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# Which Institutions Rule?

## Unbundling the Democracy-Growth Nexus<sup>\*†</sup>

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## **Abstract:**

Over the past two decades studies of the causal impact of ‘institutions’ and ‘democracy’ on economic prosperity have occupied a prominent position in the cross-country growth literature and within economics more broadly. While this body of work establishes a consensus that ‘institutions rule’ (over trade and geography) and that ‘democracy causes growth’, what has been missing in the debate is an attempt to systematically trace some tangible building blocks of these abstract ‘bundles’ driving the positive relationship with economic development. In this paper, we adopt an encompassing concept of ‘liberal democracy’, covering underlying political and economic institutions, which we unbundle using the hierarchical data developed by the Varieties of Democracy project. We sketch how the incentives and opportunities as well as the distribution of political power created and shaped by these underlying institutions, in combination with the extent of the market, endogenously form an ‘economic blueprint for growth’, which is likely to differ across countries. Furthermore, political learning and institutionalisation imply a non-linear growth effect of institutional change within countries over time. We overcome these challenges by adopting a heterogeneous treatment effects estimator which allows for non-parallel trends in the run-up to and endogenous selection into institutional change. Our results for each underlying institution are presented as a function of ‘time in treatment’ and conditioned on the evolution of ‘rival’ institutions, enabling us to interpret them as empirical horse-races. We find that freedom of expression, clean elections, and legislative constraints on the executive are the foremost institutional drivers of economic development in the long-run. Erosion of these institutions, as witnessed recently in many countries, may jeopardise the perpetual growth effect of becoming a liberal democracy we establish for the post-WWII period.

**JEL Classification:** O10, P16, C23

**Keywords:** Democracy, Growth, Institutions, Difference-in-Difference, Interactive Fixed Effects

# 1 Introduction

Recent research establishes a positive long-run relationship between democracy and economic growth (Papaioannou & Siourounis 2008, Madsen et al. 2015, Acemoglu et al. 2019). Nevertheless, two important challenges to a better understanding of how democracy causes growth remain: first, the underlying political and economic institutions which drive the democracy-growth nexus have not been identified; and second, the existing literature has assumed that the democracy-growth relationship is common across countries and over time spent in democracy, which makes it difficult to derive tangible policy implications for individual countries (Durlauf 2020).

The first challenge is to better understand how democratic institutions foster growth: Which institutional building blocks are essential, what's inside the black box? In a frequently-cited phrase from his seminal book *On Democracy* Robert Dahl suggests that "democracy has meant different things to different people at different times and places" (Dahl 2000, 3), which is reflected in the variety of political institutions brought together in the binary indicators of democracy in Papaioannou & Siourounis (2008), Cheibub et al. (2010), Boix et al. (2013) and Acemoglu et al. (2019): electoral rights, civil rights, executive constraints or a (selective) combination of all these — see Appendix Figure A-3 for illustration. Acemoglu et al. (2019, footnote 4), for instance, argue that their meta-indicator successfully captures "a bundle of institutions that characterize electoral democracies", but that this misses elements of a "broader set of inclusive institutions" (ibid) emphasized in other work by Acemoglu & Robinson (2012). Which elements of the 'bundle' matter most for economic prosperity, if indeed they are not all of equal significance, is left uncertain.<sup>1</sup> This question is the focus of the present study.

The second challenge is more methodological in nature and relates to the heterogeneity of democracy's effect on growth across countries and within countries over time: existing research assumes a common democracy-growth relationship across countries and presents the growth effects of democracy as averages over time (e.g. the average treatment effect on the treated). First, such assumptions ignore existing arguments for heterogeneous growth effects across democratisers, including 'elite-biased democratisation' (Albertus & Menaldo 2018) among other work emphasising differential *modes* of regime change (e.g. peaceful vs violent regime change or 'democratisation by mistake', see Cervellati & Sunde 2014, Treisman 2020), or the negative implications of populist leaders for economic performance, regardless of democratic regime (Funke et al. 2020). A systematic analysis of heterogeneities is only possible when country regressions, not pooled regressions of all countries, are the basis of empirical investigation. Second, distinguishing growth implications of institutional change *over time* speaks to a political economy interpretation of the 'experience' of democracy. Political scientists refer to the initial period in many new democracies as 'democratic overload', a 'tumultuous youth' during which historical internal rivalry may raise its ugly head again and leaders may priori-

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<sup>1</sup>Acemoglu et al. (2019) provide some event analysis for different elements of the polity2 variable (their Appendix Figure A-2) akin to our descriptive analysis in Appendix Figure A-2, concluding that "transitions to democracy typically entail a similar set of institutional changes" (A34) across the indicators considered. In Footnote 4 of their main paper they suggest that this translates into the "joint effects of this bundle of democratic institutions, which improve in tandem following a democratization" (emphasis added) although they do not empirically model this like we do.

tise short-term policies to pander to the impatient populace or their own political supporters, with negative implications for sustainable economic growth (Gerring et al. 2005). But politicians, bureaucrats and citizens learn over time, decision-making and bureaucratic processes (like recruitment and procurement) become more formalised and hence predictable, cementing the ‘political institutionalisation’ of authority patterns in the country. These thoughts point to the potential for non-linear growth effects with length of democratic experience. This aside, the focus on an average treatment effect in the existing literature pre-supposes that the economic effect of democracy constitutes a one-off levels effect (or, equivalently, only a temporary growth effect). If democracy fosters the ‘right incentives’ to innovate, then a more permanent effect in line with many endogenous growth theories cannot be ruled out, but this can only be discovered if the period of time spent in democracy is explicitly acknowledged in the analysis.<sup>2</sup>

The main contribution of this paper is to overcome the two challenges discussed above to answer the question “Which institutional building blocks drive the democracy-growth relationship?” We address the first challenge by developing a conceptual framework that outlines how change in political and economic institutions fosters economic growth over time.<sup>3</sup> We then empirically trace the democracy-growth nexus from an encompassing high-level construct (liberal democracy) down to its building blocks to identify the institutional drivers of the democracy-growth nexus. These low-level constituent components represent tangible practices and reflections of sound institutions, such as free and fair elections or constraints on the head of state, rather than broad and abstract concepts like “liberal democracy”. We overcome the second challenge with an econometric implementation that allows us to study the evolution of *country-specific* effects of institutional change on economic growth over time. This exercise provides insights in the relative as well as to an extent the sequential relevance of different institutions for economic prosperity, evaluated over the time spent ‘in treatment’ and hence allows us to distinguish long-run short-run effects. We discuss in detail how we define institutional change in Section 3 below.<sup>4</sup>

Our empirical analysis studies regime change effects in different layers of democratic institutions to trace the positive democratic dividend we establish at the higher level (in line with the recent empirical literature, including Papaioannou & Siourounis 2008, Acemoglu et al. 2019, Boese & Eberhardt 2021, Eberhardt 2021) to the low-level constituent components. We take advantage of the Varieties of Democracy (V-Dem) project’s hierarchical indices to adopt an encompassing conceptual framework for ‘liberal democracy’ including political rights, executive

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<sup>2</sup>Note that we do not employ the concept and empirical operationalisation of ‘democratic capital stock’ as is done in studies by Persson & Tabellini (2009) and Gerring et al. (2005), among others: these stocks are computed for very long time horizons and hence may conflate the effects of democratic experience of the current regime with those of democratic legacy (earlier stints of democracy). Furthermore, results for stock values are difficult to interpret when economic magnitudes are of interest, and given the ‘within-country’ nature of standard empirical assessment, the identification in the empirical analysis derives from the *changes* in stocks over time, not the stock levels.

<sup>3</sup>In this paper we use ‘institutional change’ and ‘regime change’ interchangeably. Our threshold for regime change is defined by the full sample mean of a high- (e.g. liberal democracy), mid- (e.g. polyarchy) or low level (e.g. freedom of association) V-Dem index, respectively; additional results gauge the robustness of our findings to alternative cut-offs.

<sup>4</sup>We construct regime dummies from *continuous* V-Dem indices. There is an unfortunate overlap in names between some of these indices and the different regimes in V-Dem’s ‘Regimes of the World’ (ROW) dataset (Lührmann et al. 2018). We only ever use the latter for comparison of high-level democracy indicators in Panel (a) of Figure 3. Whenever we refer to ‘liberal democracy’ or ‘electoral democracy’ we refer to the respective index or the indicator variables we construct on the basis of these indices, not the ROW regimes.

constraints, property rights, and other civil rights. The V-Dem data provide us with a close mapping between the building blocks of a multi-faceted concept of liberal democracy and the empirical analysis of institutional change in a large sample of countries over the 1949 to 2018 period.

Our empirical implementation uses the novel [Chan & Kwok \(2021\)](#) Principal Component Difference-in-Difference (PCDID) estimator which arrives at country-specific estimates for the treatment effect and hence is not subject to recent concerns about the use of the two-way fixed effects estimator when treatment effects are likely to be heterogeneous ([De Chaisemartin & d’Haultfœuille 2020](#), [Athey & Imbens 2021](#), [Goodman-Bacon 2021](#)). The PCDID estimator allows for pre-intervention non-parallel trends and endogenous selection into regime change by augmenting the estimation equation of a ‘treated’ country (i.e. one that has experienced regime change) with common factors estimated from the residuals of the same equation in the control sample. These common factors capture unobserved confounders such as total factor productivity, and we elaborate on them in section 4.1.

We adopt the graphical form of presentation introduced in [Boese & Eberhardt \(2021\)](#) to report our findings: we employ multivariate running line regression, a form of local linear regression, to plot the smoothed estimated treatment effects (e.g. the effect of becoming a liberal democracy on economic development) against the ‘years of treatment.’ This enables us to additionally control for sample characteristics and regime reversal dynamics and further helps determine whether democratic regime change has a temporary or permanent growth effect. In the comparison of mid- and low-level building blocks of democracy this practice also allows us to conduct horse-races by conditioning on the magnitude and evolution of the ‘rival’ institutions: for instance, when charting the effect of regime change defined on the basis of the ‘electoral democracy’ (polyarchy) index we control for the value of the ‘liberal component’ index in the year of polyarchy regime change as well as the variability of the liberal component index during the time in the polyarchy ‘regime.’

We have two main findings: first, studying constituent components representing economic and political institutions (the question about ‘which institutions rule’), we establish that clean elections and, to a lesser extent, freedom of expression and legislative constraints on the executive drive economic prosperity in the long-run. In contrast, the initially strong positive effects of freedom of association, judicial constraints on the executive, and the rule of law peter out and turn statistically and economically insignificant after a decade or two. These findings are robust to an alternative empirical setup to explicitly model the interdependencies between different institutions in their effect on growth. Second, when we study the effect of becoming a ‘liberal democracy’ on growth, we find that democratic regime change is the dividend that keeps on giving — in the long-run liberal democracy does not just have a temporary but a permanent growth effect.

The remainder of the paper is structured as follows: in Section 2 we review the literature for the constituent elements of our encompassing liberal democracy conceptual framework and sketch the mechanisms determining the democracy-growth nexus. The data proxies from V-Dem and our data transformations are discussed in Section 3. The empirical strategy, including a brief discussion of what constitutes ‘common factors’, is provided in Section 4, with

results presented in Section 5. We investigate interaction models to capture interdependencies between different institutions in Section 6. A short conclusion follows.

## 2 From Institutions to Growth

The focus of this paper is on unbundling the democracy-growth nexus to pinpoint the democratic building blocks driving the relationship. Therefore, in this section we first discuss previous research and outline how our approach bridges the gap between two strands of literature: the ‘institutions rule’ and the ‘democracy causes growth’ literature. In the second part of this section, we present our definition of democratic institutions and relate it to previous studies of democracy and growth. Finally, we present a conceptual framework in which the tractable building blocks of democracy are embedded to lay the groundwork for our empirical analysis in the subsequent sections.

### 2.1 Background

2021 marked the twentieth anniversary of the publication of *‘The colonial origins of comparative development’* (Acemoglu et al. 2001). Though not the first empirical contribution on the link between institutions and growth (e.g. Dawson 1998, Hall & Jones 1999), it is arguably the paper which firmly established the quality of **institutions** as the most significant ‘deep determinant’ of long-run economic development. In the years after its publication empirical battles were fought over the supremacy of institutions over geography and trade openness (e.g. Dollar & Kraay 2003, Easterly & Levine 2003, Rodrik et al. 2004) as well as over the precise definition of institutional quality which did (or did not) cause development over the long-run (Glaeser et al. 2004).<sup>5</sup> With some exceptions,<sup>6</sup> most of these studies took a relatively narrow view of institutions when it came to empirical implementation:<sup>7</sup> protection against expropriation (Acemoglu et al. 2001, Dollar & Kraay 2003), rule of law<sup>8</sup> (Dollar & Kraay 2003, Rodrik et al. 2004), or constraints on the executive (Acemoglu et al. 2002, Glaeser et al. 2004)<sup>9</sup> In the end, although perhaps individual battles were lost, the overall ‘war’ over the supremacy of ‘institutions for development’ has undoubtedly been won.

More recently, arguably with less fervour, the empirical debate has moved away from ‘institutions’ and has studied the economic implications of ‘**democracy**’.<sup>10</sup> That is, some of

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<sup>5</sup>See the schematic literature reviews in Appendix B.

<sup>6</sup>Easterly & Levine (2003) include the full Kaufmann Institutions Index (Kaufmann et al. 1999) covering elements of electoral democracy as well as civil liberties in their regressions. Dollar & Kraay (2003) investigate the rule of law but also the Freedom House index.

<sup>7</sup>If we locate these interpretations of ‘good institutions’ in our encompassing framework of liberal democracy in Figure 1, introduced in the following subsection, then these studies tended to emphasise either the ‘rule of law’ or ‘constraints on the executive’ strands.

<sup>8</sup>In their 2002 update to Kaufmann et al. (1999) the authors explain that this combines “indicators which measure the extent to which agents have *confidence in and abide by the rules of society*. These include perceptions of the incidence of both violent and non-violent crime, the *effectiveness and predictability of the judiciary*, and the *enforceability of contracts*” (6, emphasis added).

<sup>9</sup>The executive constraint variable follows the definition of PolityIII. It should be emphasised that the latter authors’ aim is to support the notion that institutional development *follows* human capital and economic development; they further find fault with the lack of durability of the proxies used in the institutions-growth literature.

<sup>10</sup>Of course, the study of the effect of institutions has not gone away, but in line with the ‘credibility revolution’



the protagonists from the above institutions debate have taken to questioning (Giavazzi & Tabellini 2005, Rodrik & Wacziarg 2005, Persson & Tabellini 2006) or supporting (Papaioannou & Siourounis 2008, Acemoglu et al. 2019) the long-run effect of democracy on growth.<sup>11</sup> The most recent contribution by Acemoglu et al. (2019) offers causal evidence for a positive link between democracy and growth<sup>12</sup> across a wide range of specifications and implementations. According to these authors the economic effects of democratisation are sizeable: an increase in per capita GDP of 20% or more in the long-run.

In a recent survey Durlauf (2020) combines these literatures under the ‘institutions’ banner but sides with Glaeser et al.’s (2004, 274) emphasis on the “durable rules, procedures or norms that the word ‘institutions’ refers to” when interpreting North’s (1981, 201f) definition of institutions (“a set of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals in the interests of maximising the wealth or utility of principals”).<sup>13</sup> This emphasis on the *permanence* of institutions marks the biggest difference between the two literatures, which investigate institutions and institutional change, respectively. Hence, it is important to emphasise that in line with the work in the empirical literature on democracy and growth we cannot explain the impact of democracy on growth *in all countries*, including those which were democratic throughout our post-WWII sample period — in that sense, we cannot claim to speak to the deep determinants of growth which some researchers in the ‘institutions rule’ literature have proclaimed for their findings, but only to the causal effect of *institutional change* on economic performance (albeit over the long-run of fifty or more years in some cases): like others (e.g. Papaioannou & Siourounis 2008, Acemoglu et al. 2019) we cannot explain why some countries are rich and others are poor, but merely whether institutional change can lead to economic betterment.

## 2.2 Defining Democratic Institutions

As discussed, the past two decades have witnessed a lively debate about the causal effect of ‘institutions’ on economic development: the ‘institutions rule’ debate of the 2000s and the more recent ‘democracy causes growth’ literature. We can illustrate the definitional choices made in these empirical literatures in Figure 1, which presents the constituent elements of the Varieties of Democracy’s (V-Dem) ‘liberal democracy’ index (Coppedge et al. 2021):<sup>14</sup> the ‘institutions rule’ literature has primarily focused on the rule of law or executive constraints (in pink), while

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of the 2010s the literature largely shifted to microeconomic analysis and/or the analysis of specific institutions (e.g. slavery, colonialisation, ethnic fractionalisation). These are arguably part of the ‘long arm of history’ literature and hence cannot speak to the recent call for more policy-relevant research on institutions (Durlauf 2020).

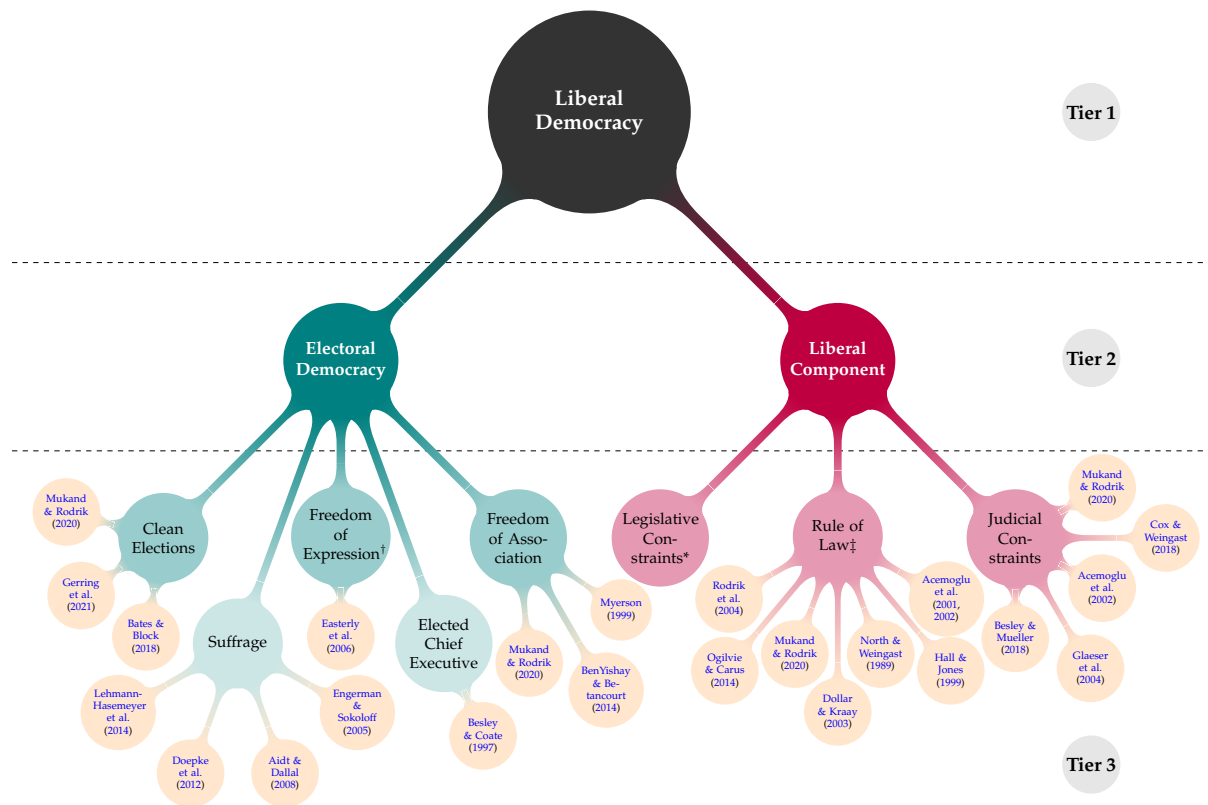
<sup>11</sup>This list only covers a number of those studies in the economics literature which adopt binary indicators for democracy. Details of earlier work (e.g. Barro 1996), studies using continuous measures (e.g. Murin & Wacziarg 2014, Madsen et al. 2015) and work from the political science literature (e.g. Gerring et al. 2005, Leblang 1997, Knutsen 2013) are provided in Appendix B.

<sup>12</sup>We follow their practice (see footnote 1 in Acemoglu et al. 2019) in using ‘growth’ as a short-hand for long-run economic development (the level of per capita GDP). For brevity economic development or income is at times used instead of per capita GDP. See Eberhardt & Teal (2011) for a more detailed discussion of growth empirics.

<sup>13</sup>Glaeser et al. (2004) argue that any time-series variation in executive constraints (and other measures) implies that these cannot be valid proxies for institutions in North’s sense.

<sup>14</sup>See Appendix Table A-2 for V-Dem concepts and empirical proxies, discussed in detail below. The empirical proxies adopted in the institutions and democracy literatures are reported in Appendix Tables B-1 and B-2. The V-Dem indices have a number of advantages over the PolityIV index laid out in Section 3 (see also Boese 2019).

**Figure 1: Liberal Democracy** — a conceptual framework with selected references



**Notes:** The framework presents the V-Dem conceptualisation of liberal democracy. The references indicate elements emphasised in existing work on institutions, democracy, and on institutions and economic performance (theoretical and empirical papers).<sup>16</sup>

\* The references for judicial constraints similarly apply to legislative constraints; we refer to these jointly as ‘executive constraints’.

† This includes ‘alternative sources of information’.

‡ In its entirety this component also covers ‘Individual Liberties and Equality before the Law.’

research on the democracy-growth nexus has adopted measures of ‘electoral democracy’ (in teal) — seemingly very separate conceptual strands.

Yet, the terminology used in these literatures and that adopted in our Figure are not entirely congruent. Acemoglu et al. (2019), for example, adopt a union (of sorts) of the PolityIV and Freedom House indices.<sup>15</sup> Their measure of democracy thus captures not just the V-Dem definition of electoral democracy (polyarchy), but also elements of V-Dem’s ‘liberal component’ (executive constraints, rule of law). Recognising these choices reveals a striking definitional overlap between the two empirical debates: the recent literature on democracy and growth has really used a mesh-up of existing minimalist definitions of democracy from the political science literature (Boix et al. 2013, Cheibub et al. 2010) and old friends from the ‘institutions rule’ debate. Adopting an encompassing definition of liberal democracy enables us to study the significance of both, democracy *and* institutions.

We unbundle this mesh-up by employing an empirical approach that traces the democracy-

<sup>15</sup> As presented in the two upper panels of Appendix Figure A-3.

<sup>16</sup> This representation is by necessity stylised and incomplete (many studies consider several ‘lower-level’ components, e.g. Dawson 1998, Easterly et al. 2006). Further examples can be found in Durlauf (2020, Table 1).

growth relationship through three tiers of political and economic institutions (see Figure 1). We begin at the highest institutional level (Tier 1): our encompassing ('high-level') definition of democracy/institutions is that of Liberal Democracy. This includes an electoral democracy emphasising participation and competition *in combination with* executive constraints and the rule of law — the latter is seen as the “truly distinctive” feature of liberal democracy (Mukand & Rodrik 2020, 765) and represents the dominant factor studied in the ‘institutions rule’ empirical literature.<sup>17</sup> The ‘mid-level’ splits these concepts into their constituent parts, namely an ‘electoral democracy’ (polyarchy) component,<sup>18</sup> and a ‘liberal component’. A third layer sees these ‘mid-level’ political institutions split into ‘low-level’ components: freedom of speech, freedom of association, suffrage, elected leaders, and clean elections in case of the polyarchy index; and the rule of law guaranteeing individual liberties, along with judicial and legislative constraints on the executive in case of the liberal component.<sup>19</sup> In contrast to the existing literature, using this three-tiered framework, we can pinpoint those specific institutional elements of the broadly defined concept of democracy that are driving the ‘democratic dividend’. In addition, our empirical approach reveals the particular qualities of this effect over time, i.e. a permanent growth effect vs. a one-off levels effect.

## 2.3 Conceptual Framework

*“[Democracy is an] institutional arrangement for arriving at political decisions in which individuals acquire the power to decide by means of a competitive struggle for the people’s vote.”*  
Schumpeter (1942/1950/1976, 269)

*“[W]ithout democracy, you have no understanding of what is happening down below . . .”*  
Mao Zedong cited in Przeworski et al. (2000, 144)

*“[D]emocracy + time = economic development.”*  
Gerring et al. (2005, 337)

How can democracy foster economic development? Figure 2 provides a schematic overview of how this process broadly can be synthesised. We differentiate between an endogenous process on the left of the diagram (incentives, market size, political power) and a sequential process that accumulates over time on the right. Long-run economic growth following democratic regime change can be thought of as the outcome of an amplification or moderation of the ‘economic blueprint for growth’ over time. We identify three factors jointly forming this blueprint: ‘incentives and opportunities’ for firms and individuals determine economic fundamentals, ‘market size’ determines whether these fundamentals have the potential to foster Smithian (structural change), neoclassical (K, HC) and/or endogenous (TFP) growth, and the ‘political power’ structure (broad vs elite) determines to what extent this potential can be fully realised

<sup>17</sup>See Appendix Table B-1; a review of literature on the democracy-growth nexus is provided in Appendix Table B-2.

<sup>18</sup>This follows Dahl (1971), closest in conceptual coverage to the polity2 variable from PolityIV, though the correspondence is not perfect (see Figure A-3): in V-Dem terms, the polity2 variable represents polyarchy less political participation but with added constraints on the executive (a ‘liberal’ component in V-Dem).

<sup>19</sup>Over the past 70 years, ‘Suffrage’ and ‘Elected Chief Executive’ display very limited temporal variation and near-universal coverage. Hence, we omit them from our post-WWII analysis. For more details see Section 3.

to foster economic growth. Over time, the impact of the ‘economic blueprint’ changes: ‘experience’ (of democracy) explains how and why the ‘democratic dividend’ will differ with time and hence also across countries. We discuss all these elements in turn in the following paragraphs.

**Incentives and Opportunities** Much of the ‘institutions rule’ literature focuses on the first block, on what could be termed ‘economic fundamentals.’ The ‘right’ institutions incentivise and offer opportunities for firms and individuals (i) to invest in capital accumulation (e.g. [Hall & Jones 1999](#), [Acemoglu et al. 2001, 2002](#)), namely physical (K) in the case of firms and human (HC) in the case of individuals, and/or (ii) to ‘improve technological efficiency’ (TFP).

