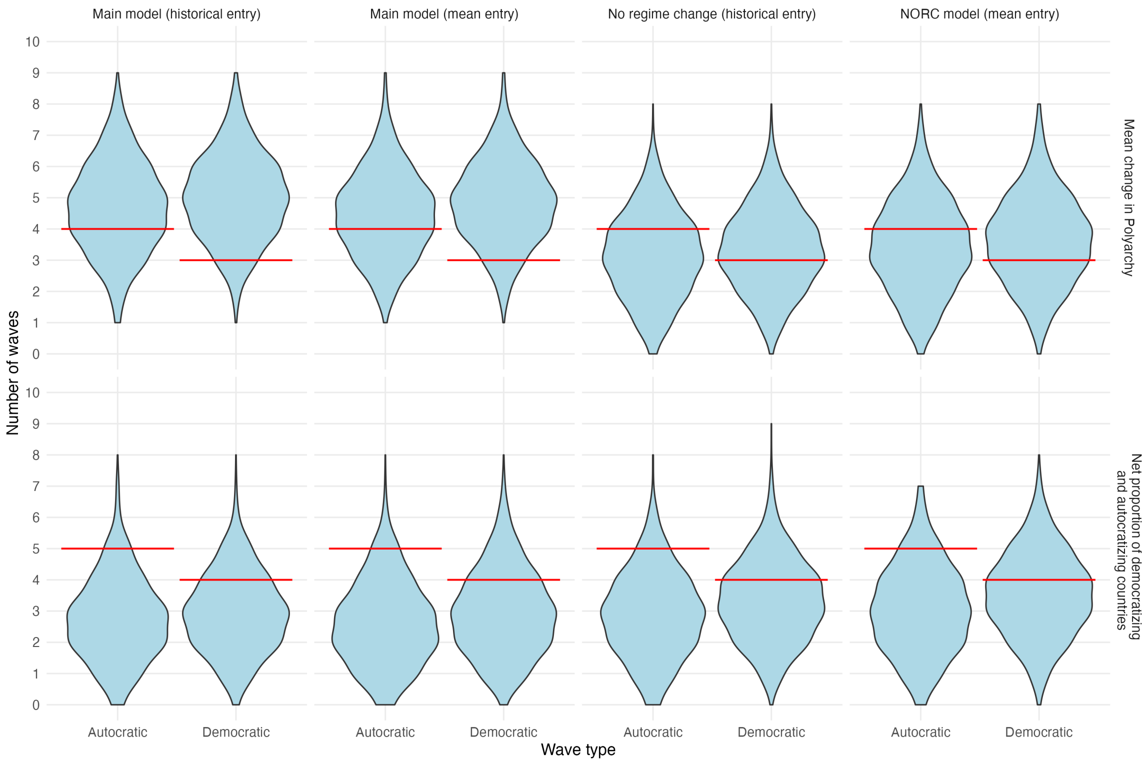

Figure B3. Number of democratization and autocratization waves for the alternative model specifications.

Likelihood of a third wave of autocratization

The likelihood of a third wave of autocratization varies significantly across the robustness tests. In models without the regime change layer, the probability of a third wave of autocratization of at least the same magnitude as the one observed historically is similar to the original model at 2.1% and 1.4% respectively for the historical entry and regional entry models respectively. Howeevr, in the main model with the regional mean entry, the probability of a third wave of autocratization drops dramatically, occurring in less than one percent of simulations, making it highly implausible.

Additionally, among simulations without the regime change layer, the proportion of simulations experiencing a third wave of autocratization in the latter part of the time series, regardless of the magnitude, differs depending on how democratization waves are conceptualized. The mean polyarchy change model produces a higher proportion of autocratization waves than the net proportion of democratization conceptualization. In contrast, for both the main model and the regional mean entry model, the two conceptualizations produce similar results.

Summary of Robustness Test Findings

The robustness tests presented here broadly support the inclusion of regime change dynamics in the simulation model. The higher proportion of rejected KS and CVM tests in models without the regime change layer signal that these models are less able to replicate the historical distribution of changes in global polyarchy. The number of democratization and autocratization waves remains consistent across all models, suggesting that the wave-like structure of democratization and autocratization is not sensitive to alternative specifications. However, the likelihood of a third wave of autocratization varies significantly across the robustness tests, with the regional mean entry model producing the least plausible outcomes. Furthermore, the exogenous influence of initial entry conditions of new states seem to have at least some impact on the likelihood of observing a third wave of autocratization, signaling that the historical entry conditions do play an important role in shaping political trajectories.