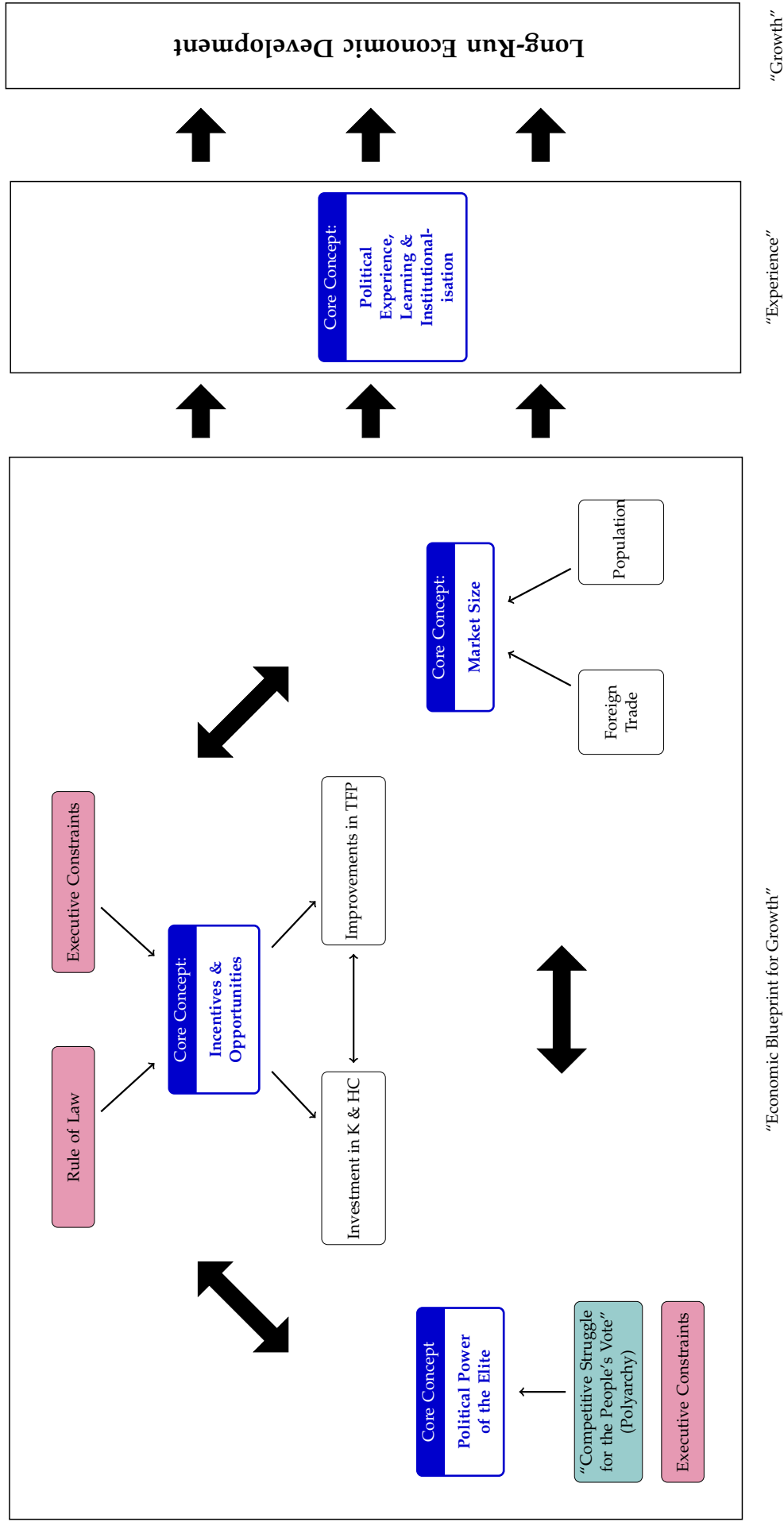
Human capital investment is of course not limited to schooling/education, but also improvements in health and hence increased life expectancy as well as decisions leading to demographic transitions (reduced fertility rates) ([Gerring et al. 2005](#)). TFP improvements can be achieved through purposive R&D and innovation (in a broad sense, see [Cirera & Maloney 2017](#)), and/or by addressing resource misallocation (e.g. structural transformation). Investment takes place if firms and individuals are assured to reap the ‘fruits of their investments’ by the presence of secure property rights and protection against (individual or state) misappropriation of private returns — a suite of civil rights which we can refer to broadly as the ‘rule of law’ and ‘constraints on the executive’. These are, of course, the institutions economists commonly associate with Douglass North ([North 1981](#), [North & Weingast 1989](#))<sup>20</sup> and ‘getting incentives and opportunities and prices right’ also entails the reduction of market frictions (e.g. in credit markets) and the facilitation of transaction more generally, including foreign trade ([Besley 1995](#)). We have argued above that studying the effects of *changes* in the institutions of this form is a worthwhile endeavour, emphasising the time-variation of institutions rather than their permanence ([Glaeser et al. 2004](#)), in agreement with many other researchers (see, for instance, [Acemoglu et al. 2002](#), 1395).

**Market Size** The best blueprint for economic growth cannot deliver prosperity if there is only a limited market, if the country has a small population, is effectively closed to international trade (out of policy choice or fate), and/or is far away from large, open economies with ample consumer demand to feed on. The incentives and opportunities that determine the potential for growth in an economy with constraints on the executive and the rule of law are themselves affected by this ‘extent of the market’ argument (e.g. [Jones 1995](#), [Dollar & Kraay 2003](#), [Peters 2021](#)). This factor in and of itself is not directly linked to democracy, but illustrates that the economic growth potential afforded an economy by its ‘Northian’ institutions is amplified or attenuated by the realities of its demographic, geographic or international environment (see also [Acemoglu & Zilibotti 2001](#), for formal arguments). Hence we should expect two countries with identical institutions to experience different long-run growth if their market size differs substantially.

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<sup>20</sup>[Baum & Lake \(2003, 334f\)](#) label this the ‘compatibility’ school of thought which emphasises the “safeguarding of the private sphere” and the limitation of “the state’s power to intervene in the economy”.

Figure 2: Mechanisms — Institutions and Economic Development



**Notes:** This diagram shows the proposed mechanisms of how institutions lead to economic growth. There are four core concepts: ‘Incentives and Opportunities’, ‘Market Size’, ‘Political Power of the Elite’ and ‘Experience’ which together determine the economic effect of institutions. The quote is from Joseph Schumpeter, cited in Gerring et al. (2005, 338). Shaded boxes are for institutions, with the colouring in line with that in Figure 1.

**The Distribution of Political Power** This concept speaks to the fundamental political differences between democracy and autocracy: “[I]n no autocracy is it possible for the present-day rulers to effectively *constrain future decisions*, particularly those taken by their successors. This means that long-term *credible commitment* is impossible in an authoritarian setting” (Gerring et al. 2005, 336, emphasis added). Economic decision-making does not merely focus on the institutional environment at the time of the decision but also on potential future changes to this environment. The more concentrated political power is in an economy, the more likely it is that the ‘Northian’ institutions governing investment behaviour will be undermined (the ‘extractive institutions’ of Acemoglu et al. 2001) and that government decision-making becomes “discretionary or even arbitrary” (Madsen et al. 2015, 175). Although this functionally relates to the investment incentives of the ‘economic fundamentals’ (e.g. Acemoglu et al. 2002, 1262), we separate this out into a ‘political multiplier’ factor to emphasise that democratic institutions can curtail the power of the elite in at least two broad ways: (i) by the power of the vote (see the Schumpeter citation at the start of this section), and (ii) by the power of information and transparency (see the Chairman Mao quote at the start of this section). Universal suffrage, the appointment of political leaders through popular elections, the freedom to form political parties and civil society organisations as well as free and fair elections are clear elements supporting the former, while the latter relates to the freedom of expression (as an individual, in independent media, in academia or society more broadly).

Executive constraints can go some way to reign in political leaders, but ‘accountability’ of a political regime can ultimately only come from the power of the electorate to withdraw the leaders’ mandate. The same spirit is expressed in Przeworski’s (1991, 10) widely cited phrase that “[d]emocracy is a system in which parties lose elections.” Enfranchising the broader population is further argued to play a crucial role at a key point of the economic trajectory of a nation, namely in the transition to or consolidation of ‘modern growth’ via new technologies (Engerman & Sokoloff 1997, Acemoglu et al. 2002). Social equality as an important determinant of broad economic success also points to successful redistribution of wealth, via *inter alia* taxation and land reform, which relates to the likely outcome of ‘broad’ electoral participation and competition (Gerring et al. 2005).<sup>21</sup>

The ‘political multiplier’ hence determines the economic success (or lack thereof) of economic incentives for investment mediated by the extent of the market — heterogeneous effects of ‘Northian’ institutions due to differential market size hence may be further amplified or attenuated. As was emphasised in our discussion, the above three factors should not be viewed as (decision-making) processes *in isolation, sequentially* determining the economic outcomes of an institutional framework, but as a set of endogenous determinants and we illustrate this endogeneity in our diagram by use of two-way arrows. However, our conceptualisation enables us to provide a somewhat clearer distinction between, using the V-Dem categorisation, the ‘liberal component’ elements of liberal democracy in the ‘economic fundamentals’ and the ‘electoral democracy’ elements in the ‘political multiplier’, although this separation is not always

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<sup>21</sup>The early empirical literature on democracy and growth, finding statistically insignificant results, typically echoed concerns voiced by Galenson and de Schweinitz over the (allegedly) personal consumption-feeding and hence investment-reducing nature of populist democratic government on the basis of a *broad* electorate with the median voter being poor (see Przeworski et al. 2000, Baum & Lake 2003).



straightforward (e.g. constraints on the executive appear to fit in either category).

**Democratic Experience** Our final determinant of the economic effects of democracy is explicitly linked to time and clearly demarcated as sequential to the previous three. Abstracting from all other determinants of the magnitude of the democracy-growth relationship discussed so far, it is important to separate out long-run and short-run effects. Parts of the existing literature already recognises this, but the primary motivation here is the (economic or civil) upheaval during regime change, accompanied by a slump in the economic growth rate) which could bias estimated effects of democracy downwards (Papaioannou & Siourounis 2008, Cervellati & Sunde 2014, Acemoglu et al. 2019). Our motivation for ‘nonlinear’ within-country effects over time is somewhat different, building on a political economy interpretation of the ‘experience’ of democracy. The importance of accounting for the length of time spent in democracy is of course central to Gerring et al. (2005) and echoed in Persson & Tabellini (2009) among others.

Following regime change new democracies frequently face a period of upheaval which in some cases leads to reversal to autocracy or ‘hybrid regimes’ (Diamond 2002, Brownlee 2009, Geddes et al. 2014). With expectations sky-high, leaders in new democracies may prioritise short-term policies to fire up the political business cycle or to pander to impatient political supporters. Internal struggles among factions and interest groups may arise; if certain groups in society were previously disengaged or actively suppressed then their newly-established freedom may find them vociferously making demands or rehashing old animosities with other groups. These forms of ‘democratic overload’ during their ‘tumultuous youth’ may prove costly for new democracies when the regime’s bureaucracy is as yet insufficiently institutionalised: lacklustre economic performance, disillusionment, and perhaps even nostalgia for the ‘old’ regime.

One fundamental difference in policy-making between autocracies and democracies is that the former is leader-centred whereas the latter “generally involves many more players” (Gerring et al. 2005, 330), which implies debate, dialectic decision-making, consensus-building, and input from (technocratic) experts. This means that over time governments may learn how to improve policy-making. In addition to this process of ‘political learning’ on behalf of individual actors (both the politicians and the citizens), the ongoing experience of democracy fosters the ‘political institutionalisation’ of authority patterns in the country: the behaviour of political institutions. Over time democratic regimes may become more formal and rational in their approach to procedures, more rule-based and predictable in their actions, adopt professional practices and hence meritocracy in recruitment and promotion (better bureaucracy), and thus become legitimised in the eyes of the populace. Taken together these different processes result in “cumulatively causal effects [of democracy] over time” (Gerring et al. 2005, 337).

**Implications** There are three important insights for empirical modelling deriving from our discussion of these mechanisms. Firstly, it is to be expected that for the same number of years in democracy, countries display differential growth effects of democratic regime change due to the inherently differential investment efficiency across countries, e.g. investment in capital accumulation may not be as effective as investment in TFP improvements. Secondly, the significance of market size further conditions the country-specific growth effects — our empirical

analysis controls for measures of trade and population. And thirdly, even two ‘institutionally’ identical countries may experience differential ‘democratic dividends’ if they vary in their experience of democracy: the longer-term effects are likely to differ from the short-run fluctuations.

### 3 Data and Descriptives

#### 3.1 Concepts, Sources, and Variable Transformations

*“Choices on how to organize institutions into distinct categories need not be invariant across studies and in fact should be tailored to the questions that need to be addressed... A study of the treatment effect of a given institution is well defined to the extent that the institution under study is well defined in the context of the study, not whether the definition is portable across studies.” (Durlauf 2020, 9)*

As our discussion in the introduction has argued, our analysis of an encompassing framework of liberal democracy captures both the core elements of the recent ‘democracy causes growth’ literature as well as the earlier ‘institutions rule’ literature, provided the empirical focus is on the causal effects of institutional change on economic betterment. In that sense we label all constituent (low-level) elements presented in Figure 1 as ‘institutions’. We feel free to do so in line with the above guidance by Steven Durlauf (2020) as well as the practice of fitting ‘democracy’ under the umbrella of ‘institutions’ in his survey. We similarly feel free to deviate from Durlauf’s own definition of institutions, which in line with Glaeser et al. (2004) emphasises the impermanence of institutions and hence the placement of the question about the economic effect of institutions within the ‘long arm of history’ literature. Instead, like in the recent democracy-growth literature (Papaioannou & Siourounis 2008, Acemoglu et al. 2019, Boese & Eberhardt 2021) and elements of the institutions-growth literature (Dawson 1998, Dollar & Kraay 2003) we view and hence define all institutions as subject to change over time, and quantify the effect of this change on economic development in the context of the most recent seven decades. We now ensure that, in Durlauf’s words, “the institution[s] under study [are] well defined” in the context of our paper.

**Concepts** In our empirical analysis, we make use of two main advantages of the V-Dem Dataset (Coppedge et al. 2021): the underlying conceptualization of democracy and the availability of disaggregated data (Boese 2019). The conceptual basis of the V-Dem dataset allows for a direct mapping of the data to the framework depicted in Figure 1. The disaggregated nature of the dataset enables us to empirically ‘drill down’ three tiers to systematically analyze the growth effects of each of the building blocks of liberal democracy (while conditioning on the evolution of ‘rival’ building blocks).

The V-Dem dataset employs a range of lower-level variables distinguished either as ‘factual in nature’ based on extant sources or coded by country experts and coordinators,<sup>22</sup> which

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<sup>22</sup>Most of the latter type variables are based on questions with answers on an ordinal scale and subsequently aggregated across coders using Bayesian item response theory models (Coppedge et al. 2017, Pemstein et al. 2015).



are then systematically aggregated and transformed to create the index variables across three tiers we use in this study. Due to the strategies employed in developing the underlying definitions, in the measurement scales applied in constructing individual lower-tier indices and, crucially, in the theoretical justification for the weighting and aggregation procedures to arrive at higher-tier measures, the V-Dem indices naturally lend themselves to the hierarchical investigation we carry out in this study (for more detail including a comparison to PolityIV and other alternative democracy indices see [Boese 2019](#)).

The empirical counterpart to the concept of Liberal Democracy in the top tier of Figure 1 is V-Dem’s Liberal Democracy Index (*v2x\_libdem*). Liberal democracy consists of two second tier components: electoral democracy and the liberal component. In the V-Dem dataset these concepts are empirically captured by the Electoral Democracy (aka Polyarchy) Index (*v2x\_polyarchy*) and the Liberal Component Index (*v2x\_liberal*). The principle of Electoral Democracy rests on the eight institutional guarantees<sup>23</sup> outlined by [Dahl \(1971\)](#),<sup>24</sup> capturing contestation and participation. Empirically, these guarantees are integrated into the five building blocks of polyarchy, in turn corresponding to the concepts on the lowest tier of Figure 1: freedom of association, freedom of expression and alternative sources of information, clean elections, suffrage and elected officials. Similarly, the Liberal Component, which covers “constitutionally protected civil liberties, strong rule of law, and effective checks and balances that limit the use of executive power” ([Lindberg et al. 2014](#), 160), can be broken down into three components with empirical counterparts in the V-Dem data: the Equality before the Law and Individual Liberties index (*v2xcl\_rol*), capturing the extent to which rule of law prevails, as well as judicial and legislative constraints on the executive (*v2x\_jucon* and *v2xlg\_legcon*). Detailed definitions for the Tier 3 indices are provided in Appendix Table A-2.

Thus, the ability to empirically trace the conceptual building blocks of our mechanism clearly earmarks the V-Dem data as a first data a choice. Previous research on democracy often relied on PolityIV data, given that the V-Dem data have only been available since 2014. ‘Drilling down’ with PolityIV would however not be possible, for the following reasons: (i) the theoretical foundation of elements which feed into the PolityIV democracy index do not map into our conceptual framework,<sup>25</sup> (ii) the rules for weighting and aggregating constituent measures are arbitrary and lack justification, and (iii) periods of interregnum, interruption and transition are treated ambiguously.<sup>26</sup>

**Data Sources** Our empirical analysis uses three main data sources: the V-Dem data ([Coppedge et al. 2021](#), version 11) of high-, mid- and low-level indicators for democracy as discussed above, real income per capita and population data from the updated Maddison dataset ([Maddison 2007](#), [Bolt et al. 2018](#), [Bolt & van Zanden 2020](#)), and trade data from IMF DOTS — we adopt export-share of trade and population growth as additional controls in our Difference-

<sup>23</sup>Freedom to form and join organizations, Freedom of expression, Right to vote, Eligibility for public office, Right of political leaders to compete for support, Alternative sources of information, Free and fair elections, Institutions for making government policies depend on votes and other expressions of preference.

<sup>24</sup>See also [Teorell et al. \(2019\)](#) and [Wilson & Boese \(2021\)](#).

<sup>25</sup>As is highlighted in Figure A-3, the PolityIV measures do not capture what we refer to as ‘rule of law’ but are limited to polyarchy and constraints on the executive.

<sup>26</sup>For a direct comparison of the V-Dem, Freedom House and PolityIV data see [Boese \(2019\)](#).

in-Difference models to capture the significance of the ‘extent of the market’. Tellingly, the inclusion of a trade variable was indicated to affect the magnitude of the democracy-growth nexus in [Papaioannou & Siourounis \(2008, Table 3, column 5\)](#) and [Acemoglu et al. \(2019, Table 6, column 6\)](#). For ease of interpretation we log-transform the dependent variable (real GDP per capita), and multiply it with 100, so that regime change can be interpreted in terms of the percentage change in per capita income.

In our analysis of high-level democracy indicators we also adopt the V-Dem *Regimes in the World* categorisation ([Lührmann et al. 2018](#), henceforth ROW) which is based on the electoral democracy (polyarchy) index; the polity2 variable from PolityIV ([Marshall et al. 2017](#)) to construct two binary democracy variables (cut-offs zero and 5); and the [Boix et al. \(2013\)](#) definition of democracy.

**Sample, Data Transformation and Omissions** For the main analysis using V-Dem data our full dataset comprises 157 countries from 1949 to 2018 with on average 53 country observations (8,303 total observations, minimum  $T_i$  is 12, maximum  $T_i$  70). Depending on the definition of the democracy dummy, this contains three different groups of countries: (i) those which were democracies throughout the sample period, (ii) those which were autocracies throughout the sample period, and (iii) countries which became democracies and/or reverted to autocracy. In our analysis the countries in (i) are discarded, those in (ii) represent the control sample, and those in (iii) the treatment sample — we report the sample sizes of the latter two in our results plots and tables.

Our empirical analysis relies on *binary* indicators for liberal democracy and its constituent components, in line with much of the recent empirical literature in economics ([Giavazzi & Tabellini 2005](#), [Rodrik & Wacziarg 2005](#), [Persson & Tabellini 2006](#), [Papaioannou & Siourounis 2008](#), [Acemoglu et al. 2019](#)). Since the V-Dem indices are quasi-continuous and range from zero to one this raises the question which cut-offs to chose in order to arrive at a binary democracy dummy. In Appendix Section E we present results using 0.5 as the cut-off, including robustness checks where cut-offs range between 0.4 and 0.6. In the main part of the paper we instead adopt the standardised index mean *for the entire sample*, i.e. groups (i) to (iii) above, along with robustness checks ranging from 1/4 of a standard deviation below to 1/4 of a standard deviation above the mean. Unstandardised index means as well as the standard deviations for the high-, mid- and low-level democracy indices are presented in Appendix Table A-4. In line with the findings in [Baltz et al. \(2020\)](#) we by and large do not find qualitatively substantial deviations in our results if we adopt alternative cutoffs.

Our analysis below does not consider the polyarchy sub-components of ‘suffrage’ and ‘elected chief executive’: 89% of observations in the full sample indicate universal suffrage, while the mean sample index value for ‘elected officials’ is 0.76 (mean  $-1/4$  SD: 0.66, mean  $+1/4$  SD: 0.87). Adopting our standard mean index cut-off would only provide for two control group countries (ARE, SAU) in the former and eleven in the latter (dropping to six for the mean  $+1/4$  SD cutoff) — hence, these practices cannot provide for a feasible control sample used to estimate common factors. This highlights that even though suffrage in particular is the subject of much economic analysis (see references in Figure 1), this is focused on historical narratives

(most prominently, [Engerman & Sokoloff 2005](#)), whereas for post-WWII samples this political institution was near-universally adopted across countries.

### 3.2 Descriptives and Sample Makeup

Details on the 157 countries over 1949-2018 in our full sample in terms of country makeup, start year and years in sample, GDP per capita and the Liberal Democracy index in the individual sample start and end years along with the average annual growth rate as well as regime changes on the basis of the liberal democracy, polyarchy and liberal component indices are tabulated in Appendix Table A-3. We also highlight the group association for countries which did not experience regime change for regime change dummies based on these three indices: C for the control group, A for countries which were above the regime threshold throughout the sample period. The latter countries are not part of the empirical analysis, although their respective index values form part of the calculations to determine the mean index used as threshold for each democracy indicator.

The median income growth rate (rate of change in the liberal democracy index) in the full sample is 2.24% per annum (0.97%), compared with 2.10% (1.89%) in the treated sample for liberal democracy and 2.15% (0.62%) in the control sample — over time the median country has become richer and more democratic.

Our panel is unbalanced and Appendix Figure A-1 indicates the differential start years in the sample for all 157 countries and for the polyarchy PCDID regressions (treated countries only) — the patterns are next to identical, with over 40% of countries in either sample having start years after 1959, balanced out over the (primarily) four decades thereafter. Hence, our treatment analysis would do well to account for the differential sample characteristics of each country.

With the notable exception of [Giavazzi & Tabellini \(2005\)](#) and [Papaioannou & Siourounis \(2008\)](#),<sup>27</sup> much of the existing literature on democracy and growth does not concern itself with ‘regime change dynamics’: whether a country had repeated episodes of crossing the democracy threshold. For instance, among the 103 countries which democratised in [Acemoglu et al.’s \(2019\)](#) regression sample over 25% had more than one democratisation event, with Thailand classified as having experienced four. As is shown in Appendix Table A-5, these dynamics are similar in the treated samples of our own analysis, with *multiple* regime changes in 25%, 35% and 31% of countries for the liberal democracy, polyarchy and liberal component definitions of regime change (adopting the mean index cut-off), respectively. These regime change dynamics are taken into account when we present our results for the long-run democratic dividend.

In Figure A-2 we present with-in country (‘single’) differences between the real GDP growth ‘in regime’ and ‘out of regime’ (*y*-axis); these are accumulated over and presented relative to time spent in regime (*x*-axis). We then fit fractional polynomial regression lines to indicate the overall sample relationship and further highlight the frequency of regime change (i.e. crossings of the mean index threshold). The resulting plots for the two mid-level indicators yield next-to identical, linearly increasing regression lines, while the low-level indicators,

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<sup>27</sup>These authors, at least as a robustness check in the former’s case, confine the sample to countries which experienced a single transition from autocracy to democracy.

though still largely increasing over treatment length, frequently display nonlinear, at times convex, patterns. Using this univariate approach focusing narrowly on within-country evolution in regime change countries we can get a strong sense of the positive correlation between good institutions and economic development. Whether institutional change causally relates to a perpetual (linear relationship) or to a one-off (concave relationship) growth effect over the long-term will be a central point of discussion in our analysis below.

## 4 Empirical Strategy

This section introduces novel methods to capture the impact of observable and unobservable heterogeneity on empirical estimates of the liberal democracy-growth nexus. Since [Pesaran & Smith \(1995\)](#)<sup>28</sup>, the panel time series econometric literature has emphasised heterogeneous parameters across panel members, and, more recently, the presence of strong cross-section dependence (e.g. [Pesaran 2006](#), [Bai 2009](#)) — a form of unobserved, time-varying heterogeneity.<sup>29</sup> Strong correlation across panel members is distinct from weaker forms of dependence, such as spatial correlation, and if ignored can lead to serious (omitted variable) bias in the estimated coefficients on observable variables ([Phillips & Sul 2003](#), [Andrews 2005](#)). This literature has taken to specifying a multi-factor error structure, also referred to as interactive fixed effects —  $\lambda'_i \mathbf{f}_t$ , where  $\mathbf{f}$  is a set of common factors with associated heterogeneous factor loadings  $\lambda$  — to capture this strong dependence.<sup>30</sup> These factors are orthogonal to each other, hence the combination of a small number of factors and country-specific factor loadings can capture highly idiosyncratic, time-variant heterogeneity.

In the following, we discuss how we should think about these common factors, what they could represent, and why we do not use some of the many observable proxies adopted in the cross-country growth literature to replace them. We then detail a novel difference-in-difference approach which extracts common factors from control countries to identify the causal effect of a discrete treatment variable in the face of endogenous selection into treatment and non-parallel pre-treatment trends. We close this section by explaining our strategy for presenting the results from these empirical implementations.

### 4.1 Capturing total factor productivity (TFP) as latent factors

In our empirical approach we employ common (latent) factors to capture time-varying unobserved heterogeneity across countries. When it comes to this unobserved heterogeneity, growth

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<sup>28</sup>The pitfalls of imposing common slope coefficients on heterogeneous equilibrium relationships have been highlighted for dynamic ([Pesaran & Smith 1995](#)) and static specifications ([Sul 2016](#)). It is also worth emphasising that any instrumentation strategy applied in a pooled panel (such as the IV strategy in [Acemoglu et al. 2019](#)) will be invalid *by construction* if the true underlying equilibrium relationship differs across countries. If the coefficient imposed on  $x$  is  $\beta$  yet the true relationship is  $\beta_i x$  then  $(\beta_i - \beta)x$  will be contained in the error term, thus violating the exclusion restriction that instrument  $z$  be uncorrelated with the error since  $E[xz] \neq 0$ .

<sup>29</sup>[Eberhardt & Teal \(2011\)](#) provide a detailed introduction to these models with discussion of empirical applications from the cross-country growth literature. See also [Eberhardt \(2021\)](#) and [Boese & Eberhardt \(2021\)](#) for applications to the democracy-growth nexus.

<sup>30</sup>Detailed discussions of how to motivate and implement the investigation of observed and unobserved heterogeneity in the context of the cross-country production function which underlies the empirical growth literature can be found in [Eberhardt & Teal \(2020\)](#).

economists have mastered the art of putting a label on “our ignorance” (Abramovitz 1956), everything we think may matter but we have not measured or cannot measure: total factor productivity (TFP). Whenever we run a cross-country regression of income per capita or its growth on some observed ‘determinants’, as is our intention here, we need to be concerned about capturing TFP, since its pervasiveness in everything and anything is the source of the perennial ‘transmission bias’ (Marschak & Andrews 1944). Relatively tangible candidates capturing elements or determinants of TFP growth include investment in R&D, human capital development, financial development, infrastructure investment (roads, ports, railways, subways, sewage and fresh water systems, broadband...), fiscal policy more generally, and innovation incentives in form of tax breaks and grants; less tangible ones include ‘absorptive capacity’, economic integration, trust, good citizenship, culture, thrift, the writing system, the spread of the potato (or in China: the sweet potato), genetic diversity, genetic distance, religious belief, colonial heritage, the neolithic transition, staple crops, luck and many more.<sup>31</sup>

These intentionally exaggerated lists are intended to highlight that there is an inherent *dimensionality problem* in cross-country growth empirics: following the seminal work of Robert Barro (1991) empirical studies have included a myriad of growth determinants in their models,<sup>32</sup> far too many to feasibly combine in a single study without running out of degrees of freedom, and the unpopularity of cross-country growth regressions since the early 2000s at least in part derives from the frequent ‘kitchen-sink’ approach to growth empirics or the lack of robustness of results to changes in the covariates (Durlauf 2020). Thus, capturing all or even just the most relevant determinants of TFP with *observable* proxies would seem an impossible task.

The recent panel time series literature instead has employed dimensionality-reducing tools to capture ‘interactive fixed effects’: global factors affecting all and local factors affecting a small sub-group of countries in the sample (strong and weak factors: see Chudik & Pesaran 2015, for a recent survey). One popular approach here is to employ cross-section averages of all model variables (Pesaran 2006), an alternative the adoption of principle component analysis (PCA) to create estimated proxies for unobserved common factors from regression residuals (Bai 2009). Since our focus is on the causal effect of democracy on growth, and not on that of TFP, it is immaterial that we do not obtain interpretable estimates for the latter. We also do not seek to include candidate determinants of TFP: first, data coverage would never be as good as for our data for GDP per capita and political institutions; second, we are not interested in the TFP determinants of growth, we are interested in the effect of political institutions — a ‘reduced form model’; and third, inclusion of a subset of determinants would merely lead to calls for inclusion of others, resulting in the undesirable kitchen sink empirics of yesteryear. Instead, capturing the *latent* drivers of all variables in the model allows us to dispense with this practice. We now explain how these unobservable common factors can help identify the democracy-growth nexus.

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<sup>31</sup>Suggestions that some of these could be captured by simple country fixed effects ignore the properties of variables with a unit root: for integrated processes shocks have a permanent impact, and if the ‘long arm of history’ literature tells us that events like the bubonic plague still affect health or other outcomes *today* then one conclusion to be drawn from this is the likely unit root behaviour of the outcome processes studied.

<sup>32</sup>Durlauf et al.’s (2005: Appendix B) survey lists around 150 separate determinants, but this count surely can be thought to have at least doubled in the intervening years (AI, robots,...).



## 4.2 Heterogeneous Difference-in-Difference Estimation

The most recent contributions to the macro panel econometric literature have been able to build bridges to the literature on policy evaluation using difference-in-difference specifications (Go-billon & Magnac 2016, Chan & Kwok 2021) and the synthetic control methodology (Xu 2017). What distinguishes these latest approaches from their canonical predecessors is the adoption of interactive fixed effects in order to address two well-known challenges to identification in these popular methods: (i) the presence of uncommon trends prior to the policy change evaluated, and (ii) endogenous selection into ‘treatment’.

Previous work analysing the democracy-growth nexus using difference-in-difference specifications includes Giavazzi & Tabellini (2005) and Papaioannou & Siourounis (2008). The recent literature on pooled panel DiD estimators has highlighted the implicit weighting of treatment effects when treatment timing varies (Goodman-Bacon 2021) and the potential for negative weights in this context when treatment effects are likely to be heterogeneous (De Chaisemartin & d’Haultfœuille 2020). Our implementation adopts the Chan & Kwok (2021) PCDID estimator, which estimates a country-specific treatment effect and allows for correlation between the unobserved determinants of growth (institutions, absorptive capacity, etc.) and selection into democratic transition or reversal — see Eberhardt (2021) for a detailed discussion and empirical analysis of potential sources of heterogeneity in the democracy-growth nexus.

Underlying the approach is a treatment effect model with interactive fixed effects. Using a potential outcomes interpretation

$$y_{it} = \bar{\Theta}_i \mathbf{1}_{\{i \in I\}} \mathbf{1}_{\{t > T_{0i}\}} + y_{it}^0, \quad (1)$$

where  $\bar{\Theta}_i$  refers to the time-averaged treatment effect on the treated unit  $i$ ,  $\mathbf{1}_{\{i \in I\}}$  is a dummy for the treatment group, and  $\mathbf{1}_{\{t > T_{0i}\}}$  is a dummy for the (heterogeneous) intervention date. This is a reduced form model which already incorporates a decomposition of the potentially time-varying heterogeneous treatment effect:  $\Theta_{it} = \bar{\Theta}_i + \tilde{\Theta}_{it}$ . Here, we assume that the time-varying idiosyncratic component of this treatment effect over the treatment period is mean zero for treated units, i.e.  $E(\tilde{\Theta}_{it} | t > T_{0i}) = 0$ .

The full empirical model is then given by

$$y_{it}^0 = \beta_i' x_{it} + u_{it} \quad u_{it} = \lambda_i' f_t + \epsilon_{it} \quad (2)$$

$$\Rightarrow y_{it} =: \bar{\Theta}_i \mathbf{1}_{\{i \in I\}} \mathbf{1}_{\{t > T_{0i}\}} + \beta_i' x_{it} + \mu_i' f_t + \epsilon_{it}, \quad (3)$$

with the flexible assumption  $x_{it} = \Lambda_i' f_t + \nu_{it}$ , i.e. that the additional controls  $x$  are endogenous due to the common factor structure (sometimes referred to as ‘factor overlap’).  $\mu$  is then some combination of the  $\lambda$  and  $\Lambda$  parameters, and  $f$  is a set of unobserved common factors — note that country and year FE are accommodated as special cases of this multifactor error structure.  $\bar{\Theta}_i$  is what we seek to estimate, Chan & Kwok (2021) refer to this as ITET, the treatment effect of unit  $i$  averaged over the treatment period. The average treatment effect ATET is simply the (mean group) average of the heterogeneous ITET.

The implementation is straightforward: for the sample of countries which experienced

variation in the treatment dummy over time we specify the following regression model

$$y_{it} = \alpha_i + \beta_i \text{Dem}_{it} + \gamma_i' X_{it} + \delta_i' \hat{f}_t + \varepsilon_{it}, \quad (4)$$

where  $y$  is per capita GDP (in logs and multiplied by 100),  $\text{Dem}$  is the democracy/treatment dummy, and  $X$  is a set of additional controls (we adopt population growth and export share of trade as proxies for the extent of the market).  $\hat{f}$  are common factors estimated via Principal Component Analysis (PCA) from the residuals of a heterogeneous regression of  $y$  on  $X$  in those countries which never experienced democracy during the sample period (the control group). Following the insights from [Chan & Kwok \(2021\)](#) these estimated factors can capture the presence of uncommon and/or stochastic trends between treatment and control samples. The empirical model accommodates selection into democracy given that we allow for correlation between the estimated factors, the observable covariates (including the regime dummy), and the country intercept.

The main identifying assumptions for the PCDID estimator of  $\beta_i$  are as follows: (i) we can capture all unobservable determinants of economic development (TFP) with the common factor error structure; and hence (ii)  $\varepsilon_{it}$  is white noise and therefore orthogonal to all other elements of equation (4). These are standard assumptions for interactive fixed effects models made in the panel time series literature ([Pesaran 2006](#), [Bai 2009](#)) and in [Athey et al. \(2021\)](#): these imply that the endogeneity surrounding democratic regime change as well as the nonparallel trends are entirely captured by the controls, the factor structure, and the deterministic components in their correlation with the treatment variable. Since we do not know the true common factors and instead rely on estimates there is potential for correlation between the error terms of treated and control countries — this bias can be removed if we require that asymptotically  $\sqrt{T}/N_c \rightarrow 0$ , where  $N_c$  is the number of control countries and  $T$  is the time series dimension of the panel. The main threat to identification derives from idiosyncratic shocks to country  $i$ , such as financial crises or natural resource discoveries, which may further or thwart a drive to democratic regime change while simultaneously affecting economic prospects. Existing research suggests that financial crises have a significant international (and hence common factor) dimension ([Cesa-Bianchi et al. 2019](#), [Arellano et al. 2017](#)), while oil exploration is guided by global prices (a common factor) and is known to follow rather than lead democratic regime change ([Cust & Harding 2020](#)).

We present the ATET results for models augmented with one to six estimated factors in Appendix C.<sup>33</sup> Our main specification will be the model augmented with four factors, for which we present results using running line regressions — for inference see the following section.

### 4.3 Conditional Mean Results in the Context of Heterogeneous Treatment Models

The models introduced above build on country-specific estimates — as we indicated in the introduction adopting a country-specific approach has desirable properties from a theoretical but also a practical perspective: cross-country panel data on democracy and development by virtue

<sup>33</sup>In line with the literature we adopt robust regression ([Hamilton 1992](#)) to compute outlier-robust means. Inference for this robust ‘Mean Group’ estimate is based on standard errors computed non-parametrically [Pesaran \(2006\)](#).

of nation-building and differential data availability for other reasons is always unbalanced and with missing observations. Estimating country regressions assures that results are specific to the country and the observations at hand, albeit perhaps not as precise as one would like to see (see [Boyd & Smith 2002](#)).

Below we present most of our results in graphical form, plotting local predictions for the estimated democracy coefficients  $\hat{\beta}_i$  (treatment effect) against the *time spent in democracy/regime* (treatment length), following the practice introduced in [Boese & Eberhardt \(2021\)](#). Attempts at presenting sample average results for country-specific democracy estimates (ATET) introduce all the sample heterogeneities across countries which blight pooled panel analysis, e.g. differential amount of time spent in the sample (number of observations), differential year of entry into the sample, differential regime reversal dynamics (single treatment compared with countries which move back and forth between regimes). The ATET also glosses over the possibility that causal effects of democracy may be perpetual, rather than one-off, and ignores the arguments for a nonlinear relationship over the length of treatment we developed above (with many references to [Gerring et al. 2005](#)).

Our graphical results instead are based on multivariate smoothing of the country estimates: ‘running line’ regressions, which are  $k$  nearest neighbour locally linear regressions, allow us to jointly condition on all of the above characteristics. Rather than a noisy, bivariate scatter of the democracy-growth estimates,  $\hat{\beta}_i$ , against a single variable (‘years in regime’), we plot the *predicted* values from this multivariate smoothing procedure, which are conditioned on the aforementioned controls, against the years spent in regime.<sup>34</sup> For a total of  $p$  controls the predictions are:

$$\hat{\beta}_i = \alpha + \{f_1(\text{years in regime}_i) - \alpha\} + \sum_{\ell=2}^p \{f_\ell(x_{i\ell}) - \alpha\}, \quad (5)$$

where  $\alpha$  is the mean of all democracy-growth estimates  $\hat{\beta}_i$ , and each  $f_\ell(\cdot)$  is a locally linear smoothing function.<sup>35</sup> Standard errors are calculated based on the local weighted least squares fit.

Furthermore, when moving to mid- and low-level democracy indices we can condition on the country-specific value and variability of one or more *other/rival* indices: for instance, if the ‘mid-level’ polyarchy index in country  $i$  rises above the full sample mean value in 1990 (‘regime change’) and remains above this threshold until 2018 (29 years of ‘treatment’), then our running line regression for the income effect of polyarchy against length of time in the polyarchy regime (29 years), in addition to the regime change count and country series start year as mentioned above, further controls for country  $i$ ’s liberal component index value in 1990 as well as the standard deviation of that index over the 1990-2018 time period. These estimates are the foundation for the horse-races we run between rival mid- and low-level democracy indicators. For a low-level indicator, such as freedom of association (a component part of polyarchy), under the same scenario the regression controls for the values of the liberal component

<sup>34</sup>Without explicitly adopting a measure of democratic *capital stock*, like in [Gerring et al. \(2005\)](#) and [Persson & Tabellini \(2009\)](#), our practice speaks to the sentiment expressed in these studies that “[regime] history might matter” ([Gerring et al. 2005](#), 324), although, of course, our history only starts in 1949.

<sup>35</sup>Binary indicators are accounted for linearly rather than locally-linearly.



(mid-level ‘rival’), as well as freedom of expression, and clean elections indices (low-level ‘rivals’) in 1990 along with the standard deviations for each of these indices over the 1990-2018 period. While each  $\hat{\beta}_i$  is estimated from a country-regression as defined in equation (4), the cross-country profile of the ‘treatment effect’ of regime change thus accounts for the evolution of other political institutions at critical points in time (regime change, time in regime). These adjustments are made ex-post estimation — in Section 6 we study whether modelling the interaction between ‘rival’ indices *explicitly* within the treatment regression yields very different results due to ‘conditionality’ between institutions.

## 5 Main Empirical Results

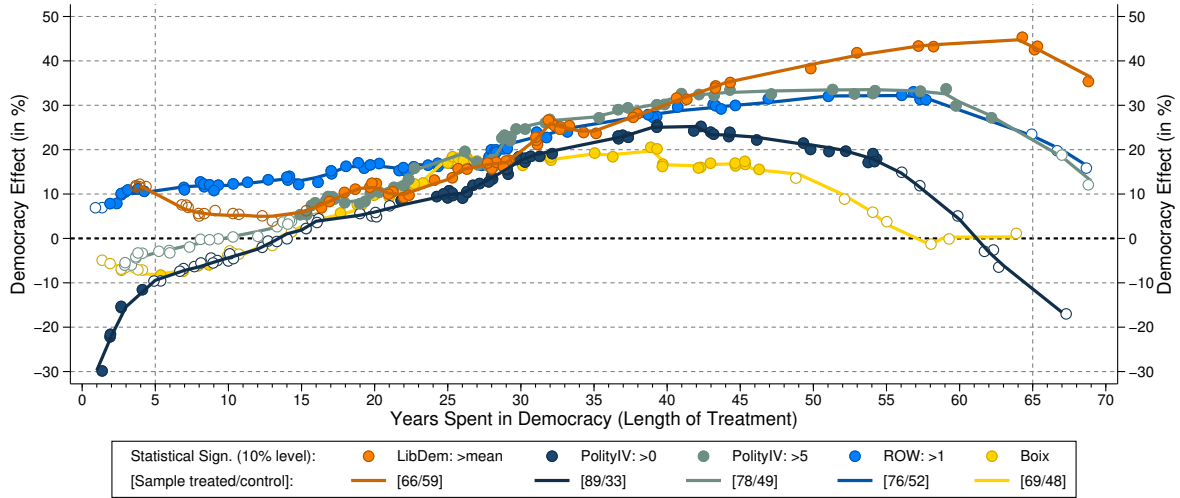
### 5.1 High-level Indicators of Democracy

We present robust sample mean ATET estimates for ‘democracy dummies’ derived from five high-level democracy indicators, in columns [1] to [5] of Table C-1: all of these estimates (and the results presented below) adopt the PCDDID specification with population growth and exports/total trade as additional controls and augmented with four estimated factors from the respective control groups — in a lower panel of the table we report ATET estimates for alternative specifications augmented with one to six factors. These and all estimates below, unless indicated, employ the full sample mean of the respective V-Dem index as the cut-off value/threshold. The table also indicates the size of the treatment and control samples. These ATET estimates ignore the relationship between time spent in regime and the effect magnitude — if democracy has a one-off levels effect then this is a suitable way of gauging the ‘growth dividend’, however if the effect of democracy on growth is ongoing/perpetual, these results are mixing apples and oranges. Leaving this issue aside until the discussion of our running line regression results below, we can see substantial heterogeneity between the PolityIV and V-Dem high-level indicator estimates as well as the size of treatment and control samples. All ATET estimates, with the exception of the definition of democracy by Boix et al. (2013), are statistically significant and positive. Note that the alternative factor augmentations, as indicated in a lower panel of the table, yield qualitatively very similar results for three or five factors as the specification augmented with four factors presented in detail.

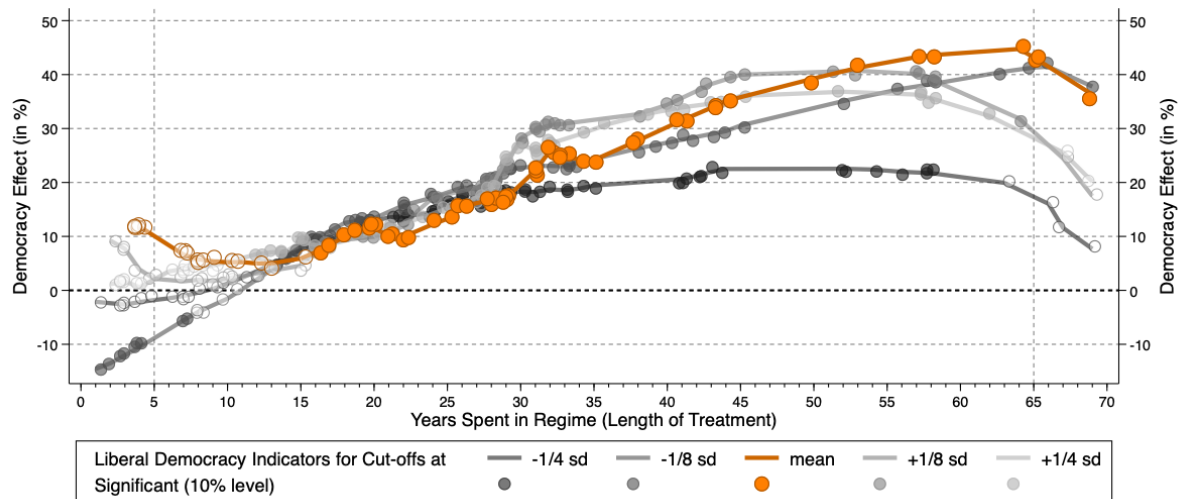
Panel (a) of Figure 3 presents the smoothed estimates from running line regressions for the country-specific coefficients of the five high-level indicators of democracy plotted against treatment length, controlling in addition for the number of regime changes as well as the start year of the country series. Here and in all following graphs a filled (hollow) marker indicates statistical (in)significance at the 10% level, and predicted values (the markers) are minimally perturbed to ease illustration. We suggest that the democracy estimates at the extremes (0-5 years and 65-70 years in regime) are likely biased as they either have very few observations ‘in regime’ or ‘out of regime’ to reliably estimate a difference in difference; as a reminder of this state of affairs we add vertical lines at these values in this and the following plots.

The Liberal Democracy dummy, the Regimes of the World definition of democracy and the more conservative cut-off for the PolityIV polity2 variable (>5) all yield similar profiles, more

**Figure 3: High-Level Indicators for Democracy and Economic Development**



(a) Five High-Level Democracy Indicators



(b) Liberal Democracy (various cutoffs relative to the standardised index mean)

**Notes:** In the upper panel we present the country-specific PCDD running line estimates for five different high-level indicators for democracy: (i) the full sample mean as the cutoff for the V-Dem liberal democracy index, (ii) the polity2>0 cutoff from PolityIV, (iii) the polity2>5 cutoff, (iv) the V-Dem Regimes of the World (ROW) cut-off 2, and (v) the democracy indicator from Boix et al. (2013). The lower panel focuses on democracy indicators derived from the V-Dem liberal democracy index and we adopt alternative cutoffs around the standardised mean (-1/4sd, -1/8sd, mean, +1/8sd, +1/4sd,) to highlight the robustness of our findings. All estimates presented are from running line regressions (constructed adopting KNN local regressions), which further linearly condition on (i) the number of times a country experienced regime change, as well as (ii) the start year of the country time series. The estimates can be interpreted as locally averaged ITET, with the scales indicating the percentage increase in per capita GDP associated with the number of years spent in democracy ( $x$ -axis). The filled (white) markers indicate statistical (in)significance at the 10% level. The markers are not a scatter of the individual estimates, they are included here to indicate statistical significance. They are minimally dispersed for illustrative purposes. Appendix Table C-1 reports the median number of years of ‘treatment’ for each model, ranging from 23 (Boix) to 28 (LibDem).

concave and with lower maxima for the latter two. Results for the more liberal PolityIV polity2 cutoff ( $>0$ , dark blue line), which partly underlies the democracy definition in [Acemoglu et al. \(2019\)](#), are qualitatively identical to those by these authors: a long-run effect of around 20% higher per capita income after 30 years in democracy, although our much longer sample indicates that in the very long run this effect evaporates. Adopting liberal democracy (orange line) leads to substantially higher economic development in the long-run, the relationship is next to linear, which implies a perpetual growth effect of regime change: 50 years of liberal democracy are associated with around 40% higher per capita income, implying an annualised growth effect of 0.8%. In line with arguments laid out above the initial years in liberal democracy do not show a significant effect on economic growth, there is even some regression before the democratic dividend begins to rise from around 15 years in regime.

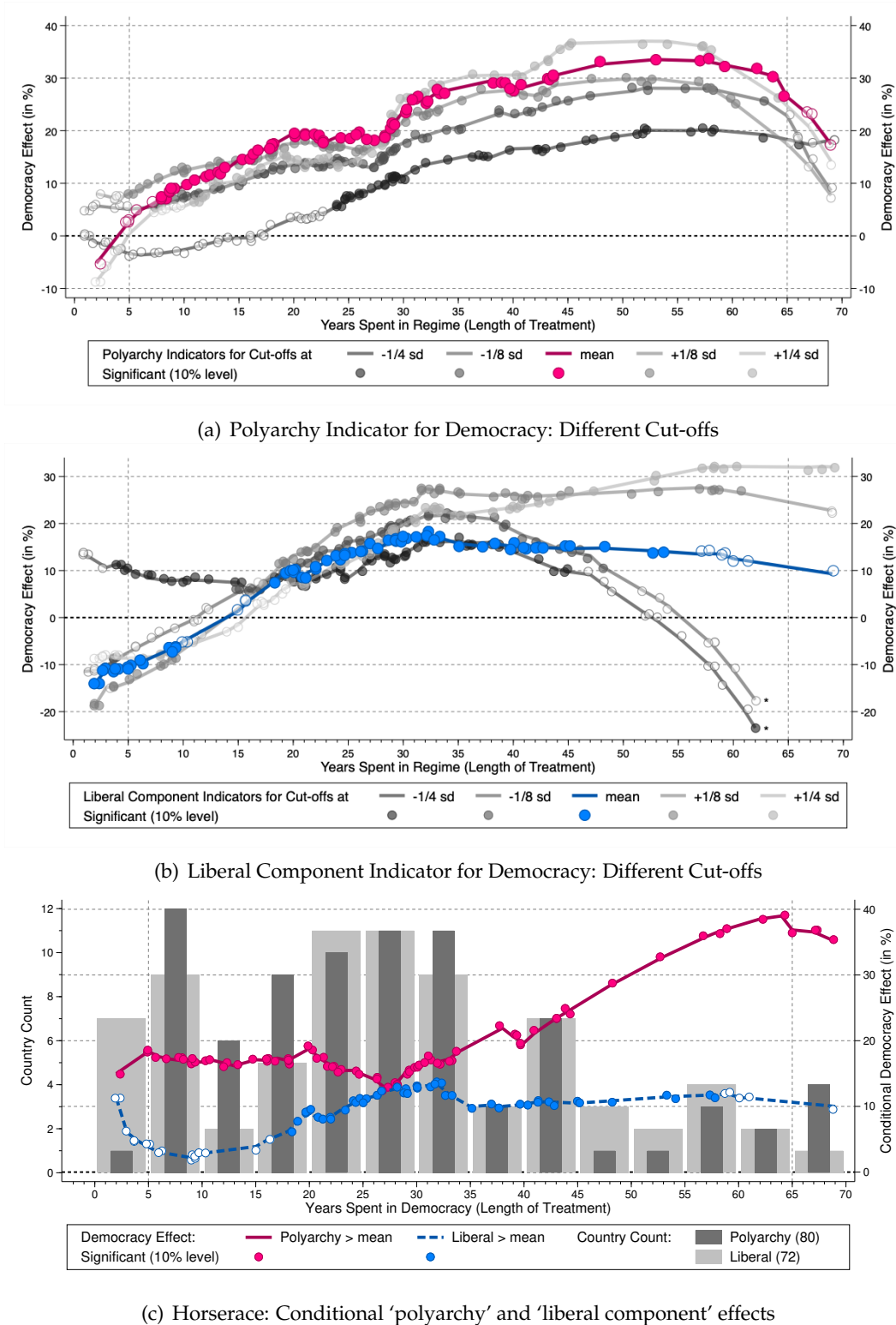
Panel (b) of the same figure focuses on the robustness of the running line regression result for liberal democracy, where the mean as a cut-off for the dummy is presented using the orange line and markers, like in the graph in panel (a), while different shades of grey represent estimates varying to cut-off between  $1/4$  of a standard deviation below the mean and  $1/4$  of a standard deviation above the mean. While all results shown here indicate a positive and significant (in statistical and economic terms) democracy effect, alternative cutoffs clearly lead to different qualitatively conclusions about the nature of the liberal democracy-growth relationship over the long run. A very low or very high regime cutoff leads to a more concave relationship, while around the mean cutoff the effect over treatment length is broadly linear.

## 5.2 Drilling Down (i): Horse Races for Mid-Level Indicators of Democracy

For the V-Dem mid-level indicators, polyarchy and the liberal component, we can see somewhat lower ATET estimates than for the high-level, encompassing liberal democracy indicator, which in case of the liberal component is only borderline statistically significant (Table C-1, columns [6]-[7]). Figure 4 studies these mid-level indicators, polyarchy in panel (a) and the liberal component in panel (b), in some more detail; in each case the coloured line is the running line estimate when we adopt the mean index as the cut-off for the dummy variable, while the alternative lines in shades of grey are the robustness checks for lower or higher cut-offs. All of these estimates for the country-specific regime change-growth effect are relative to the length of time spent in regime and further control for the number of regime changes and the start year of the sample period for the individual country but ignore interaction/conditionality between polyarchy and the liberal component. It appears that results across cut-offs are very similar for the polyarchy variable, whereas for the liberal component this is only the case up to around 45 years of 'treatment.'

In panel (c) we run horse races: the polyarchy running line regression here further controls for the index value of the liberal component (in the year of regime change) as well as its standard deviation during the time in the polyarchy regime: if, for instance, country A has data from 1949 to 2018 and by our definition passes the polyarchy regime threshold in 2000 and remains above it thereafter, then these additional controls in the horse race are the liberal component index value in 2000 as well as its standard deviation during the 2000-2018 period. We proceed in analogy for the liberal component horse race estimates. The grey bars (left axis)

**Figure 4: Mid-level Democracy Indicators and Horseraces**



**Notes:** The top and middle panel of the figure present running line plots for polyarchy and the liberal component using different cutoffs in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regression). \* indicates that we excluded one (statistically significant) estimate for each of these robustness check for ease of illustration. In the bottom panel we run a horserace between the estimates of country results for the two mid-level democracy indicators: the polyarchy (liberal component) running line estimates linearly control for the value of the liberal component (polyarchy) index in the year of regime change, the standard deviation of the same index over the treatment period, as well as the number of regime switches and sample start year of each country; vice-versa for the liberal component running line estimates. The bars indicate the country count for each 5-year interval of experience of democracy. Note the difference in scale between all three plots. Appendix Table C-1 reports the median number of years of 'treatment': 26, respectively.

in this plot highlight the distribution of country estimates across treatment length.

Both mid-level measures of democracy imply positive effects on economic development in the long-run, though it is clear that these are much more modest, around 10%, for the liberal component, than for polyarchy, which after a flat line up to around 30 years in regime shows a linearly increasing relationship for the economic effect over treatment length. From this analysis it would appear that the long-run growth effect we detect in the analysis of liberal democracy above is primarily driven by the polyarchy component and thus in terms of the supremacy of institutions, it would appear that electoral democracy dominates rule of law and executive constraints.<sup>36</sup> An alternative take on these results is that electoral democracy is *not exclusively* driving economic prosperity, and turning to our lower tier analysis we can now also spell out which institutions matter *at which point* in the democratic ‘endeavour’ of countries.

### 5.3 Drilling Down (ii): Low-Level Indices of Democracy

Figure 5 presents the horse races among the constituent components of polyarchy and the liberal component — running line estimates for alternative regime cutoffs without conditioning for ‘rival’ institutions are provided in Appendix Figures D-1 and D-2, the associated ATET estimates are presented in Appendix Table C-2. The running line estimates for, say, clean elections, marked in orange in Panel (a) of this figure, control for the means and standard deviations of the other two sub-components (Freedom of Expression and Freedom of Association) as well as of the liberal component in the way described in the previous subsection. The grey shaded bars indicate the distribution of country-estimates across the range of ‘years of treatment’ and we use vertical dashed lines to separate out the extremes of the distribution. Whenever we talk of ‘regime change’ in the following we refer to the moment when the institutional index in question (e.g. clean elections index) passes the adopted threshold (i.e. the mean index value across all 157 countries over 1949-2018; see Appendix E for cut-off of 0.5).

The components of polyarchy, presented in Panel (a), result in varied long-run growth effects: while the trajectories of the Freedom of Expression and Clean Elections are clearly positive and statistically significant, the effect of Freedom of Association peters out and turns insignificant (in statistical and economic terms). Arguably, the former two increase linearly, or, put more conservatively, though the number of observations on which the running line plots are based decreases noticeably beyond 35 years of treatment, there is *no pronounced decline* signalling diminishing returns setting in for these institutions compared with the downward trajectory of Freedom of Association. The associated ability to form parties and civil society organisations nevertheless clearly provides for a large positive effect in the early stages of regime change. In contrast, press freedom and the ability for citizens to discuss political matters freely (Freedom of Expression) would appear to take a very long time to bear economic fruits. Free and fair elections appear as a significantly positive driver of economic prosperity within the first decade of regime change and throughout the time period spent in regime.<sup>37</sup>

<sup>36</sup>These findings are qualitatively unchanged if we adopt a naive index cut-off of 0.5 — see Appendix Figure E-2.

<sup>37</sup>Adopting a 0.5 index cutoff instead, Panel (a) of Appendix Figure E-5 shows very similar trajectories for Freedom of Association and Clean Elections, with the results for Freedom of Expression much more non-linear, although the patterns of initial insignificance (beyond 5 years in regime) and later economic and statistical significance (from around 30 years) is confirmed.

The building blocks of the liberal component, presented in Panel (b) of the same figure, suggest very strong positive effects of judicial constraints (covering independent courts and respect for the constitution and court rulings) and the rule of law (equality before the law and individual liberties) in the first phase following regime change, up to around 30 and 40 years, respectively, but in the very long-run these institutions no longer contribute to economic prosperity.<sup>38</sup> Legislative constraints on the executive, on the other hand, are initially less important but their effect slowly and steadily increases with years spent in regime.<sup>39</sup>

The more muted long-run effect of the mid-tier liberal component can hence be explained by the reduced economic significance of the rule of law and judicial constraints on the executive, while it is clear that guarantees that government agencies can question, investigate and exercise oversight over the executive is an important factor for long-run prosperity.<sup>40</sup>

Taken together, these lower tier findings rationalise the relative significance of polyarchy versus the liberal component in the long-run growth process. At the same time, they highlight the differential economic significance of individual institutions at early stages of regime change, while further underlining that despite the seeming dominance of polyarchy the elements of the liberal component are far from irrelevant for economic development. Minimalist definitions of democracy, limited to electoral democracy, as is often propagated in political science, cannot capture the full picture of the economic implications of democratic regime change.

## 6 Robustness Checks

Our analysis so far has operationalised democratic regime change in a treatment effect framework which somewhat abstracts from any explicit dependencies between several political institutions: for instance, the ‘rule of law’ effect on economic development may be *conditional* on the country being a functioning ‘electoral democracy’ or vice-versa. Given that in our horse races the running line regressions condition on the magnitude and variability of ‘other’ / ‘rival’ political institutions, we have not ignored this issue. However, it could be argued that adopting a specification which puts *interaction effects* at the heart of the analysis would provide a clearer test of our assumption that the above results are meaningful and robust to such ‘conditionalities.’

We restrict the potential for interactions to make this implementation feasible: (i) we can interact the two mid-level democracy indicators, but for the ‘lower-level’ analysis we only interact the sub-component of polyarchy with the liberal component, and vice-versa; and (ii) we do not estimate ‘full’ models including indicator A, indicator B and their interaction — this would make it difficult to identify each component separately due to the limited degrees of

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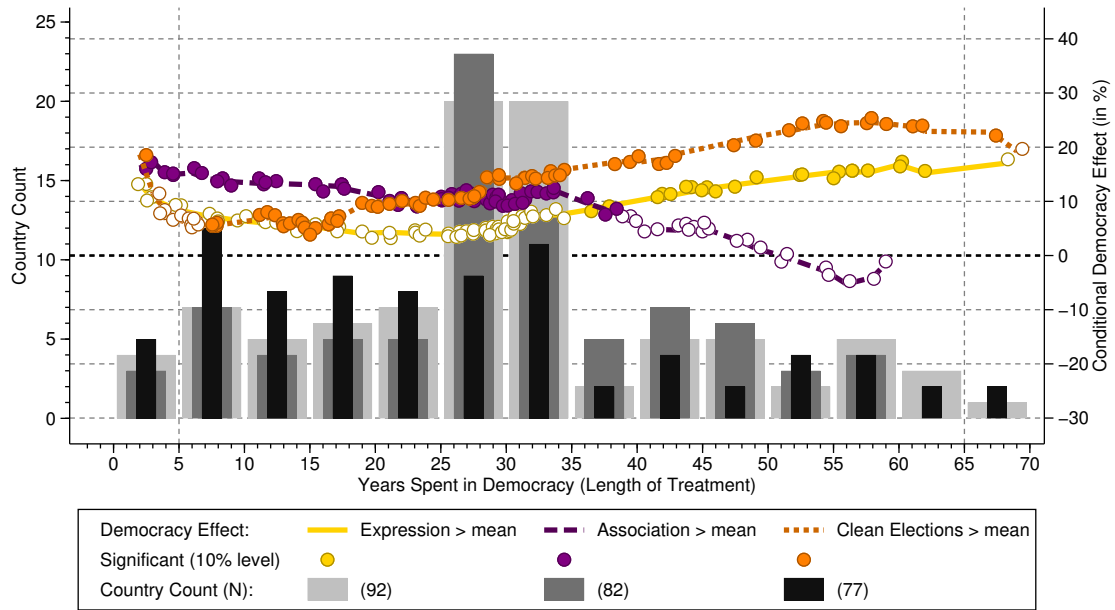
<sup>38</sup>If Turkey and the Philippines are excluded from this analysis then the judicial constraints effect remains statistically insignificant in the running line estimates beyond 45 years ‘in regime’.

<sup>39</sup>The sharp negative effect in the initial years of the running line predicted values seems to be driven by the experiences of Egypt, Libya and Algeria.

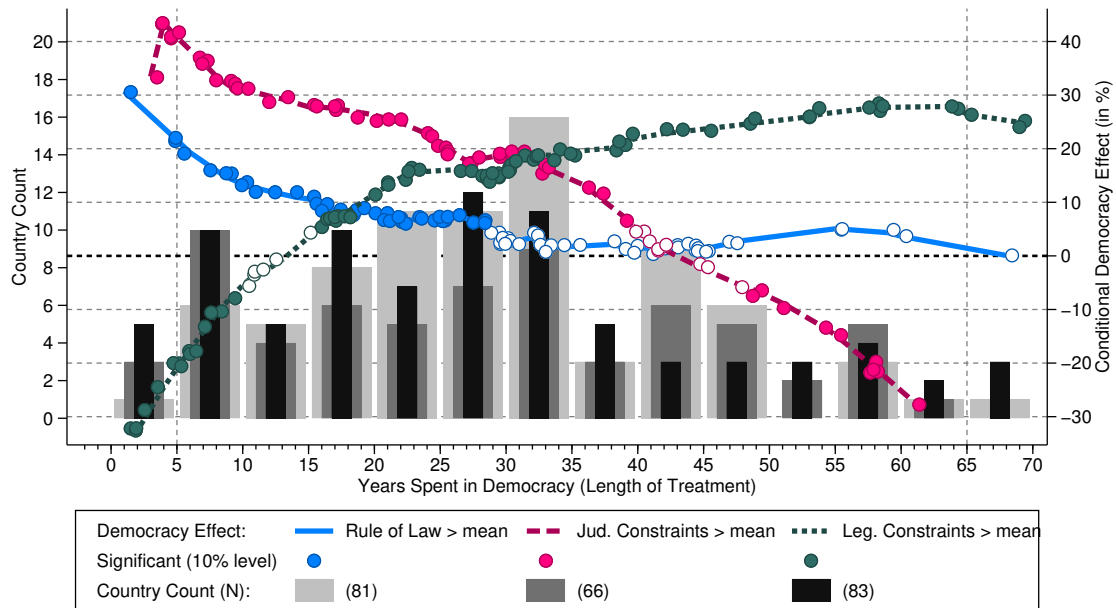
<sup>40</sup>Adopting a common threshold of 0.5 for all institutional building blocks of the liberal component (see Panel (b) of Figure E-5) confirms the above patterns with regard to the two elements of executive constraints, while the effect of rule of law differs quite markedly in that it is negative in the initial years and then continuously improves with time in regime. It should be noted that the full sample mean for rule of law, at 0.62, is markedly higher than that for all other lower-tier institutional indices.



**Figure 5: Horseraces between Low-level Indicators of Democracy**



(a) Components of Electoral Democracy (Polyarchy)



(b) Components of the Liberal Component

**Notes:** This analysis uses running line regressions which regress the estimate of the diff-in-diff model on the years of treatment, conditioning on the value and standard deviation of ‘other’ mid- and low-level democracy indices: for the ‘freedom of expression’ analysis (subcomponent of polyarchy) this is the liberal component (mid-level ‘rival’ to polyarchy), freedom of association, and clean elections (both subcomponents of polyarchy). In analogy for the other subcomponents of polyarchy in the upper panel and of the liberal component in the lower panel. Additional controls are the number of threshold crossings (‘democratisations’ and ‘reversals’), and the start year of the country’s data series. The two vertical dashed lines are added as a reminder that the ‘within-country’ difference of the Diff-in-Diff estimates presented in the extreme sections of these graphs are based on (or rather identified by) either a minimal number of years ‘in regime’ or a minimal number of years ‘not in regime’. Shaded bars indicate the country distributions of treatment years, full (hollow) markers in the running line plots indicate statistical (in)significance at the 10% level. Appendix Table C-2 reports the median number of years of ‘treatment’ for each model: 24 for clean elections, 29 for the other two polyarchy components; 27 for judicial constraints, 29 for the other two liberal components.

freedom (requiring three sets of estimated factors from different control samples) and the high levels of collinearity between the three dummy variables.<sup>41</sup> Instead, we estimate models which *only* include the interaction variable: the intuition is that if conditionality between institutions, in a fashion not captured by our previous empirical implementation, plays a significant quantitative role for economic development then we should be able to detect this deviation when comparing the results for the ‘pure’ interaction effect with those for the effects of individual indicator A and B, respectively. Put differently, these interaction effect models simply require that for regime change to occur both indices combined in the interaction have to have breached the respective mean index threshold.

## 6.1 Modelling Conditionality

We extend the previous PCDID Difference-in-Difference specification to a model where we study the *interaction* of two treatments. Generically, we denote a treatment A at some point  $T_A$  and a treatment B at some other point  $T_B$  — the timing/relative order of the two is ignored: treatment A does not *require* treatment B or vice-versa. However, we are explicit in modelling the joint or interaction effect of having received both treatments at some point  $T_A$  or  $T_B$ , whichever comes later. Our reduced form treatment effects model with interactive fixed effects is then

$$y_{it} = \bar{\Theta}_i^{AB} \mathbf{1}_{\{i \in \mathcal{A} \cap \mathcal{B}\}} \mathbf{1}_{\{t > \max(T_i^A, T_i^B)\}} + \mu_i^{AB} f_t^{AB} + \beta_i' x_{it} + \epsilon_{it}, \quad (6)$$

where we already implement the decomposition of a time-varying heterogeneous treatment effect into, generically,  $\Theta_{it} = \bar{\Theta}_i + \tilde{\Theta}_{it}$ , with  $E(\tilde{\Theta}_{it} | t > T_i) = 0$  for all treated units since this represents the demeaned, time-varying idiosyncratic component of  $\Theta_{it}$ . As a result the error term takes the following form

$$\epsilon_{it} = \varepsilon_{it} + \tilde{\Theta}_{it}^{AB} \mathbf{1}_{\{i \in \mathcal{A} \cap \mathcal{B}\}} \mathbf{1}_{\{t > \max(T_i^A, T_i^B)\}}, \quad (7)$$

with  $\varepsilon$  white noise. This reduced form error  $\epsilon_{it}$  has mean zero but can be weakly dependent (e.g. spatial or serial correlation) and/or heteroskedastic. In equation (6)  $\mathcal{A} \cap \mathcal{B}$  is the group of countries which received both treatments and we construct the control group accordingly as those countries which never experienced treatment A or B: we use  $\mathbf{AB}$  to identify this group. Note that as before the timing dummy is heterogeneous, thus allowing for variation in treatment timing.

This is a very restrictive specification, in that we ignore those groups of countries which experienced one but not the other treatment, and hence may distort the true counterfactual. Since our focus is on the potential complementarity between treatments A and B we therefore adopt an alternative model which captures the counterfactual in the groups which did not

<sup>41</sup>Fewer than 11% of all observations for the polyarchy and liberal component dummies (using the mean as the cut-off) are not jointly zero or jointly one, in the ‘treated’ sample for the interaction effect this rises to 12.5%. Naturally for the interaction term this overlap is even greater.



receive treatment A (or B) regardless of whether they received the other:

$$y_{it} = \bar{\Theta}_i^{AB} \mathbf{1}_{\{i \in \mathcal{A} \cap \mathcal{B}\}} \mathbf{1}_{\{t > \max(T_i^A, T_i^B)\}} + \mu_i^A f_t^A + \mu_i^B f_t^B + \beta_i' x_{it} + \epsilon_{it}, \quad (8)$$

with the same error structure and related assumptions as those indicated above. The difference between the two implementations is in the control group(s) from which the factors augmenting the treatment regression are estimated: (i) in model (6) these are all countries which experienced neither treatment A nor treatment B; (ii) in model (8) all countries which experienced neither treatment, or only experienced treatment A or treatment B.

For ease of illustration we present the empirical implementation using the two mid-level democracy indicators, polyarchy (poly) and the liberal component (lib). For each country which experienced variation in both the polyarchy and liberal component regime change dummies we estimate:

$$y_{it} = \alpha_i + \beta_i^{AB} (\text{poly}_{it} \times \text{lib}_{it}) + \gamma_i' X_{it} + \delta_i^{AB'} \hat{f}_t^{AB} + e_{it} \quad (9)$$

$$\text{and } y_{it} = \alpha_i + \beta_i^{AB} (\text{poly}_{it} \times \text{lib}_{it}) + \gamma_i' X_{it} + \delta_i^A \hat{f}_t^A + \delta_i^B \hat{f}_t^B + e_{it} \quad (10)$$

for the two implementations, respectively. The estimated common factors, of which there are three sets, are constructed via principal component analysis from the residuals of the following three regressions:

$$y_{it} = \psi_i^A + \theta_i \text{lib}_{it} + \phi_i^A X_{it} + \nu_{it}^A \quad \forall i \notin \mathcal{A} \quad (11)$$

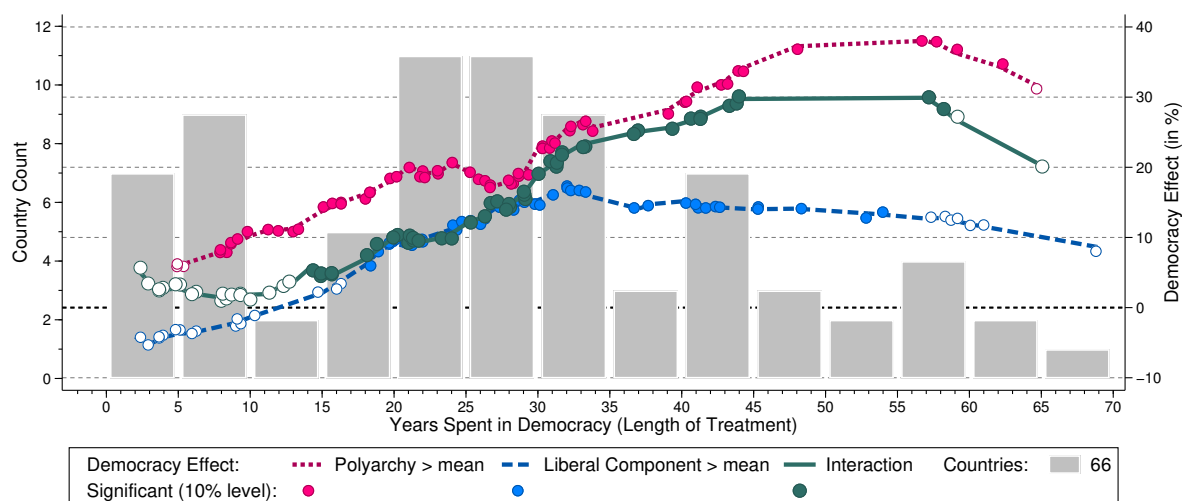
$$y_{it} = \psi_i^B + \xi_i \text{poly}_{it} + \phi_i^B X_{it} + \nu_{it}^B \quad \forall i \notin \mathcal{B} \quad (12)$$

$$\text{and } y_{it} = \psi_i^{AB} + \phi_i^A X_{it} + \nu_{it}^{AB} \quad \forall i \notin \mathcal{A} \cap \mathcal{B}. \quad (13)$$

In words, to construct the common factors  $\hat{f}_t^A$  for all countries which never became electoral democracies we (i) regress per capita GDP on an intercept, the two control variables,  $X$ , and the regime change dummy for the liberal component, using a heterogeneous parameter model following [Pesaran & Smith \(1995\)](#); we then (ii) extract one to six factors  $\hat{f}_t^A$  from  $\hat{\nu}_{it}^A$ . We proceed in analogy for those countries which never crossed the liberal component threshold, extracting one to six factors  $\hat{f}_t^B$  from  $\hat{\nu}_{it}^B$ . Including the lib dummy in the counterfactual equation for the poly equation and vice versa ensures that we account for the alternative political institutions in the counterfactual countries — note that for some countries the respective dummy drops out if they did not experience regime change. For the countries which neither have become electoral democracies nor crossed the liberal component threshold we regress per capita GDP on an intercept and the two control variables only.

We present results in two forms: (i) our standard running line regressions plots of the estimated treatment effect and the length of treatment controlling for sample start year and the count of threshold crossings (maintext); and (ii) running line regression plots of the ‘raw’ individual effect *subtracted* from the interaction effect ([Appendix H](#)) to gauge whether and/or when complementarities are statistically as well as economically significant.

**Figure 6: Mid-Level Democracy Indicators: Interaction**



**Notes:** The figure presents sample-specific running line estimates for polyarchy (short-dashed line), the liberal component (dashed line) and a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant (hence the deviation from the results in panel (a) of Figure 4). The grey bars in these plots indicate the sample distribution (countries). The results in this figure are based on the specification in equation (10), which includes factors from two control groups as described in the text. Results for the more restrictive specification in equation (9) can be found in Appendix Figure G-1.

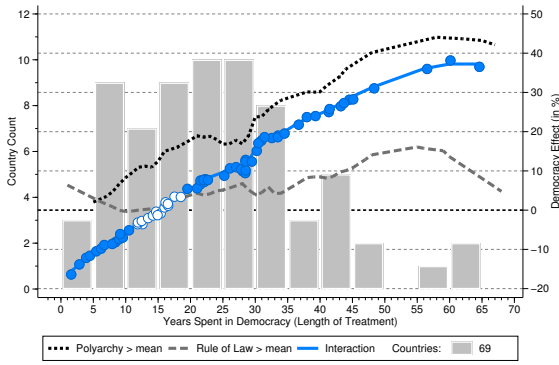
## 6.2 Empirical Results

As is indicated in Panel A of Table C-3, the median number of years countries are in both polyarchy and liberal regimes (treatment length) is typically three to five years shorter than for each of the respective regimes — based on model [3] using the index mean as threshold here and in the following discussion. There are 66 countries in the treatment sample (held constant across the three specifications), compared with 33 control countries in the simple interaction model based on equation (9) and 40 or 45 control countries in the alternative interaction models based on equation (10).

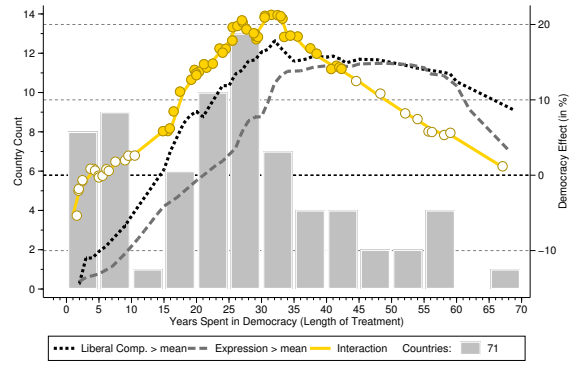
In Figure 6 we present the running line estimates for polyarchy (short pink dashes), the liberal component (long blue dashed), and their interaction (solid emerald line). The profile of the interaction results in this graph first matches that of the liberal component effect and subsequently that of the polyarchy effect but peters out earlier. Importantly, it does not appear to clearly *exceed* the polyarchy effect but instead roughly represents the average between the two effects in isolation. This would imply that a conditional effect of electoral democracy — requiring the liberal component to be in place as well — does not yield higher growth effects over the longer term. The simpler, more restrictive, interaction model yields to a qualitatively identical conclusion (see Appendix Figure G-1).

Figure 7 presents the interaction estimates alongside the respective low-level components and the mid-level ‘rival’, and Appendix Figures F-1 and F-2 plot the robustness checks using alternative regime indicator cut-offs. Across the six models investigated the interaction specification typically closely matches the results for one or the other individual component or

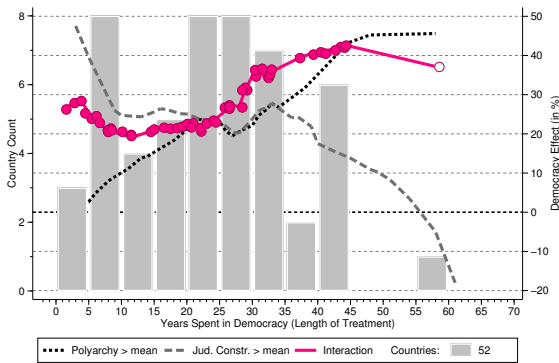
**Figure 7: Low-Level Democracy Indicators: Interaction**



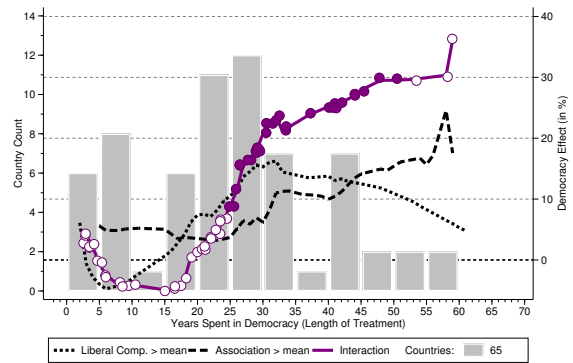
(a) Rule of Law  $\times$  Polyarchy ( $N = 69$ )



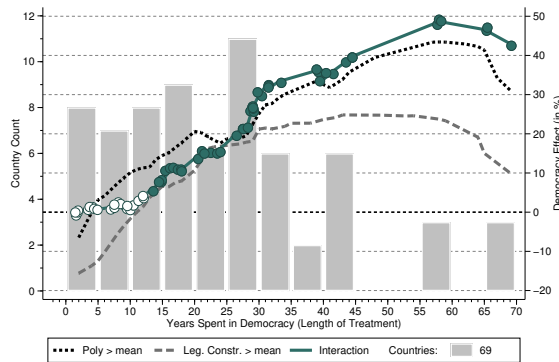
(b) Freedom of Expr'n  $\times$  Liberal Comp. ( $N = 71$ )



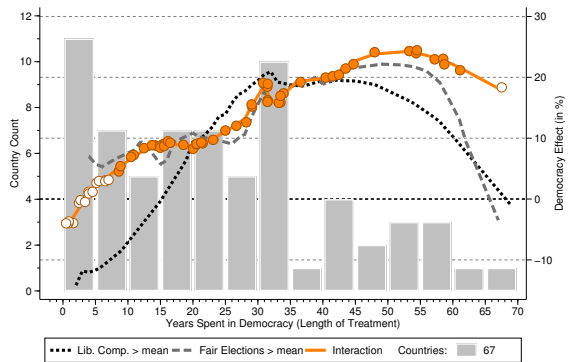
(c) Judicial Constraints  $\times$  Polyarchy ( $N = 52$ )



(d) Freedom of Assoc'n  $\times$  Liberal Comp. ( $N = 65$ )



(e) Legislative Constraints  $\times$  Polyarchy ( $N = 69$ )



(f) Clean Elections  $\times$  Liberal Comp. ( $N = 67$ )

**Notes:** The plots in this figure present running line regressions for the interaction effect of three sub-components of the liberal component (Rule of Law, Judicial Constraints on the Executive, and Legislative Constraints on the Executive) in the left column and of polyarchy (Freedom of Expression, Freedom of Association, and Free and Fair Elections) in the right column. In each case we show the sample-specific running line estimates for polyarchy or the liberal component (short-dashed line), that for the sub-component (dashed line) and that for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant between these three models in each plot. The grey bars indicate the sample distribution (countries) for the interaction model. The different interaction models imply different length of time in regime ('treatment'), for completeness we report the medians in years: (a) lib 27, component 30, interaction 25; (b) poly 26, component 30, interaction 22; (c) lib 27, component 30, interaction 25; (d) poly 27, component 31, interaction 23; (e) lib 28, component 26, interaction 21; (f) poly 26, component 29, interaction 22.

mid-level indicator, only the Freedom of Association interaction with the Liberal Component in panel (d) suggests a substantially higher trajectory with increasing years in regime, a gap of around +15%.

Taken together, in these robustness checks we have explicitly modelled the growth-effect of individual ‘institutions’ to be conditional on the evolution of others by adopting interaction specifications. Broadly speaking, these exercises did not yield any substantial deviations in the effects from interaction models relative to the effects based on individual low-level or mid-level components of liberal democracy. Hence, we believe our empirical approach in the main results section is robust and meaningful in determining the low-tier drivers of the liberal democracy-growth nexus.

## 7 Concluding Remarks

In this study we adopt heterogeneous difference-in-difference implementations to trace the positive and significant causal relationship between liberal democracy and long-run economic growth to its constituent institutional components. We bring together the existing empirical literatures on the economic effect of institutions and of (electoral) democracy, which have dominated the cross-country empirical literature for the past two decades. With the help of hierarchical V-Dem data we are able to study the lower tier building blocks of liberal democracy, relating to institutions such as Freedom of Expression or Judicial Constraints on the Executive, in their significance as ‘drivers’ of the positive long-run democracy-growth nexus. Since studying individual institutions in isolation would be equivalent to asking whether the steering wheel *on its own* is relevant for the movement of a vehicle, we employ two alternative strategies to condition our results on ‘rival’ institutions, equivalent to additionally accounting for the engine, wheels, and power transmission in our vehicle analogy: first, we condition on the evolution of the rival institutions *after* our PCDID estimation, and second, we devise an interaction model which captures the economic effect in the presence of both sets of institutions. The patterns emerging from these two alternative approaches are very similar, suggesting that the first approach does not paint a misleading picture of the institutional driving forces of the liberal democracy-growth nexus.

Our results provide a number of important insights into the democracy-growth nexus and the question about ‘which institutions rule’. First, our focus on an encompassing concept of ‘liberal democracy’ which captures aspects related to the electoral process, civil liberties, and constraints on the executive, and which matches the conceptual construct developed in recent work by [Mukand & Rodrik \(2020\)](#), leads us to conclude that democratic regime change has a perpetual growth effect, on the order of around 0.8% per annum. Existing work in this literature has found a levels effect which implies the dividends from regime change accrue as a one-off effect (albeit over a time horizon of 20 to 30 years), e.g. [Acemoglu et al. \(2019\)](#).<sup>42</sup> Our

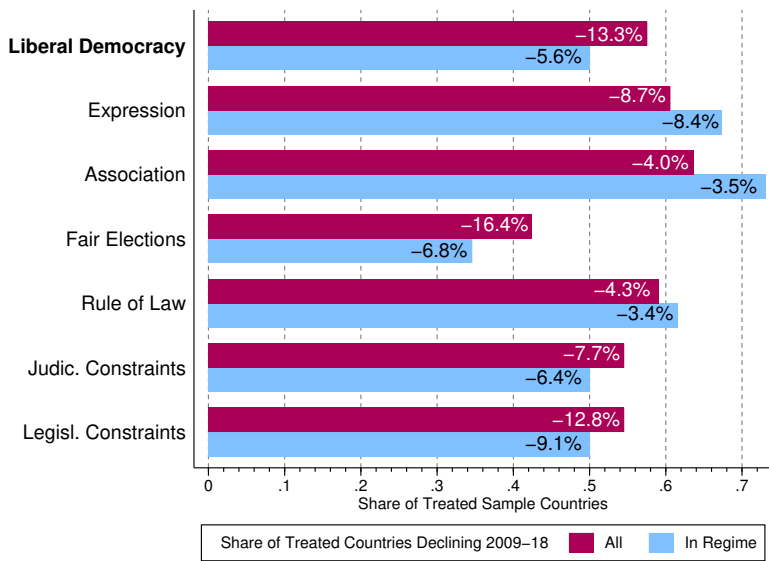
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<sup>42</sup>[Papaioannou & Siourounis \(2008\)](#) suggest their results provide the *growth* effect of democratisation, however the presence of the lagged level of GDP pc alongside lagged growth terms transforms their model into a dynamic one, from which we can derive the long-run *levels* effect. For instance, the model in column (6) of Table 2 is based on two lags of the dependent variable (growth of GDPpc) and one lag of the levels of GDPpc, but the estimated results for ‘Democratisation’ are identical if this specification is replaced by one with three lags for the levels of GDPpc

finding is important because it implies that democracy has an economic dividend which keeps on giving... in perpetuity.

Second, we are able to trace this positive effect of democracy on growth through lower tiers of institutions, which consistently shows that electoral democracy and its constituent components are important drivers of the long-run growth effect of liberal democracy. The liberal component and its constituent elements clearly *do* matter for economic prosperity, also in the long-run, but perhaps less substantially so. While we do not explicitly study sequencing of different political and economic institutions, one interpretation of our findings could be that those institutions typically associated with Douglass North and a long line of economists (labelled ‘incentives and opportunities’ in our conceptual framework in Figure 2) are of particular relevance for the growth process in the initial and consolidation stages after democratic regime change (a process which can take up to three decades), whereas the institutions political scientists associate with a minimal definition of democracy (the ‘distribution of political power’ in the same framework) additionally are also relevant in the very long-term beyond these stages. Hence, which institutions rule in the long-run? Arguably, those related to the electoral process.

**Figure 8:** Erosion of Democratic Institutions (2009-2018)



**Notes:** The figure charts the share of countries in the treatment sample for ‘liberal democracy’ (N=66; orange line in Panel (a) of Figure 3) for which the respective index *declined* over the 2009-2018 period. We report two shares for each institution: one for all countries in the treatment sample and one for those countries which in 2018 were ‘in regime’ (i.e. above the mean value of the respective institutional index). Liberal Democracy is the Tier 1 concept, Freedom of Expression, Freedom of Association and Fair Elections are Tier 3 components of electoral democracy, the remaining institutions are Tier 3 components of the liberal component. The percentages reported represent the median change in the respective index from 2009 to 2018 among those countries which experienced decline.

Third, in our analysis of high and mid-level democracy indicators as well as lower-level institutions we find that a focus on at most 25 or 30 years ‘in regime’ during the post-WWII era, as is the practice in the recent literature (Acemoglu et al. 2019, e.g. Figures 3-5), leads to only. The latter is then clearly recognisable as an error correction model, such that it is straightforward to estimate the long-run *levels* effect of Democratisation, which here amounts to 25% (*t*-ratio 2.91 via the Delta method).

qualitatively very different conclusions from our analysis over 1949-2018 which can trace the effect of a much longer period spent ‘in regime.’ Using the full sample mean cutoff, in the liberal democracy (polyarchy/liberal component) analysis the upper quartile of our sample experienced 34 (38-39) years in regime, while these numbers are even higher for the analysis of some lower-tier institutions.

Finally, our findings are perhaps primarily of interest to economists and political scientists who want to understand the dynamic characteristics of the democracy-growth nexus and the ‘bundles’ of institutions which ultimately drive the democratic dividend. In the light of recent global developments, this work can also act as a stark warning to policymakers about the economic prospects from change in political institutions: the past decade has seen substantial erosion of democratic institutions across the globe — Figure 8 charts the share of our sample of ‘treated’ countries for the analysis of ‘liberal democracy’ in which the index for the respective democratic institution *declined* over the 2009-2018 period (i.e. prior to the emergence of the Coronavirus which triggered temporary restriction of many civil liberties and other institutions in many countries). Exactly half of the treated sample which, following our definition, are still classified as Liberal Democracies in 2018 (light blue bar) saw a decline in this Tier 1 index; the median change for these 33 countries was a drop of 5.6% from their 2009 index value. If we ignore whether countries are classified as Liberal Democracy in 2018 or not (dark pink bar) then closer to two-thirds of countries saw a decline, with a median decline of 13.3%. Studying the constituent components of electoral democracy and the liberal component in the remainder of the chart, we can see that with the exception of ‘Fair Elections’ *all* these democratic institutions declined in half or more sample countries. It is interesting to point out that the median proportional changes among countries which did see erosion of democratic institutions were most substantial for Legislative Constraints on the Executive, Freedom of Expression and Fair Elections (-9.1%, -8.4% and -6.8%, respectively)... exactly those institutions we highlighted as being the lower-tier driving force of the democracy-growth nexus in the long-run. The decline in democratic institutions across the globe has significant implications for long-term economic prosperity: if the current trend continues this may well erode the perpetual growth effect of democratisation we find and trace in this paper.

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# Appendix

## A Data Appendix

**Table A-1:** V-Dem political institutions (i): Regimes (Regimes of the World database)

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<b>(I) Autocracy (i)</b>		
Closed Autocracy Regime	$v2x\_regime = 0$	"[T]he chief executive is either not subjected to elections or there is no meaningful, <i>de facto</i> competition in elections." (LLT 2017: 1).
<hr/>		
<b>(II) Autocracy (ii)</b>		
Electoral Autocracy Regime	$v2x\_regime = 1$	"Electoral autocracies hold <i>de facto</i> multiparty elections for the chief executive, but they fall short of democratic standards due to significant irregularities, limitations on party competition or other violations of Dahl's institutional requisites for democracies" (LLT 2017: 1f).
<hr/>		
<b>(III) Democracy (i)</b>		
Electoral Democracy Regime	$v2x\_regime = 2$	"[C]ountries not only have to hold <i>de facto</i> free and fair multiparty elections, but also based on Dahl achieve a high level of institutional guarantees for democracies such as freedom of association, suffrage, clean elections, an elected executive, and freedom of expression." (LLT 2017: 2)
<hr/>		
<b>(IV) Democracy (ii)</b>		
Liberal Democracy Regime	$v2x\_regime == 3$	"In addition to [the Electoral Democracy Regime] principles effective legislative and judicial oversight of the executive, protection of individual liberties and the rule of law denominate as liberal democracies." (LLT 2017: 2)

**Notes:** This table defines the regimes provided in the 'Regimes of the World' (ROW) dataset by V-Dem. These definitions are provided here for completeness, we only use the simple 'democracy' cut-off (value of 2) in the analysis of high-level democracy indicators in Figure 3. The labels in the first column are the full names given to respective regimes in V-Dem, the second column reports the exact variable definition for the regime, the third column gives a brief definition. Note the unfortunate naming of the 'Liberal Democracy Regime'; this is not to be confused with the 'Liberal Democracy Index': the former is from ROW (LLT) and based on polyarchy, the latter is from Coppedge et al. (2021) and combines polyarchy with the liberal component. Citations: LLT – Lührmann et al. (2018).



**Table A-2: V-Dem political institutions (ii): Indices (V-Dem v11)**

<b>(I) High-level Index of Democracy and Associated Regime Definitions</b>		
Liberal Democracy	<i>v2x_libdem</i>	"[A]n electoral democracy in combination with constraints on the executive by the judiciary as well as the legislature and transparent and rigorously-enforced laws and individual liberties" (LLT 2017: 1).
<b>(II) Mid-level Indices of Democracy</b>		
(a) Electoral Democracy (Polyarchy)	<i>v2x_polyarchy</i>	Electoral participation and competition, clean elections, and inbetween elections freedom of expression and association (LLT 2017: 1).
(b) Liberal Component	<i>v2x_liberal</i>	Constitutionally protected civil liberties, strong rule of law, an independent judiciary and effective checks and balances on the executive (LLT 2017: 1).
<b>(III) Low-level Indices of Democracy</b>		
<i>----- (a) Pertaining to Electoral Democracy/Polyarchy</i>		
(i) Freedom of expression and alternative sources of information	<i>v2x_freexp_altinf</i>	The extent to which: "government respect[s] press and media freedom, the freedom of ordinary people to discuss political matters at home and in the public sphere, as well as the freedom of academic and cultural expression" (C: 42).
(ii) Freedom of association	<i>v2x_frassoc_thick</i>	The extent to which: "parties, including opposition parties, [are] allowed to form and to participate in elections, and civil society organizations [are] able to form and to operate freely" (C: 43).
(iii) Clean elections	<i>v2xel_frefair</i>	The extent to which: "elections [are] free and fair" (C: 44).
(iv)* Elected officials	<i>v2x_elecuff</i>	The extent to which: "the chief executive and legislature [are] appointed through popular elections" (C: 43).
(v)* Share of population with suffrage	<i>v2x_suffr</i>	"What share of adult citizens as defined by statute has the legal right to vote in national elections?" (C: 43)
<i>----- (b) Pertaining to the Liberal Component</i>		
(i) Equality before the law and individual liberties	<i>v2xcl_rol</i>	The extent to which: "laws transparent and rigorously enforced and public administration impartial, ... citizens enjoy access to justice, secure property rights, freedom from forced labor, freedom of movement, physical integrity rights, and freedom of religion" (C: 45).
(ii) Judicial constraints on the executive	<i>v2x_jucon</i>	The extent to which: "the executive respect the constitution and comply with court rulings, and... the judiciary [is] able to act in an independent fashion" (C: 46).
(iii) Legislative constraints on the executive	<i>v2xlg_legcon</i>	The extent to which: "the legislature and government agencies e.g., comptroller general, general prosecutor, or ombudsman [are] capable of questioning, investigating, and exercising oversight over the executive" (C: 46).

**Notes:** \* Not included in the analysis – see maintext for details. The labels in the first column are the full names given to respective concepts in V-Dem (we adopt version 11, C21), the second column reports the exact variable name, the third column gives a brief definition; citations: LLT – Lührmann et al. (2018); C – Coppedge et al. (2019); C21 – Coppedge et al. (2021).

Table A-3: Sample Makeup

	ISO	Country	Start	End	Obs	Miss	GDP per capita			Liberal Democracy			Regime Change					
							Base	End	$\Delta$ pa	Base	End	$\Delta$ pa	+LD	-LD	+Pol	-Pol	+Lib	-Lib
1	AFG	Afghanistan	1959	2018	51	9	1,307	1,935	0.7%	0.07	0.19	1.7%	C	C	C	C	C	C
2	AGO	Angola	1951	2018	61	7	1,715	7,771	2.2%	0.04	0.21	2.5%	C	C	C	C	C	C
3	ALB	Albania	1982	2018	37	0	3,783	11,104	2.9%	0.06	0.42	5.4%	2	1	1	0	1	0
4	ARE	UAE	1977	2018	40	2	41,915	76,398	1.4%	0.05	0.09	1.6%	C	C	C	C	C	C
5	ARG	Argentina	1953	2018	66	0	7,769	18,556	1.3%	0.21	0.63	1.7%	2	1	4	3	3	2
6	ARM	Armenia	1993	2018	26	0	4,130	11,454	3.9%	0.34	0.34	0.0%	C	C	1	1	1	0
7	AUS	Australia	1949	2018	70	0	11,536	49,831	2.1%	0.74	0.82	0.1%	A	A	A	A	A	A
8	AUT	Austria	1949	2018	66	4	5,249	42,988	3.0%	0.62	0.76	0.3%	A	A	A	A	A	A
9	AZE	Azerbaijan	1993	2018	26	0	4,315	16,628	5.2%	0.18	0.06	-4.2%	C	C	C	C	C	C
10	BDI	Burundi	1970	2018	49	0	893	651	-0.6%	0.07	0.05	-0.9%	C	C	C	C	C	C
11	BEL	Belgium	1998	2018	21	0	31,481	39,756	1.1%	0.81	0.82	0.1%	A	A	A	A	A	A
12	BEN	Benin	1961	2018	58	0	1,482	2,220	0.7%	0.23	0.49	1.3%	1	0	1	0	1	0
13	BFA	Burkina Faso	1962	2018	55	2	1,060	1,590	0.7%	0.23	0.52	1.4%	2	1	2	1	1	0
14	BGD	Bangladesh	1974	2018	45	0	872	4,099	3.4%	0.20	0.11	-1.3%	C	C	2	2	C	C
15	BGR	Bulgaria	1956	2018	38	25	3,392	18,444	2.7%	0.06	0.52	3.5%	1	0	1	0	1	0
16	BHR	Bahrain	2002	2018	17	0	19,488	39,499	4.2%	0.07	0.04	-3.0%	C	C	C	C	C	C
17	BIH	Bosnia & Herz.	1994	2018	25	0	3,017	10,461	5.0%	0.06	0.35	7.0%	1	0	1	0	1	0
18	BLR	Belarus	1993	2018	26	0	9,077	18,727	2.8%	0.45	0.11	-5.4%	0	1	0	1	0	1
19	BOL	Bolivia	1949	2018	70	0	3,083	6,696	1.1%	0.07	0.36	2.3%	1	0	1	0	1	1
20	BRA	Brazil	1949	2018	70	0	2,204	14,034	2.6%	0.26	0.60	1.2%	1	0	1	0	1	1
21	BRB	Barbados	1959	2018	56	4	5,053	11,995	1.4%	0.37	0.66	1.0%	A	A	A	A	A	A
22	BWA	Botswana	2001	2018	18	0	8,083	15,842	3.7%	0.61	0.58	-0.3%	A	A	A	A	A	A
23	CAF	Central Afr. Rep.	1961	2018	54	4	1,597	623	-1.6%	0.12	0.25	1.3%	C	C	C	C	C	C
24	CAN	Canada	1949	2018	70	0	11,260	44,869	2.0%	0.63	0.77	0.3%	A	A	A	A	A	A
25	CHE	Switzerland	1949	2018	70	0	10,944	61,373	2.5%	0.56	0.86	0.6%	A	A	A	A	A	A
26	CHL	Chile	1949	2018	70	0	5,710	22,105	1.9%	0.27	0.80	1.6%	2	1	2	1	1	1
27	CHN	China	1979	2018	40	0	1,859	13,102	4.9%	0.05	0.05	0.2%	C	C	C	C	C	C
28	CIV	Cote d'Ivoire	1961	2018	58	0	2,114	3,714	1.0%	0.15	0.37	1.6%	1	0	2	1	2	1
29	CMR	Cameroon	1963	2018	56	0	1,366	2,888	1.3%	0.07	0.13	1.0%	C	C	C	C	C	C
30	COG	Congo, Rep.	1961	2018	58	0	2,020	5,715	1.8%	0.19	0.11	-1.0%	C	C	1	1	1	1
31	COL	Colombia	1949	2018	70	0	3,359	13,545	2.0%	0.09	0.51	2.5%	1	0	2	1	1	0
32	COM	Comoros	1970	2018	46	3	961	1,724	1.2%	0.06	0.21	2.4%	1	1	2	2	1	1
33	CPV	Cape Verde	1971	2018	48	0	1,435	6,831	3.3%	0.03	0.68	6.3%	1	0	1	0	2	1
34	CRI	Costa Rica	1949	2018	70	0	3,384	14,686	2.1%	0.21	0.84	2.0%	1	0	1	0	A	A
35	CUB	Cuba	1949	2018	46	24	2,482	8,326	1.7%	0.32	0.09	-1.9%	C	C	C	C	0	1
36	CYP	Cyprus	1951	2018	68	0	2,782	27,184	3.4%	0.10	0.76	3.0%	1	0	1	0	1	0
37	CZE	Czech Republic	1994	2018	25	0	13,518	30,749	3.3%	0.83	0.71	-0.6%	A	A	A	A	A	A
38	DEU	Germany	1951	2018	68	0	6,704	46,178	2.8%	0.78	0.83	0.1%	A	A	A	A	A	A
39	DJI	Djibouti	1982	2018	37	0	3,043	3,296	0.2%	0.08	0.12	1.1%	C	C	C	C	C	C
40	DNK	Denmark	1949	2018	70	0	10,351	46,312	2.1%	0.86	0.89	0.0%	A	A	A	A	A	A
41	DOM	Dominican Rep.	1951	2018	54	14	1,780	15,912	3.2%	0.03	0.28	3.2%	1	1	2	1	C	C
42	DZA	Algeria	1951	2018	63	5	2,147	14,228	2.8%	0.10	0.16	0.7%	C	C	C	C	C	C
43	ECU	Ecuador	1949	2018	67	3	2,815	10,639	1.9%	0.19	0.48	1.3%	2	1	1	0	3	2
44	EGY	Egypt	1951	2018	68	0	1,443	11,957	3.1%	0.19	0.12	-0.7%	C	C	C	C	0	1
45	ESP	Spain	1949	2018	70	0	3,435	31,497	3.2%	0.06	0.79	3.6%	1	0	1	0	1	0
46	EST	Estonia	1993	2018	26	0	12,207	27,409	3.1%	0.82	0.85	0.2%	A	A	A	A	A	A
47	ETH	Ethiopia	1951	2018	68	0	630	1,838	1.6%	0.02	0.15	2.7%	C	C	C	C	C	C
48	FIN	Finland	1949	2018	70	0	6,604	38,897	2.5%	0.76	0.84	0.1%	A	A	A	A	A	A
49	FRA	France	1949	2018	70	0	7,884	38,516	2.3%	0.64	0.80	0.3%	A	A	A	A	A	A
50	GAB	Gabon	1961	2018	58	0	4,415	17,614	2.4%	0.12	0.22	1.1%	C	C	C	C	C	C
51	GBR	United Kingdom	1949	2018	70	0	11,088	38,058	1.8%	0.69	0.81	0.2%	A	A	A	A	A	A
52	GEO	Georgia	1993	2018	26	0	3,793	11,985	4.4%	0.16	0.55	4.7%	1	0	1	0	1	0
53	GHA	Ghana	1951	2018	68	0	1,808	4,267	1.3%	0.21	0.62	1.6%	3	2	2	1	4	3
54	GIN	Guinea	1982	2018	37	0	858	1,606	1.7%	0.04	0.20	4.4%	C	C	C	C	C	C
55	GMB	The Gambia	1964	2018	55	0	1,274	1,882	0.7%	0.23	0.44	1.2%	2	1	2	1	2	1
56	GNB	Guinea-Bissau	1971	2018	48	0	1,333	1,501	0.2%	0.01	0.34	7.1%	C	C	3	2	2	1
57	GNQ	Equat. Guinea	1982	2018	37	0	2,533	28,529	6.5%	0.03	0.06	1.6%	C	C	C	C	C	C
58	GRC	Greece	1949	2018	70	0	2,979	23,451	2.9%	0.21	0.77	1.9%	1	0	1	0	2	1
59	GTM	Guatemala	1949	2018	70	0	3,365	7,402	1.1%	0.23	0.43	0.9%	1	0	1	0	1	0
60	HKG	Hong Kong	1951	2018	66	2	3,688	50,839	3.9%	0.18	0.28	0.7%	C	C	C	C	A	A

(Continued overleaf)

Table A-3: Sample Makeup (continued)

ISO	Country	Start	End	Obs	Miss	GDP per capita			Liberal Democracy			Regime Change						
						Base	End	$\Delta$ pa	Base	End	$\Delta$ pa	+LD	-LD	+Pol	-Pol	+Lib	-Lib	
61	HND	Honduras	1949	2018	70	0	2,013	5,042	1.3%	0.08	0.24	1.6%	C	C	2	2	C	C
62	HRV	Croatia	1994	2018	25	0	9,353	22,012	3.4%	0.22	0.62	4.1%	1	0	1	0	1	0
63	HTI	Haiti	1949	2018	67	3	1,782	1,729	0.0%	0.10	0.26	1.4%	C	C	2	2	2	2
64	HUN	Hungary	1956	2018	53	10	4,632	25,623	2.7%	0.07	0.39	2.7%	1	0	1	0	1	0
65	IDN	Indonesia	1950	2018	66	3	1,280	11,852	3.2%	0.18	0.46	1.4%	2	1	2	0	1	0
66	IND	India	1949	2018	70	0	995	6,806	2.7%	0.15	0.41	1.4%	2	1	2	1	1	0
67	IRL	Ireland	1949	2018	70	0	5,426	64,684	3.5%	0.66	0.81	0.3%	A	A	A	A	A	A
68	IRN	Iran	1965	2018	41	13	4,388	17,011	2.5%	0.08	0.15	1.1%	C	C	C	C	C	C
69	IRQ	Iraq	1951	2018	58	10	2,303	12,836	2.5%	0.16	0.25	0.6%	C	C	C	C	2	3
70	ISL	Iceland	1951	2018	68	0	8,080	43,439	2.5%	0.71	0.80	0.2%	A	A	A	A	A	A
71	ISR	Israel	1951	2018	68	0	5,035	32,955	2.8%	0.50	0.61	0.3%	A	A	A	A	A	A
72	ITA	Italy	1949	2018	70	0	5,188	34,364	2.7%	0.56	0.79	0.5%	A	A	A	A	A	A
73	JAM	Jamaica	1951	2018	68	0	2,251	7,273	1.7%	0.24	0.70	1.6%	1	0	1	0	A	A
74	JOR	Jordan	1954	2018	65	0	2,848	11,506	2.1%	0.17	0.25	0.6%	C	C	C	C	6	6
75	JPN	Japan	1949	2018	70	0	2,867	38,674	3.7%	0.37	0.74	1.0%	A	A	1	0	A	A
76	KAZ	Kazakhstan	1993	2018	26	0	9,174	25,308	3.9%	0.18	0.12	-1.6%	C	C	C	C	C	C
77	KEN	Kenya	1951	2018	68	0	1,229	3,377	1.5%	0.05	0.35	2.9%	1	0	2	2	1	0
78	KGZ	Kyrgyz Rep.	1993	2018	26	0	3,765	5,177	1.2%	0.21	0.34	1.9%	C	C	1	0	1	0
79	KHM	Cambodia	1956	2018	48	15	912	3,629	2.2%	0.15	0.08	-1.1%	C	C	C	C	C	C
80	KOR	Korea, Rep.	1956	2018	63	0	1,382	37,928	5.3%	0.16	0.80	2.6%	1	0	1	0	1	0
81	KWT	Kuwait	1974	2018	45	0	34,962	65,521	1.4%	0.28	0.29	0.1%	C	C	C	C	2	2
82	LAO	Lao PDR	1956	2018	52	11	744	6,451	3.4%	0.12	0.10	-0.4%	C	C	C	C	C	C
83	LBN	Lebanon	1951	2018	58	10	5,150	12,559	1.3%	0.20	0.31	0.6%	C	C	1	0	1	0
84	LBR	Liberia	1967	2018	52	0	4,065	818	-3.1%	0.11	0.44	2.8%	1	0	1	0	2	1
85	LBY	Libya	1956	2018	63	0	950	15,013	4.4%	0.13	0.16	0.4%	C	C	1	1	C	C
86	LKA	Sri Lanka	1949	2018	70	0	1,911	11,663	2.6%	0.53	0.48	-0.2%	1	1	2	2	1	1
87	LSO	Lesotho	2001	2018	18	0	1,997	2,731	1.7%	0.27	0.45	2.9%	1	0	1	0	A	A
88	LTU	Lithuania	1993	2018	26	0	8,621	27,371	4.4%	0.76	0.76	0.0%	A	A	A	A	A	A
89	LUX	Luxembourg	1998	2018	21	0	44,143	57,428	1.3%	0.78	0.78	0.0%	A	A	A	A	A	A
90	LVA	Latvia	1993	2018	26	0	8,439	24,313	4.1%	0.63	0.75	0.7%	A	A	A	A	A	A
91	MAR	Morocco	1951	2018	68	0	2,324	8,451	1.9%	0.05	0.26	2.5%	C	C	C	C	1	0
92	MDA	Moldova	1993	2018	26	0	5,384	6,747	0.9%	0.39	0.40	0.1%	A	A	A	A	A	A
93	MDG	Madagascar	1951	2018	68	0	1,549	1,428	-0.1%	0.07	0.28	2.0%	1	1	3	2	1	1
94	MEX	Mexico	1949	2018	70	0	3,276	16,494	2.3%	0.10	0.45	2.2%	1	0	1	0	1	0
95	MLI	Mali	1964	2018	55	0	888	1,667	1.1%	0.19	0.32	0.9%	2	2	2	1	2	1
96	MLT	Malta	1959	2018	60	0	2,278	32,029	4.4%	0.19	0.57	1.8%	1	0	1	0	1	0
97	MMR	Myanmar	1951	2018	68	0	711	5,838	3.1%	0.16	0.25	0.7%	C	C	C	C	1	1
98	MNE	Montenegro	2007	2018	12	0	12,027	19,504	4.0%	0.40	0.35	-1.0%	0	1	1	1	A	A
99	MNG	Mongolia	1982	2018	37	0	1,814	13,383	5.4%	0.06	0.50	5.9%	1	0	1	0	1	0
100	MOZ	Mozambique	1951	2018	48	20	1,841	1,133	-0.7%	0.02	0.28	3.7%	C	C	3	4	0	0
101	MRT	Mauritania	1963	2018	47	9	944	3,458	2.3%	0.12	0.16	0.4%	C	C	1	1	C	C
102	MUS	Mauritius	1952	2018	65	2	4,002	20,139	2.4%	0.31	0.73	1.3%	1	1	1	1	A	A
103	MWI	Malawi	1967	2018	52	0	725	1,117	0.8%	0.09	0.44	3.1%	1	0	2	1	1	0
104	MYS	Malaysia	1968	2018	51	0	3,096	24,842	4.1%	0.20	0.26	0.5%	C	C	C	C	1	0
105	NAM	Namibia	2001	2018	18	0	5,888	9,043	2.4%	0.53	0.57	0.4%	A	A	A	A	A	A
106	NER	Niger	1961	2018	58	0	1,239	965	-0.4%	0.13	0.41	1.9%	3	2	3	2	3	2
107	NGA	Nigeria	1951	2018	66	2	1,262	5,238	2.1%	0.11	0.40	1.9%	1	0	2	1	1	1
108	NIC	Nicaragua	1949	2018	70	0	2,345	4,952	1.1%	0.03	0.06	1.0%	1	1	1	1	1	1
109	NLD	Netherlands	1949	2018	70	0	9,373	47,474	2.3%	0.72	0.83	0.2%	A	A	A	A	A	A
110	NOR	Norway	1949	2018	70	0	8,332	84,580	3.3%	0.71	0.86	0.3%	A	A	A	A	A	A
111	NPL	Nepal	1982	2018	37	0	1,135	2,727	2.4%	0.10	0.51	4.3%	2	1	2	1	3	2
112	NZL	New Zealand	1949	2018	70	0	11,988	35,336	1.5%	0.72	0.84	0.2%	A	A	A	A	A	A
113	OMN	Oman	1971	2018	48	0	5,923	36,478	3.8%	0.05	0.14	2.2%	C	C	C	C	C	C
114	PAK	Pakistan	1951	2018	68	0	969	5,510	2.6%	0.17	0.26	0.6%	C	C	1	1	C	C
115	PAN	Panama	1949	2018	70	0	2,732	22,637	3.0%	0.18	0.56	1.6%	1	0	1	0	1	0
116	PER	Peru	1949	2018	70	0	3,470	12,310	1.8%	0.03	0.68	4.3%	3	2	2	1	4	3
117	PHL	Philippines	1949	2018	70	0	1,634	8,139	2.3%	0.26	0.31	0.3%	1	1	1	0	1	1
118	POL	Poland	1956	2018	53	10	4,565	27,455	2.8%	0.11	0.55	2.5%	1	0	1	0	1	0
119	PRK	DPR Korea	1991	2018	28	0	2,316	1,596	-1.3%	0.02	0.01	-0.2%	C	C	C	C	C	C
120	PRT	Portugal	1949	2018	70	0	3,279	27,036	3.0%	0.08	0.84	3.4%	1	0	1	0	1	0

(Continued overleaf)

**Table A-3: Sample Makeup (continued)**

ISO	Country	Start	End	Obs	Miss	GDP per capita			Liberal Democracy			Regime Change						
						Base	End	$\Delta$ pa	Base	End	$\Delta$ pa	+LD	-LD	+Pol	-Pol	+Lib	-Lib	
121	PRY	Paraguay	1949	2018	62	8	2,625	9,339	1.8%	0.06	0.42	2.9%	1	0	1	0	1	0
122	QAT	Qatar	1973	2018	41	5	68,407	153,764	1.8%	0.08	0.10	0.6%	C	C	C	C	C	C
123	RUS	Russian Federation	1982	2018	37	0	12,267	24,669	1.9%	0.03	0.11	3.9%	C	C	1	1	1	1
124	RWA	Rwanda	1965	2018	54	0	1,023	1,929	1.2%	0.16	0.11	-0.6%	C	C	C	C	C	C
125	SAU	Saudi Arabia	1965	2018	54	0	8,717	50,305	3.2%	0.04	0.05	0.1%	C	C	C	C	C	C
126	SDN	Sudan	1951	2018	68	0	1,334	3,380	1.4%	0.06	0.09	0.5%	C	C	C	C	C	C
127	SEN	Senegal	1961	2018	58	0	2,351	2,617	0.2%	0.28	0.56	1.2%	1	0	1	0	A	A
128	SGP	Singapore	1963	2018	51	5	4,049	68,402	5.0%	0.27	0.31	0.3%	C	C	C	C	A	A
129	SLE	Sierra Leone	1958	2018	57	4	1,109	1,684	0.7%	0.11	0.39	2.1%	2	1	1	0	2	1
130	SLV	El Salvador	1949	2018	70	0	2,432	8,598	1.8%	0.05	0.45	3.1%	1	0	1	0	1	0
131	STP	Sao Tome & Pr.	1970	2018	42	7	2,243	3,730	1.0%	0.09	0.55	3.7%	1	0	1	0	1	0
132	SVK	Slovak Republic	1995	2018	24	0	11,874	27,076	3.4%	0.55	0.70	1.1%	A	A	A	A	A	A
133	SVN	Slovenia	1994	2018	25	0	16,665	29,245	2.2%	0.77	0.77	0.0%	A	A	A	A	A	A
134	SWE	Sweden	1949	2018	70	0	10,127	45,542	2.1%	0.71	0.88	0.3%	A	A	A	A	A	A
135	SWZ	Eswatini	2001	2018	18	0	4,977	8,068	2.7%	0.10	0.13	1.2%	C	C	C	C	C	C
136	SYC	Seychelles	1971	2018	48	0	3,987	29,531	4.2%	0.23	0.46	1.5%	1	0	1	0	2	2
137	SYR	Syria	1951	2018	68	0	3,609	3,349	-0.1%	0.17	0.03	-2.5%	C	C	C	C	C	C
138	TCD	Chad	1961	2018	52	6	971	2,046	1.3%	0.12	0.08	-0.6%	C	C	C	C	C	C
139	TGO	Togo	1960	2018	59	0	1,058	1,451	0.5%	0.12	0.21	1.0%	C	C	2	1	C	C
140	THA	Thailand	1957	2018	62	0	1,451	16,649	3.9%	0.11	0.11	0.0%	2	2	2	2	3	3
141	TJK	Tajikistan	1993	2018	26	0	2,482	4,440	2.2%	0.06	0.05	-0.5%	C	C	C	C	C	C
142	TKM	Turkmenistan	1993	2018	26	0	4,604	26,318	6.7%	0.03	0.04	0.4%	C	C	C	C	C	C
143	TTO	Trinidad & Tob.	1951	2018	68	0	6,207	28,549	2.2%	0.27	0.64	1.2%	1	0	1	0	A	A
144	TUN	Tunisia	1951	2018	68	0	1,763	11,354	2.7%	0.04	0.65	4.2%	1	0	1	0	1	0
145	TUR	Turkey	1949	2018	70	0	1,946	19,270	3.3%	0.16	0.11	-0.5%	3	3	2	2	3	3
146	TZA	Tanzania	1951	2018	68	0	743	2,875	2.0%	0.09	0.33	1.9%	1	1	1	1	1	0
147	UGA	Uganda	1951	2018	68	0	1,023	2,045	1.0%	0.11	0.23	1.1%	C	C	C	C	1	0
148	UKR	Ukraine	1993	2018	26	0	7,090	9,813	1.3%	0.38	0.25	-1.6%	1	2	1	2	1	2
149	URY	Uruguay	1949	2018	70	0	6,531	20,186	1.6%	0.68	0.82	0.3%	1	1	1	1	1	1
150	USA	United States	1949	2018	70	0	14,197	55,335	1.9%	0.51	0.75	0.5%	A	A	A	A	A	A
151	UZB	Uzbekistan	1993	2018	26	0	5,193	11,220	3.0%	0.05	0.07	1.1%	C	C	C	C	C	C
152	VEN	Venezuela	1952	2018	65	2	9,309	10,710	0.2%	0.05	0.08	0.7%	1	1	1	1	1	1
153	VNM	Vietnam	1956	2018	55	8	1,218	6,814	2.7%	0.09	0.15	0.8%	C	C	C	C	C	C
154	YEM	Yemen	1991	2018	28	0	3,662	2,285	-1.7%	0.14	0.04	-4.6%	C	C	C	C	C	C
155	ZAF	South Africa	1999	2018	20	0	7,234	12,166	2.6%	0.60	0.63	0.2%	A	A	A	A	A	A
156	ZMB	Zambia	1951	2018	57	11	1,097	3,534	1.7%	0.11	0.26	1.3%	1	1	1	1	1	0
157	ZWE	Zimbabwe	1951	2018	42	26	1,151	1,611	0.5%	0.184	0.218	0.2%	C	C	C	C	2	3

*Notes:* We provide details on the 157 countries in the full sample of analysis, including Start and End Year of the country time series, the number of observations (Obs) and hence the number of missing observations (Miss). Real GDP pc is in US\$ for the first and final year of the country sample,  $\Delta$ pa for the Liberal Democracy Index;  $\Delta$ pa refers to the average annual percentage change (in GDPpc growth or in the LibDem Index) over the country-specific sample period. The final set of columns indicate regime change as defined by the mean cutoff of the Liberal Democracy Index (LD), the Polyarchy Index (Pol) and the Liberal Component Index (Lib). +LD counts the occasions when a country overcame the threshold/cutoff, -LD counts the reversals, similarly for Pol and Lib. When countries had no regime change or reversal, they either always stayed below the threshold, in which case they are in the control group sample (C), or they always stayed above the threshold (A), in which case they are discarded. We report countries even if they were discarded in all of our analysis since their respective index scores informed the ‘full sample mean’ we employ to determine the primary cut-off for regime change across all indicators of democracy and political institutions. As robustness check we use cutoffs from 1/4 sd below the mean to 1/4 sd above the mean — the regime change counts and control group makeup for these cutoffs are not presented here.

**Table A-4: Democracy ‘Thresholds’ and Alternatives**

	SD	Mean -1/4 SD	Mean -1/8 SD	Mean cut-off	Mean +1/8 SD	Mean +1/4 SD
<b>Tier 1 High-level Democracy Index</b>						
Liberal Democracy	0.281	0.281	0.316	0.351	0.386	0.421
<b>Tier 2 Mid-level Democracy Indices</b>						
Liberal Component	0.289	0.482	0.518	0.554	0.590	0.626
Polyarchy	0.289	0.375	0.411	0.447	0.483	0.519
<b>Tier 3 Low-level Democracy Indices: Elements of Polyarchy</b>						
F'm of Expression	0.327	0.495	0.536	0.577	0.618	0.658
F'm of Association	0.329	0.473	0.514	0.556	0.597	0.638
Clean Elections	0.355	0.376	0.421	0.465	0.510	0.554
<b>Tier 3 Low-level Democracy Indices: Elements of the Liberal Component</b>						
Rule of Law	0.293	0.542	0.579	0.616	0.653	0.689
Judicial Constr	0.310	0.489	0.528	0.566	0.605	0.644
Legislative Constr	0.325	0.450	0.490	0.531	0.571	0.612

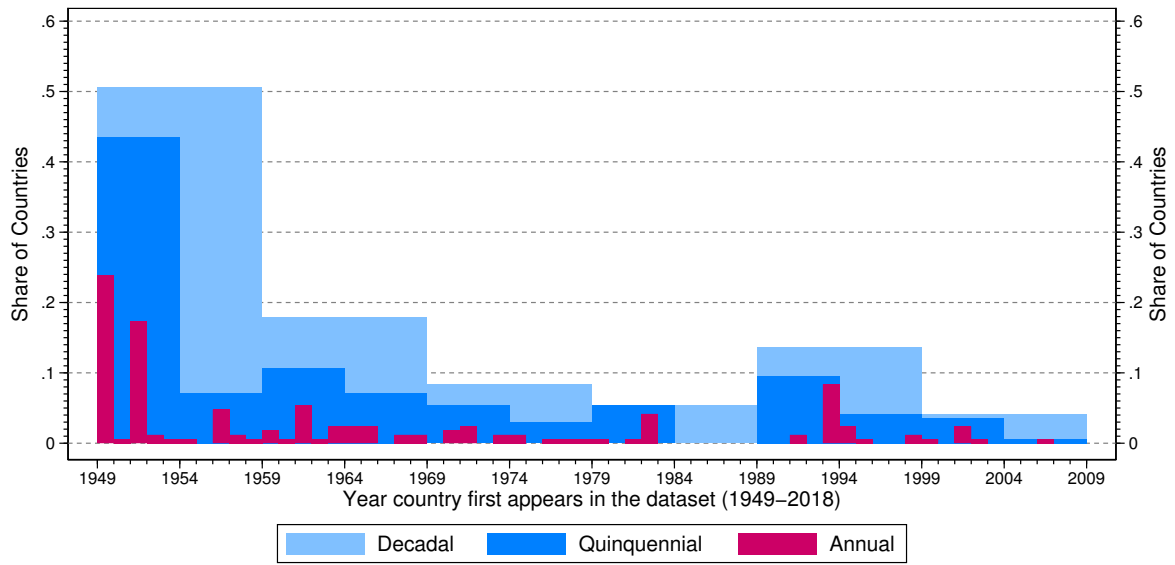
*Notes:* The table presents the definitions of our binary democracy indicators used in the PCDDID regressions. SD and Mean are the sample standard deviation and mean of the respective democracy index, where ‘sample’ includes all countries ( $N = 157$ ,  $n = 8, 303$  for 1949-2018). The main analysis is conducted using the ‘Mean cut-off’, robustness checks use cut-offs ranging from 1/4 of a standard deviation below to 1/4 of a standard deviation above the sample mean. Details on the sample sizes of the treated and control groups are presented in the results plots in the maintext as well as the ATET results tables in Appendix C.

**Table A-5: Regime Change Dynamics**

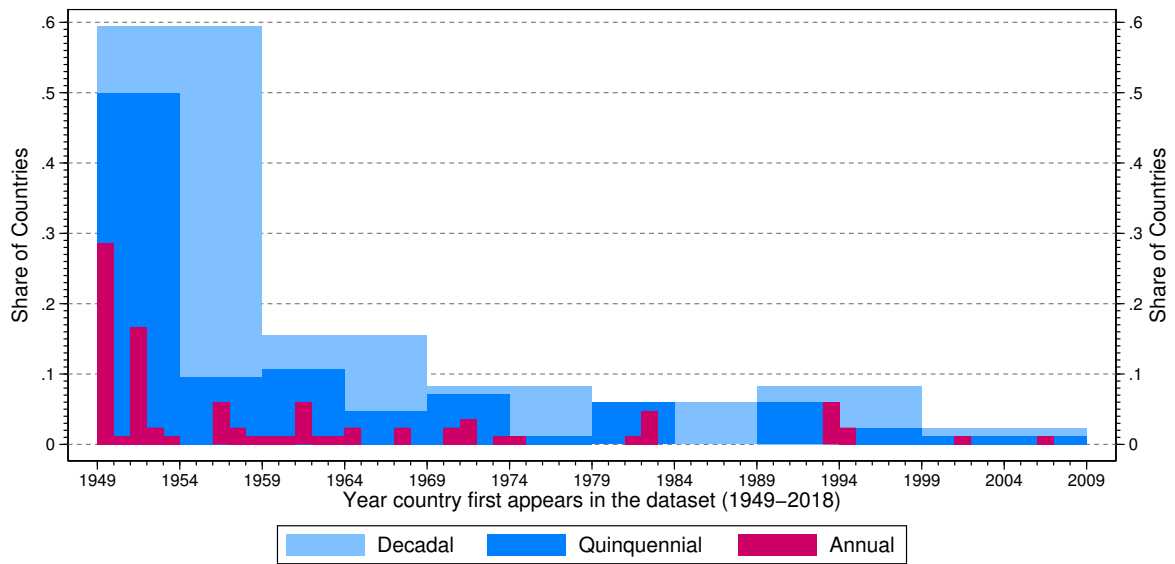
Indicator	Changes	Count	Share
Liberal Democracy (64 countries)	1	48	75%
	2	12	19%
	3	4	6%
Polyarchy (80 countries)	1	52	65%
	2	23	29%
	3	4	5%
	4	1	1%
Liberal Component (72 countries)	1	50	69%
	2	13	18%
	3	6	8%
	4	2	3%
	6	1	1%

*Notes:* The table presents frequency counts (and shares) of regime changes for the high- and mid-level democracy indicators (adopting the mean cut-off). For instance, of the 64 countries which experienced regime change per definition of the Liberal Democracy index, 48 (75%) had only a single regime change event, 12 had two, and 4 countries three.

**Figure A-1: Unbalancedness of the Panel**



(a) Country Start Year: All Countries (N=157)

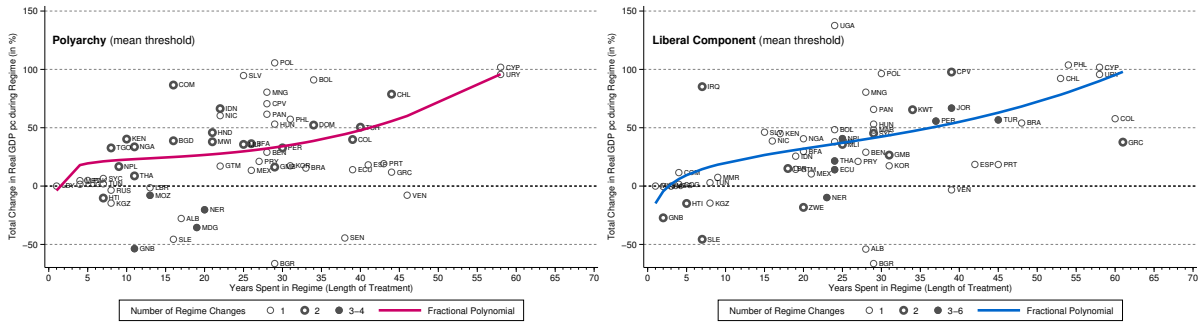


(b) Country Start Year: Polyarchy PCDID Regressions (N=80)

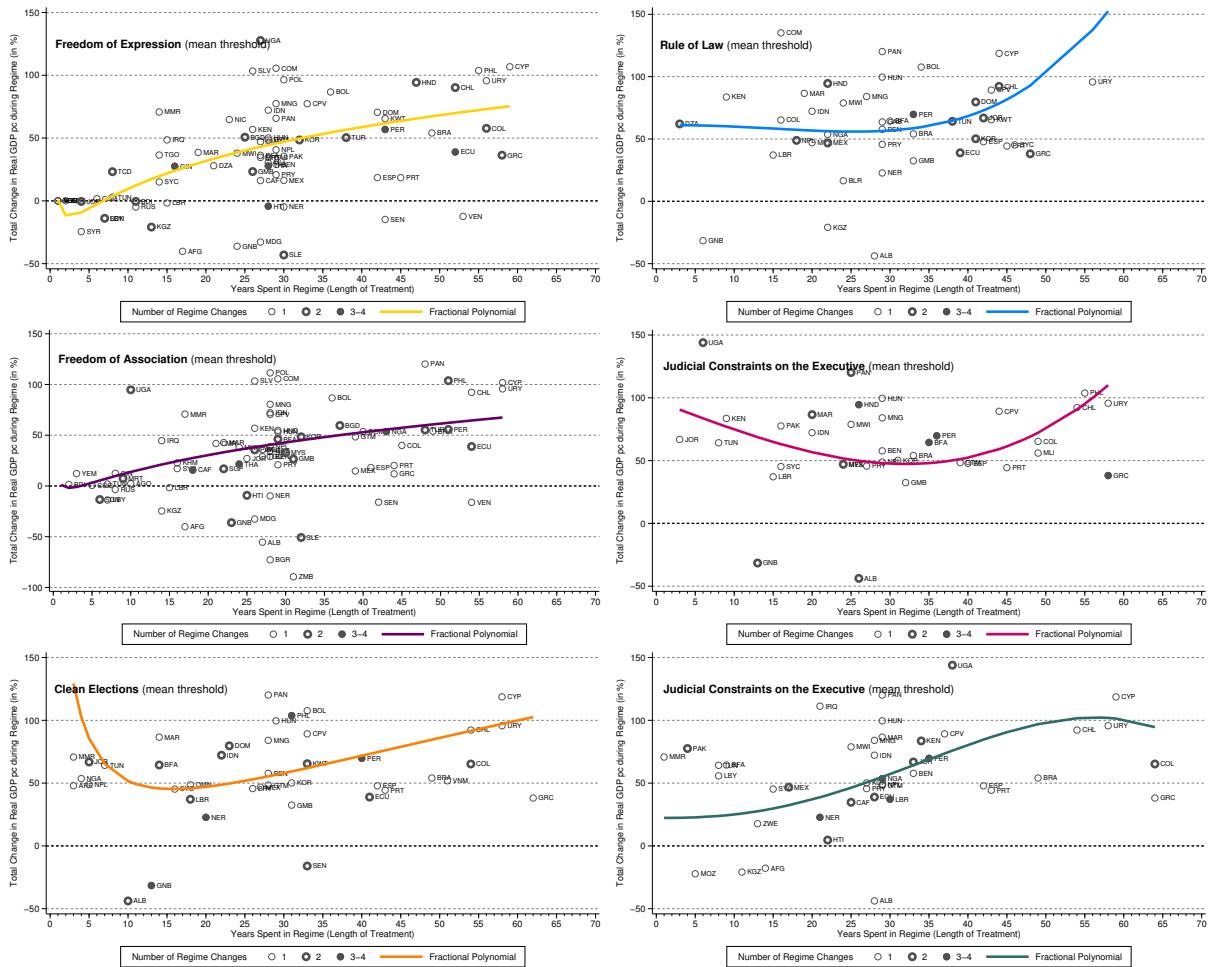
**Notes:** These histograms present the frequency share of sample countries which enter the data in the year, 5-year or 10-year period, as indicated. Panel (a) uses the full sample for all 157 countries, panel (b) the treated sample of countries which experienced variation in the electoral democracy dummy defined by the exceeding the mean threshold.



**Figure A-2: Cumulative Growth Dividend from Regime Change (Single Difference Effect)**



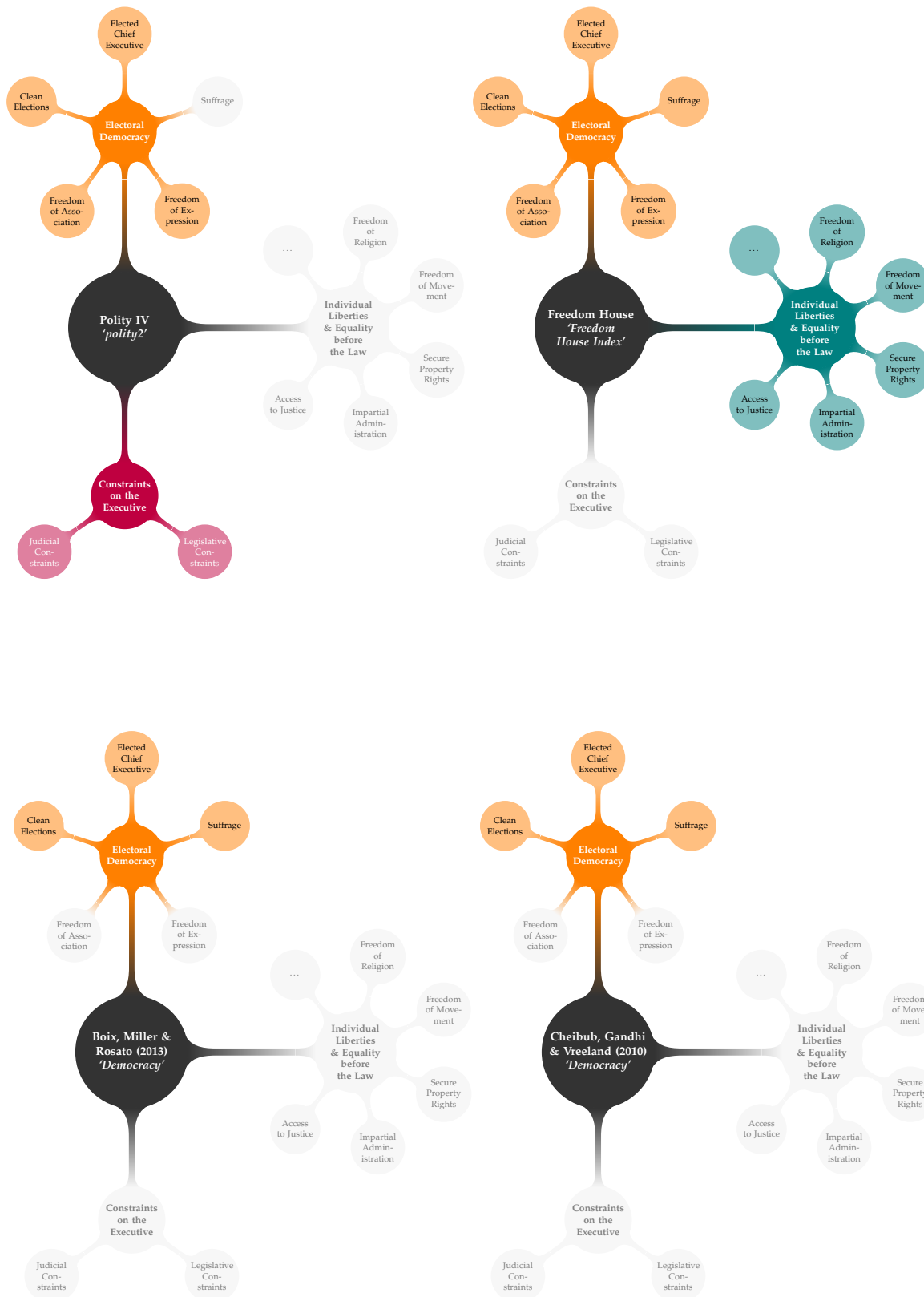
(a) Mid-Level Democracy Indicators (Polyarchy, left; Liberal Component, right)



(b) Low-Level Democracy Indicators (Polyarchy, left; Liberal Component, right)

**Notes:** We illustrate the ‘single difference’ (within-country) effect of regime change cumulated over the entire time spent ‘in regime’: in each plot we first compute the average annual per capita GDP growth for a country ‘in regime’ and ‘out of regime’ (regimes are defined here as having a V-Dem indicator index value above the full sample mean), subtract the latter from the former, and then multiply this relative annual growth dividend by the years spent ‘in regime’. This cumulative growth dividend is plotted against the years in regime (a small number of outliers are omitted in each plot for ease of illustration). For instance, a value of 96% for Uruguay in the Polyarchy plot suggests that over the 58 years ‘in regime’ the annual growth rate was on average 1.66% (96/58) higher than that in the 12 years ‘out of regime’ (note that Uruguay’s time ‘in regime’ is virtually identical for all other indicators). In each plot we add a fractional polynomial regression line (which is computed from all observations, including the outliers omitted from the scatter plot). The markers in each plot are coded to indicate the sum of regime changes experienced by the country: hollow (1), thick marker lines (2), filled marker (3-4 or 3-6 regime changes).

**Figure A-3: Alternative Empirical Measures of Democracy**



**Notes:** We compare four popular measures for democracy with the V-Dem conceptual framework for liberal democracy (to aid presentation we ignore here that Executive Constraints and Civil Rights are combined under the V-Dem 'liberal component'). Faint grey aspects/strands are not covered by the democracy measure in question. Note that the Freedom House FHI *does* include aspects of executive constraints but since these are given much less significance than in the Polity IV or V-Dem we decided to shade them in grey. Our visualisations merely illustrate the elements covered by each measure for democracy, not the substantial variation in the aggregation procedure (see Boese 2019, for detailed discussion).

## B A Brief Review of Two Empirical Literatures: ‘Institutions Rule’ and ‘Democracy and Growth’

### B.1 ‘Institutions’

In Table B-1 we provide a schematic review of the empirical literature on ‘institutions’ and growth — our focus is very narrowly on the papers immediately leading up to [Acemoglu et al. \(2001\)](#) and speaking to the ‘institutions rule’ debate their paper initiated; a much broader set of studies, including individual country studies, is reviewed in [Durlauf \(2020\)](#).

Our overview here is narrowly focused on the literature from the late 1990s to the mid-2000s, taking the ‘institutions rule’ paper ([Rodrik et al. 2004](#)) as the ‘final say’ on the matter. Naturally there were many more papers thereafter ([Glaeser et al. 2004](#), which we cover, certainly appears to be a direct response), though many later papers moved away from the issue of supremacy of institutions over geography and/or trade and towards explaining the role of institutions in other contexts ([Mehlum et al. 2006](#)) or as a robustness check to alternative deep determinants of growth ([Gorodnichenko & Roland 2017](#)).

### B.2 ‘Democracy’

In Table B-2 we provide a schematic review of the empirical literature on democracy and growth.<sup>43</sup> We can divide this body of work using two criteria: first, by the nature of the democracy proxy adopted, either in form of a continuous variable, or in form of a dichotomous variable; second, by the identification strategy. Both of these criteria seem to follow a certain chronology, so this will be the main structural feature of this brief review.

Work published in the 1990s always adopts continuous variables for democracy (Bollen Index, Freedom House, early Polity data), in combination with either simple IV strategies arising from the panel structure (lagged variables as instruments) or even plain least squares. These studies show a wide range of results, typically pointing to a non-linear (concave) relationship between democracy and growth or no relationship at all. Papers published in the early 2000s adopt more refined democracy indicators or experiment with democracy stock variables, at times concluding a positive democratic dividend ([Baum & Lake 2003](#), [Gerring et al. 2005](#)); however, when implementation was more plausibly able to identify a *causal* relationship, such as in the work by [Giavazzi & Tabellini \(2005\)](#), the results become very fragile or disappear.<sup>44</sup> The latter authors were also among the first to adopt a dummy variable for democratisation, which became the standard in the economics literature thereafter (e.g. [Rodrik & Wacziarg 2005](#), [Persson & Tabellini 2006](#)).<sup>45</sup> The first paper to make the dummy variable approach ‘work’ was the study by [Papaioannou & Siourounis \(2008\)](#), who found strongly positive growth effects for democratisation — since many sample characteristics are not dissimilar to those in the [Giavazzi](#)

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<sup>43</sup>Many of these studies, in particular the early work, carried out analysis of the growth-democracy as well as the democracy-growth relationship. More generally, while we do not present all results from all papers we believe the selection below is representative of the respective study.

<sup>44</sup>In terms of implementation the study by [Tavares & Wacziarg \(2001\)](#) is distinct from all others we discuss, and while this does not diminish their contribution, it makes it difficult to compare with the other papers reviewed.

<sup>45</sup>The exception are [Gerring et al. \(2005\)](#) and [Persson & Tabellini \(2009\)](#) who construct ‘democratic capital’ stocks.

& Tabellini (2005) paper, who had failed to find robust positive effects, this seemed to highlight the importance of careful construction of democracy dummies, comparing indices across a number of data sources. The same is still true for the most recent democracy-dummy paper by Acemoglu et al. (2019) — their paper furthermore adopts a number of empirical strategies which in their sum total are argued to address the problems inherent in cross-country analysis (endogeneity, dynamics, linearity assumptions).

The recent contributions adopting continuous democracy indicators tended to adopt the Arellano and Bond (1991, AB) or Blundell and Bond (1998, BB) estimators to argue for causal identification: the positive result of Knutsen (2013) in a small post-WWII sample of 44 countries using AB were undermined by the results for 69 countries in Murtin & Wacziarg (2014) adopting BB. The latest contribution to this strand of the literature by Madsen et al. (2015) adopts IV estimation (linguistic distance-weighted foreign democracy) to yield robustly positive and large effects for democratic change in historical and post-WWII samples.

Both strands adopting dichotomous and continuous measures for democratic change in the most recent iterations have yielded positive, large, and statistically significant causal effects. No study, however, rigorously compares models using dichotomous and continuous measures for democratic change, which is one contribution of our study.

Table B-1: Selected Literature on Institutions and Growth

Reference	Method	Institutions	Dep. variable	Specification/Controls	Sample	Results (Instit.)	Details
Dawson (1998)	OLS	Polit. Freedom, initial and change (Gastil/Freedom Hs)	$\Delta$ GDPpw over 1975–1990	Initial log GDPpw, inv/GDP, human capital, lab force growth	N=n=85	+ ( <i>insign.</i> )	Table I
	Panel 3SLS 1975-90	Polit. Freedom, initial level (Gastil/Freedom Hs)	$\Delta$ log GDPpw over 5-yr period	Initial log GDPpw, inv/GDP, human capital, lab force growth	N=79	+ ( <i>insign.</i> )	Table IV
Hall & Jones (1999)	2SLS (IV from predicted trade, languages, geography)	SocInf (combines ICRG indicators for rule of law/civil rights; Warner Sachs-openness index)	log GDPpw in 1995	many robustness checks	N=n=127	+ ( <b>1% level</b> )	Table II
Acemoglu et al (2001)	OLS	Average expropriation risk (PRS)	log GDPpc in 1995	geography	N=n=64	+ ( <b>1% level</b> )	Table 2[6]
	2SLS (IV settler mortality)	dto.	dto.	dto.	dto.	+ ( <b>1% level</b> )	Table 4[8]
	dto.	dto.	dto.	geography, legal origins	dto.	+ ( <b>1% level</b> )	Table 5[9]
Acemoglu et al (2002)	2SLS (IV from settler mortality, urbanization 1500, pop density 1500)	Average expropriation risk (PRS)	log GDPpc in 1995		N=n=64 or fewer	+ ( <b>1% level</b> )	Table VIII [1-2]
	dto.	Constraint on Executive in 1990 (Pol'yIII)	dto.		N=n=67 or fewer	+ ( <b>1/10% level</b> )	Table VIII [3-4]
	dto.	Constraint on Executive at indep. (Pol'yIII)	dto.		dto.	+ ( <b>1% level</b> )	Table VIII [5-6]

Table continued overleaf

Table B-1: Selected Literature on Institutions and Growth (continued)

Reference	Method	Institutions	Dep. variable	Specification/Controls	Sample	Results (Instit.)	Details
Dollar & Kraay (2003)	OLS/2SLS (IV from predicted trade, settler mortality), and language)	Kaufmann Rule of Law Index	log GDPpc 1995	log trade/GDP, log pop, geography	N=n=154 or many fewer	+ (1% level) LS, + (insign.) IV	Table 1
	dto.	ICRG expropriation risk	dto.	dto.	N=n=103	+ (10% level)	Table 3[3]
	dto.	Freedom House	dto.	dto.	N=n=139	+ (5% level)	Table 3[4]
	Panel 2SLS (base-yr level is IV for decadal growth)	Freedom House	$\Delta$ log GDPpc over decade	lagged $\Delta$ log GDPpc, lagged trade/GDP (over previous decade)	n=189 (1980s, 90s)	+ (insign.)	Table 4[8]
	dto.	ICRG expropriation risk	dto.	dto.	n=79 (1990s)	+ (insign.)	Table 4[10]
Easterly & Levine (2003)	2SLS from settler mortality, geography)	Kaufmann KII (elements of polyarchy, rule of law, among others)	log GDPpc 1995	Legal origin, religion, ethno-linguistic diversity, oil	N=n=72 former colonies	+ (1% level)	Table 4
	dto.	Kaufmann KII	log GDPpc 1995	dto., macro-policy incl. openness	N=n=72 or fewer former colonies	+ (1% level)	Table 5&6
Glaser et al (2004)	OLS	Averages: Executive constraints (Pol'yIV), ICRG expropriation risk, Autocracy, ...	$\Delta$ GDPpc over 1960-2000	Initial log GDPpc, initial log years of schooling, geography	N=n=71 or fewer	+ (5% level)	Table 4
	OLS	Initial executive constraints	$\Delta$ GDPpc over entire time period	(Initial primary school enrolment)	N=n=29 or fewer, 1870-1950, 1890-1950, or 1900-1950	$\pm$ (insign.)	Table 6
	2SLS from log pop 1500, legal origin, settler mortality)	Average executive constraints	log GDPpc 2000	initial years of schooling, geography	N=n=55 or fewer 1960-2000	- (insign.)	Table 11



**Table B-1:** Selected Literature on Institutions and Growth (continued)

Reference	Method	Institutions	Dep. variable	Specification/Controls	Sample	Results (Instit.)	Details
Rodrik et al (2004)	OLS	Kaufmann Rule of Law Index	log GDPpc 1995	log trade/GDP, geography	N=n=137	+ (1% level)	Table 2[9]
	2SLS (IVs are predicted openness, languages)	dto.	dto.	geography	dto.	+ (1% level)	Table 3[8]

*Notes:* The table presents a subset of empirical results from the literature on institutions and growth from the late 1990s to the mid-2000s. It is important to emphasise that we do not report all relevant results from each paper, but selectively picked the most general and most representative ones in each case. Regarding empirical results in the final column of the table, insignificant estimates are in italics, statistically significant estimates in bold. *N* refers to the number of countries, *n* the number of observations, the time period of the sample is also indicated. Some of the measures for institutions have reverse scale (e.g. for the FHI a higher number implies worse institutions), but here we adjust the ‘institutions effect’ (result) to be in line with the logic of the other indicators (higher value = better institutions). The final columns reports the Table and column for the result in the respective paper.

Table B-2: Selected Literature on Democracy and Growth

Reference	Method	Democracy	Dep. variable	Specification	Sample	Results	Details
Helliwell (1994)	2SLS (lagged levels)	<b>Continuous</b> , Bollen index	$\Delta$ GDPpc 1960-85	GDP pc (log), investment, schooling (all in 1960, restrictions imposed following MIRW values)	N=n=90, 1960-85 (time-averaged or base year values)	– (insign.)	Table 3[2]
Barro (1996)	2SLS (lagged levels)	<b>Continuous</b> , Bollen and Gastil (Freedom House) indices	$\Delta$ GDPpc in non-overlapping 5-year periods	Elaborate controls, lagged levels as instruments	N=89, 1960-90	– (insign.)	Table 1[2]
	2SLS (lagged levels)	<b>Continuous</b> , Bollen and Gastil (Freedom House) indices, level and squared terms	dto.	dto.	N=89, 1960-90	<b>concave (5% level)</b>	Table 1[4]
Leblang (1997)	OLS w/ period FE	<b>Continuous</b> , institutionalised democracy from Polity II, lagged	Decadal average $\Delta$ GDPpc	GDP pc (log), primary and secondary school attainment (all in decade start year)	n=232, 1960-89	<b>+ (5% level)</b>	Table 2[2]
Minier (1998)	2SLS (lagged levels)	<b>Continuous</b> , Gastil (Freedom House) index, level and squared terms; dummies for positive and negative changes in democracy	$\Delta$ GDPpc in non-overlapping 5-year periods	GDP pc (log), schooling attainment, (all lagged by 5 years)	n=485, 1960-89	<b>concave (5% level);</b> <i>insig. +ve changes,</i> <b>sig. –ve changes</b>	Table 2[1]
Tavares & Wacziarg (2001)	3SLS	<b>Continuous</b> , Bollen and Freedom House indices	Annual $\Delta$ GDPpc	HC, inequality, instability, distortions,...	N=n=65, 1970-89	<b>– (1% level)</b>	Table 3[4]

Table continued overleaf

Table B-2: Selected Literature on Democracy and Growth (continued)

Reference	Method	Democracy	Dep. variable	Specification	Sample	Results	Details
Baum & Lake (2003)	OLS w/ country FE	<b>Continuous</b> , Polity 98 index	Annual $\Delta$ GDPpc	GDP pc (log), life expectancy, investment, labour force, HC (all lagged), various lags of $\Delta$ GDPpc	N=128, n=548, 1967-97	+ ( <i>insign.</i> )	Table 1[2]
Gerring et al. (2005)	OLS w/ country FE	<b>Continuous</b> , Democracy stock (1900-2000) based on continuous polity2 (-10, +10)	Annual $\Delta$ GDPpc	Lagged GDP pc (log)	N=180, n=6,264, 1950-2000	+ ( <b>1% level</b> )	Table 2[1]
	dto.	<b>Continuous</b> , Democracy stock (1900-2000) based on dummy (= 1 if polity2 > 4)	Annual $\Delta$ GDPpc	Lagged GDP pc (log)	N=180, n=6,264, 1950-2000	+ ( <b>1% level</b> )	Table 2[6]
Giavazzi & Tabellini (2005)	Diff-in-Diff (OLS w/ year FE)	<b>Dummy</b> for polity2 > 0, all democratisation	Annual $\Delta$ GDPpc	Dummy for socialist regimes (interacted with democratisation), continent dummies	N=138, n=4,388, 1960-2000	+ ( <b>10% level</b> )	Table 1[7]
	Diff-in-Diff (OLS w/ year FE)	<b>Dummy</b> for polity2 > 0, permanent democratisation	Annual $\Delta$ GDPpc	Dummy for socialist regimes (interacted with democratisation), continent dummies	N=138, n=4,387, 1960-2000	+ ( <i>insign.</i> )	Table 1[8]
Rodrik & Wacziarg (2005)	OLS w/ country FE	<b>Dummy</b> : New Democracy, Established Democracy, etc (Polity IV-based)	Annual $\Delta$ GDPpc	Dummies for different regimes (new, established)	N=154, n=5,649, 1950-2000	+ ( <b>5% level</b> ) SR effect for democratisation in the past 5 yrs	Table 1[3]

Table continued overleaf

Table B-2: Selected Literature on Democracy and Growth (continued)

Reference	Method	Democracy	Dep. variable	Specification	Sample	Results	Details
Person & Tabellini (2006)	OLS w/ period FE	Dummy for polity2 > 0	Annual $\Delta$ GDPpc	Continent dummies, legal origin, lagged GDP pc (log)	N=138, n=4,338, 1960-2000	+ (5% level)	Table 1[1]
	dto.	dto.	Annual $\Delta$ GDPpc	Continent dummies, legal origin, lagged GDP pc (log)	N=148, n=8,135, 1850-2000	+ (10% level)	Table 3[3]
Person & Tabellini (2009)	2FE	Continuous, domestic and foreign democratic stock (PIM, 1800-2000) based on dummy (= 1 if polity2 > 0)	Annual $\Delta$ GDPpc	lagged GDP pc (log)	n=8,379, 1820-2000	+ (1% level) domestic; <i>in-sign. foreign</i>	Table 5[1]
Papaioannou & Siourounis (2008)	Diff-in-Diff	Dummy building on FHI and polity2	Annual $\Delta$ GDPpc	none	N=166, n=5,410, 1960-2005	+ (1% level)	Table 2[4]
	Diff-in-Diff	dto.	Annual $\Delta$ GDPpc	lagged GDP pc (log) and lagged growth rate, investment	N=166, n=5,410, 1960-2005	+ (1% level)	Table 3[1]
Knutsen (2013)	OLS w/ period FE	Continuous, Freedom House Index*	Annual $\Delta$ GDPpc	lagged GDP pc, population, regime duration (all in log)	N=44, n=1,289, 1972-2004 (SSA)	+ (1% level)*	Table 2[2]
	GMM AB	dto.	Annual $\Delta$ GDPpc	lagged GDP pc, population, regime duration (all in log)	N=44, n=1,234, 1972-2004 (SSA)	+ (1% level)*	Table 2[2]
Murtin & Wacziarg (2014)	2FE	Continuous, re-scaled lagged polity2	Decadal GDPpc (log)	GDP pc (log), lagged by a decade	N=69, n=567, 1870-2000	+ ( <i>insign.</i> )	Table 11[1]
	2FE	dto.	dto.	dto.	N=69, n=308, 1960-2000	- ( <i>insign.</i> )	Table 11[10]

Table continued overleaf

Table B-2: Selected Literature on Democracy and Growth (continued)

Reference	Method	Democracy	Dep. variable	Specification	Sample	Results	Details
Murtin & Wacziarg (2014) cont'd	GMM BB	dto.	dto.	dto.	N=69, n=489, 1870-2000	+ ( <i>insign.</i> )	Table 11[3]
	GMM BB	dto.	dto.	dto.	N=68, n=275, 1960-2000	+ ( <i>insign.</i> )	Table 11[12]
Madsen et al. (2015)	2SLS-2FE	<b>Continuous</b> , re-scaled polity2	Decadal average GDPpc (log)	lagged GDP pc (log); IV linguistic-distance weighted democracy	N=141, n=1,143, 1820-2000	+ ( <b>5% level</b> ); <b>1sd</b> → <b>+96%</b>	Table 4[1]
	2SLS-2FE	<b>Dummy</b> for polity2 > 0 or > 5	dto.	dto.	dto.	+ ( <b>5% level</b> )	Table 7[6] and [7]
	2SLS-2FE	<b>Continuous</b> , re-scaled polity2	Decadal average GDPpc (log)	dto.	N=141, n=595, 1950-2000	+ ( <b>5% level</b> )	Table 4[3]
Acemoglu et al (2019)	2FE	<b>Dummy</b> for polity2 > 0 plus other conditions	Annual GDPpc (log)	4 lags of GDP pc (log)	N=175, n=6,790, 1960-2010	+ ( <b>1% level</b> ); <b>21% LR effect</b>	Table 2[3]
	GMM AB	dto.	dto.	dto.	N=175, n=6,161, 1960-2010	+ ( <b>5% level</b> ); <b>17% LR effect</b>	Table 2[7]
	2SLS	dto.	dto.	dto., IV regional waves of democratisation	N=174, n=6,309, 1960-2010	+ ( <b>10% level</b> ); <b>32% LR effect</b>	Table 6[2], Panel A
	Non-para	dto.	dto.	4 lags of GDP pc (log)	1960-2010	+ ( <b>1% level</b> ); <b>24% (20-24 yrs)</b>	Table 5 [6], Panel C

Notes: The table presents a subset of empirical results from the literature on democracy and growth. It is important to emphasise that we do not report all relevant results from each paper, but selectively picked the most general and most representative ones in each case. We highlight the distinction between a continuous and dichotomous proxy for democracy in bold. Regarding empirical results in the final column of the table, insignificant estimates are in italics, statistically significant estimates in bold. *N* refers to the number of countries, *n* the number of observations (if either or both are missing then it was not clearly reported in the study with reference to the specific result we present here), the time period of the sample is also indicated. \* The FHI has a reversed scale compared with polity2, but here we adjust the 'democracy effect' (result) to be in line with the logic of other indicators (higher value = more democracy). SSA — sub-Saharan African sample. The final columns reports the Table and column for the result in the respective paper.

## C PCDID Main Results — ATET Estimates

**Table C-1:** Regime Threshold Models of Democracy and Economic Development

	High-level indicators					Mid-level indicators	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Polity IV Cutoff >=1	4.107* [2.488]						
Polity IV Cutoff >=6		4.576* [2.408]					
V-Dem ROW Cutoff >=2			9.685*** [2.435]				
V-Dem Liberal Democracy Cutoff > mean				9.656*** [2.519]			
Boix et al. Dummy					3.959 [2.757]		
V-Dem Polyarchy Cutoff > mean						6.550*** [1.892]	
V-Dem Liberal Component Cutoff > mean							5.007* [2.614]
<i>Additional Covariates:</i>							
Population growth	×	×	×	×	×	×	×
Exports/Total Trade	×	×	×	×	×	×	×
<i>Treatment Sample:</i>							
Countries	89	78	76	66	69	81	76
Observations	5,096	4,570	4,281	3,782	3,641	4,572	4,316
Median Sample size (years)	62	65	62	63	62	62	60
Median Time in Regime (years)	27	23	24	28	23	26	26
<i>Control Sample:</i>							
Countries	33	49	52	59	48	45	40
Observations	1,498	2,313	2,522	2,869	1,968	2,149	1,859
<i>Alternative Specifications:</i>							
1 factor	2.527	9.121***	8.353***	7.395***	3.384	7.186***	6.977**
2 factors	0.847	5.562**	8.298***	9.600***	3.497	10.677***	5.277**
3 factors	3.812*	6.201**	9.342***	9.684***	2.713	7.392***	6.631**
4 factors	4.107*	4.576*	9.685***	9.656***	3.959	6.550***	5.007*
5 factors	4.956**	6.398***	8.912***	9.417***	3.010	8.176***	6.317**
6 factors	5.469**	5.141**	7.937***	10.399***	4.296	8.018***	8.871***

*Notes:* The table reports outlier-robust mean estimates for the [Chan & Kwok \(2021\)](#) Principal Component Difference-in-Difference (PCDID) estimator for empirical models of per capita GDP (dependent variable), see Equation (4). The respective democracy indicator is defined on the basis of: the two alternative Polity IV polity2 cutoffs in [1] and [2], the V-Dem Regimes of the World (ROW) cut-off in [3], the mean cutoff for the V-Dem liberal democracy index in [4], the indicator variable by [Boix et al. \(2013\)](#) in [5], as well as the respective means as cutoffs for the V-Dem Polyarchy and Liberal Component indices in [6] and [7]. The estimates represent ATET and can be interpreted as the percentage increase in per capita GDP over the control group of countries which did not democratise. The lower panels of the table report the number of countries and observations which make up treatment and control samples. All results are for the PCDID specification with population growth and exports/trade covariates as well as *four* estimated factors. In the final rows of the table we present the ATET estimates if we include between 1 to 6 factors. Statistical significance at the 10%, 5% and 1% level is indicated as \*, \*\*, and \*\*\*, respectively.



**Table C-2: Regime Threshold Models of Lower-level Political Institutions and Economic Development**

	Polyarchy			Liberal Component		
	[1]	[2]	[3]	[4]	[5]	[6]
Freedom of Expression > mean	5.568*					
	[3.062]					
Freedom of Association > mean		5.892*				
		[3.221]				
Free and Fair Elections > mean			6.791***			
			[2.199]			
Rule of Law > mean				4.934***		
				[1.747]		
Judicial Constraints > mean					8.978***	
					[2.790]	
Legislative Constraints > mean						5.671*
						[3.287]
<i>Additional Covariates:</i>						
Population growth	×	×	×	×	×	×
Exports/Total Trade	×	×	×	×	×	×
<i>Treatment Sample:</i>						
Countries	92	85	82	81	66	83
Observations	5,195	4,826	4,633	4,526	3,816	4,736
Median Sample size (years)	58	58	58	58	58	63
Median Time in Regime (years)	29	29	24	29	27	29
<i>Control Sample:</i>						
Countries	23	24	39	34	41	39
Observations	901	1,030	1,764	1,585	1,806	1,761
<i>Alternative Specifications:</i>						
1 factor	2.160	0.563	5.740**	7.681***	9.064***	5.300
2 factors	5.460	5.560	5.912**	3.086	10.464***	4.516
3 factors	5.760*	5.510*	7.132***	5.210***	9.613***	6.610*
4 factors	5.568*	5.892*	6.791***	4.934***	8.978***	5.671*
5 factors	5.577*	5.602*	5.792***	4.913***	8.474***	7.258**
6 factors	6.170**	5.623*	6.379***	5.420***	8.700***	6.566**

*Notes:* The table reports outlier-robust mean estimates for the [Chan & Kwok \(2021\)](#) Principal Component Difference-in-Difference (PCDID) estimator for empirical models of per capita GDP (dependent variable), see Equation (4). The respective democracy indicator is defined on the basis of the components of polyarchy (electoral democracy) in [1] to [3], and components of the liberal component in [4] to [6]. The estimates represent ATET and can be interpreted as the percentage increase in per capita GDP over the control group of countries which did not experience regime change. The lower panels of the table report the number of countries and observations which make up treatment and control samples. All results are for the PCDID specification with population growth and exports/trade covariates as well as *four* estimated factors. In the final rows of the table we present the ATET estimates if we include between 1 to 6 factors. Statistical significance at the 10%, 5% and 1% level is indicated as \*, \*\*, and \*\*\*, respectively.

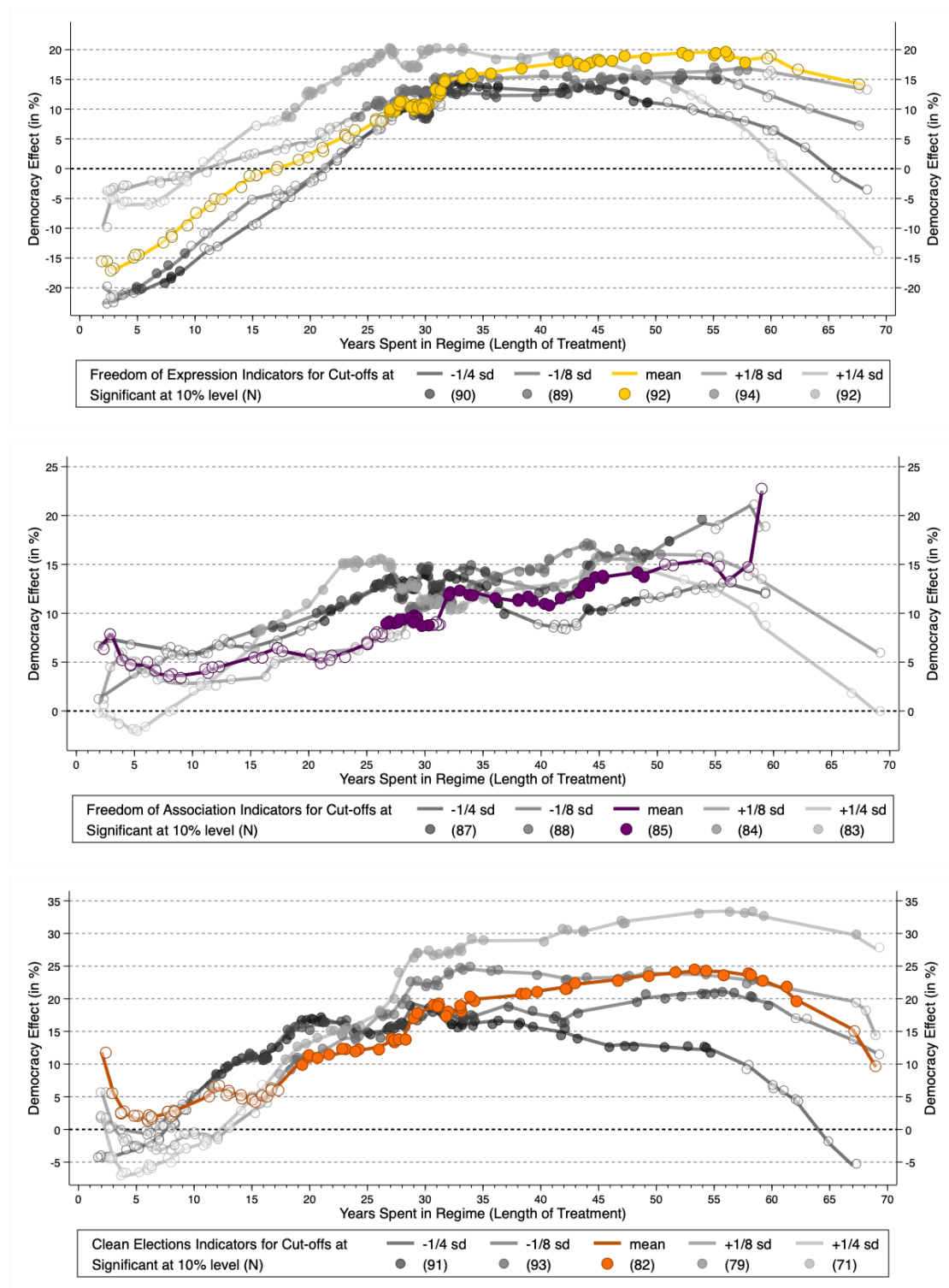
**Table C-3: Interaction Effect Models of Democracy and Economic Development**

	[1]	[2]	[3]	[4]	[5]
	-1/4 sd	-1/8 sd	mean	+1/8 sd	+1/4 sd
<b>Panel (A) Individual Treatment Models, Equation (4)</b>					
Polyarchy (separate model)	4.017 [2.087]*	5.980 [2.100]***	7.863 [2.336]***	10.753 [2.864]***	9.808 [2.762]***
Liberal Component (separate model)	3.773 [2.965]	3.886 [2.410]	5.643 [2.876]**	12.422 [3.163]***	7.916 [2.405]***
<i>Treatment Sample:</i>					
Countries	75	71	66	60	57
Observations	4,270	3,995	3,695	3,467	3,283
Median Regime in years: Poly	26	25	26	26	26
Median Regime in years: Liberal	28	26	28	29	28
Median Regime in years: Inter	24	22	23	23	21
<b>Panel (B) Simple Interaction Models, Equation (9)</b>					
Interaction Polyarchy × Liberal Component	8.617 [2.321]***	8.216 [2.357]***	6.230 [1.981]***	9.260 [2.607]***	5.346 [1.930]***
<i>Control Sample: Countries</i>	24	31	33	37	45
<i>Control Sample: Observations</i>	986	1,367	1,453	1,704	2,134
<i>Alternative Specifications:</i>					
1 factor	7.485**	8.009***	5.426**	8.665***	6.806***
2 factors	12.822***	12.663***	11.006***	10.181***	5.876***
3 factors	8.260***	7.618***	6.363***	8.979***	7.519***
4 factors	8.617***	8.216***	6.230***	9.260***	5.346***
5 factors	8.392***	7.599***	7.271***	8.464***	8.400***
6 factors	9.520***	8.115***	7.690***	10.509***	6.920***
<b>Panel (C) Alternative Interaction Models, Equation (10)</b>					
Interaction Polyarchy × Liberal Component	8.062 [1.898]***	5.156 [2.106]**	5.741 [2.063]***	7.648 [2.345]***	5.962 [1.606]***
<i>Control Sample 1: Countries</i>	30	37	40	47	52
<i>Control Sample 1: Observations</i>	1,270	1,667	1,859	2,231	2,528
<i>Control Sample 2: Countries</i>	31	39	45	49	57
<i>Control Sample 2: Observations</i>	1,396	1,840	2,149	2,368	2,765
<i>Alternative Specifications:</i>					
1 factor	7.268**	5.491**	5.335**	5.537**	7.827***
2 factors	9.423***	6.369***	7.528***	6.740***	7.602***
3 factors	7.812***	5.989**	7.087***	7.134***	9.195***
4 factors	8.062***	5.156**	5.741***	7.648***	5.962***
5 factors	7.759***	4.731**	5.055***	8.106***	5.081***
6 factors	8.373***	5.608***	4.767**	6.087***	6.719***

*Notes:* The table reports outlier-robust mean estimates for the [Chan & Kwok \(2021\)](#) Principal Component Difference-in-Difference (PCDID) estimator for empirical models of per capita GDP (dependent variable). The estimates represent ATET and can be interpreted as the percentage increase in per capita GDP over the control group of countries which did not experience regime change. The columns represent different definitions for the ‘regime change’ dummy, relative to the mean index in column [3]. Panel (A) reports ATET for models of Polyarchy and the Liberal Component from respective (separate!) PCDID regressions — the country treatment sample (but not the control sample) is held constant across Panels (A) to (C), i.e. the single regime ATETs for models in (A) are for the same set of countries as those for the interaction models in (B) and (C); Panels (B) and (C) the ATET from interaction models between Polyarchy and the Liberal Component for a simple and alternative counterfactual, respectively. The lower parts of each of panels B and C report the number of countries and observations which make up the control samples. All results are for the PCDID specification with population growth and exports/trade covariates as well as *four* estimated factors. In the final rows of panels B and C we present the ATET estimates if we include between 1 to 6 factors. Statistical significance at the 10%, 5% and 1% level is indicated as \*, \*\*, and \*\*\*, respectively.

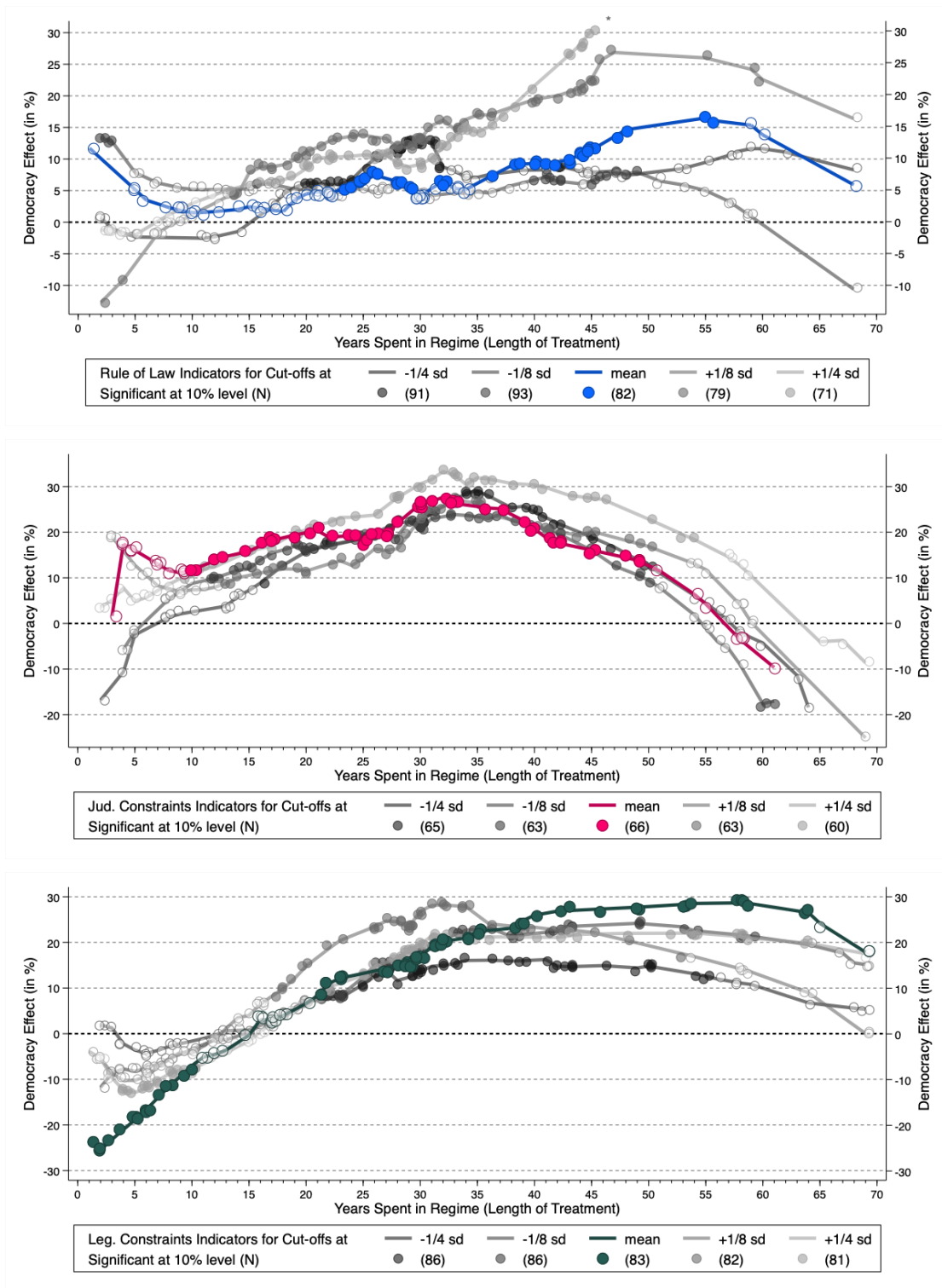
## **D PCDID Results for multiple cutoffs: low-level indicators**

**Figure D-1: Indicators from Low-Level Indices of (Electoral) Democracy: Multiple Cutoffs**



**Notes:** The plots in this figure present running line regressions for three sub-components of polyarchy (Freedom of Expression, Freedom of Association, and Free and Fair Elections) using different cutoffs for the indicator variable used, in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regressions). We do not include analysis of ‘suffrage’ or ‘elected chief executive’ here because these are near-universally achieved during our sample period. *N* indicates the number of ‘treated’ countries in each running line regression.

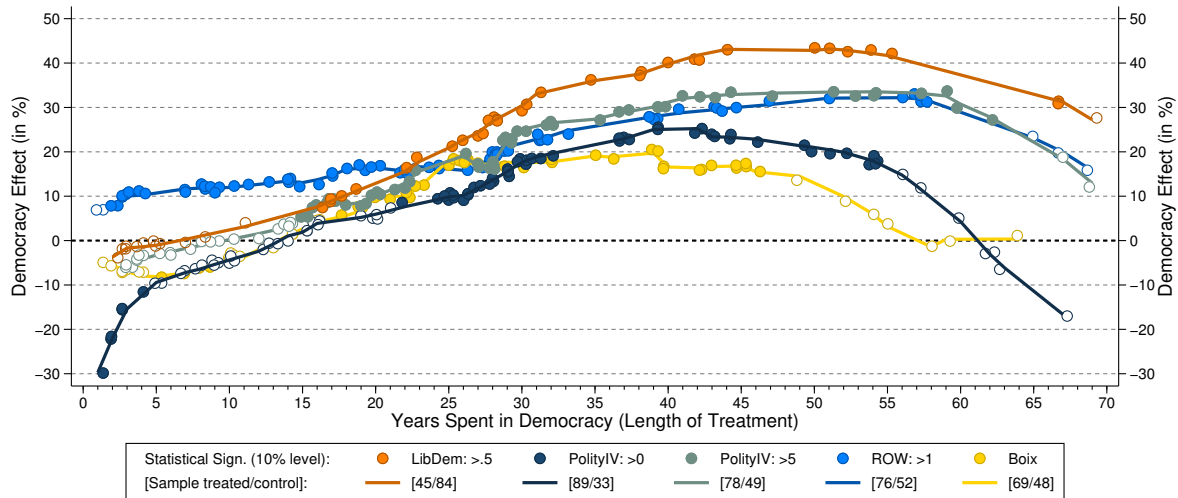
**Figure D-2: Indicators from Low-Level Indices of Democracy (liberal component): Multiple Cutoffs**



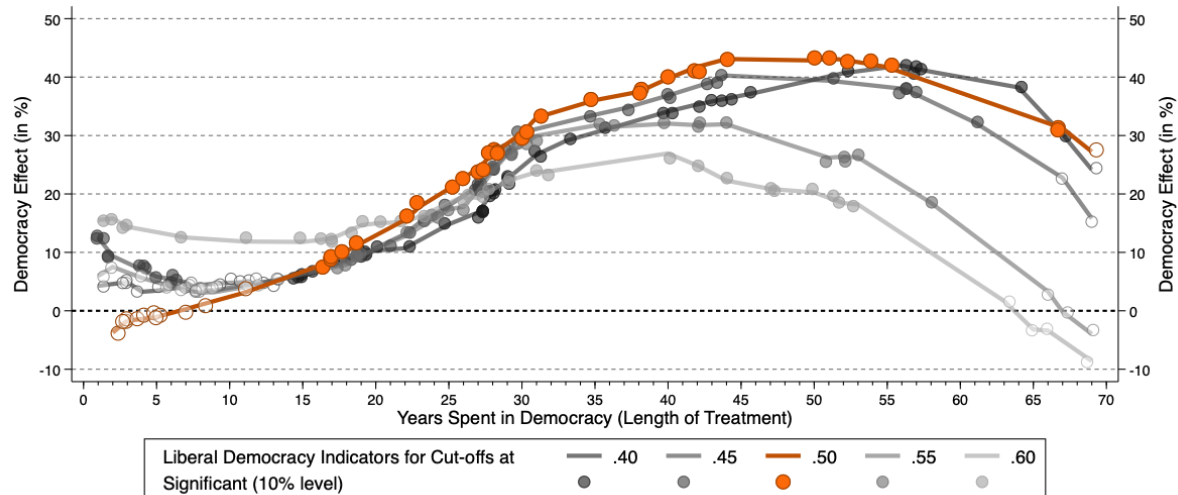
**Notes:** The plots in this figure present running line regressions for three sub-components of the liberal component (Rule of Law, Judicial Constraints on the Executive, and Legislative Constraints on the Executive) using different cutoffs for the indicator variable used, in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regression). \* indicates that we excluded a number of (statistically significant) estimates for this robustness check for ease of illustration.

## E PCDID Results – cut-offs around 0.5

Figure E-1: High-Level Indicators for Democracy and Economic Development



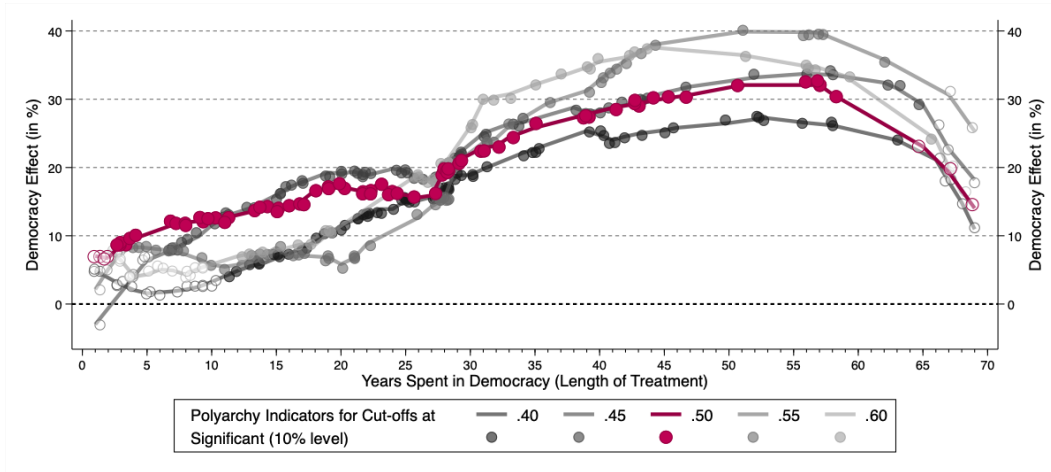
(a) Five High-Level Democracy Indicators



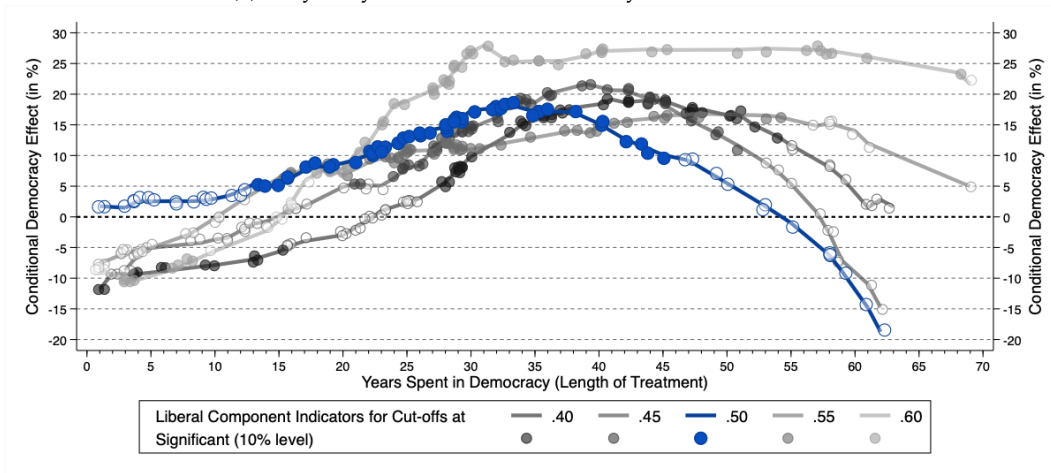
(b) Liberal Democracy (various cutoffs)

**Notes:** In the upper panel we present the country-specific PCDID running line estimates for five different high-level indicators for democracy: (i) a simple 0.5 cutoff for the V-Dem liberal democracy index, (ii) the polity2>0 cutoff from PolityIV, (iii) the polity2>5 cutoff, (iv) the V-Dem Regimes of the World (ROW) cut-off 2, and (v) the democracy indicator from Boix et al. (2013). The lower panel focuses on democracy indicators derived from the V-Dem liberal democracy index and we adopt alternative cutoffs from 0.4 to 0.6 to highlight the robustness of our findings. All estimates presented are from running line regressions (constructed adopting KNN local regressions), which further linearly condition on (i) the number of times a country experienced regime change as well as the start year of the country time series. The estimates can be interpreted as locally averaged ITET, with the scales indicating the percentage increase in per capita GDP associated with the number of years spent in democracy ( $x$ -axis). The filled (white) markers indicate statistical (in)significance at the 10% level. The markers are not a scatter of the individual estimates, they are included here to indicate statistical significance. They are minimally dispersed for illustrative purposes.

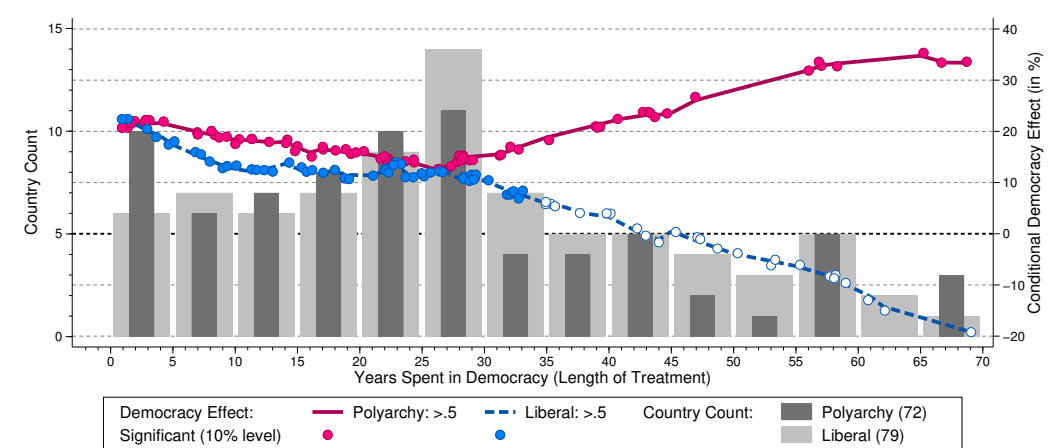
Figure E-2: Mid-level Democracy Indicators and Horseraces



(a) Polyarchy Indicator for Democracy: Different Cut-offs



(b) Liberal Component Indicator for Democracy: Different Cut-offs

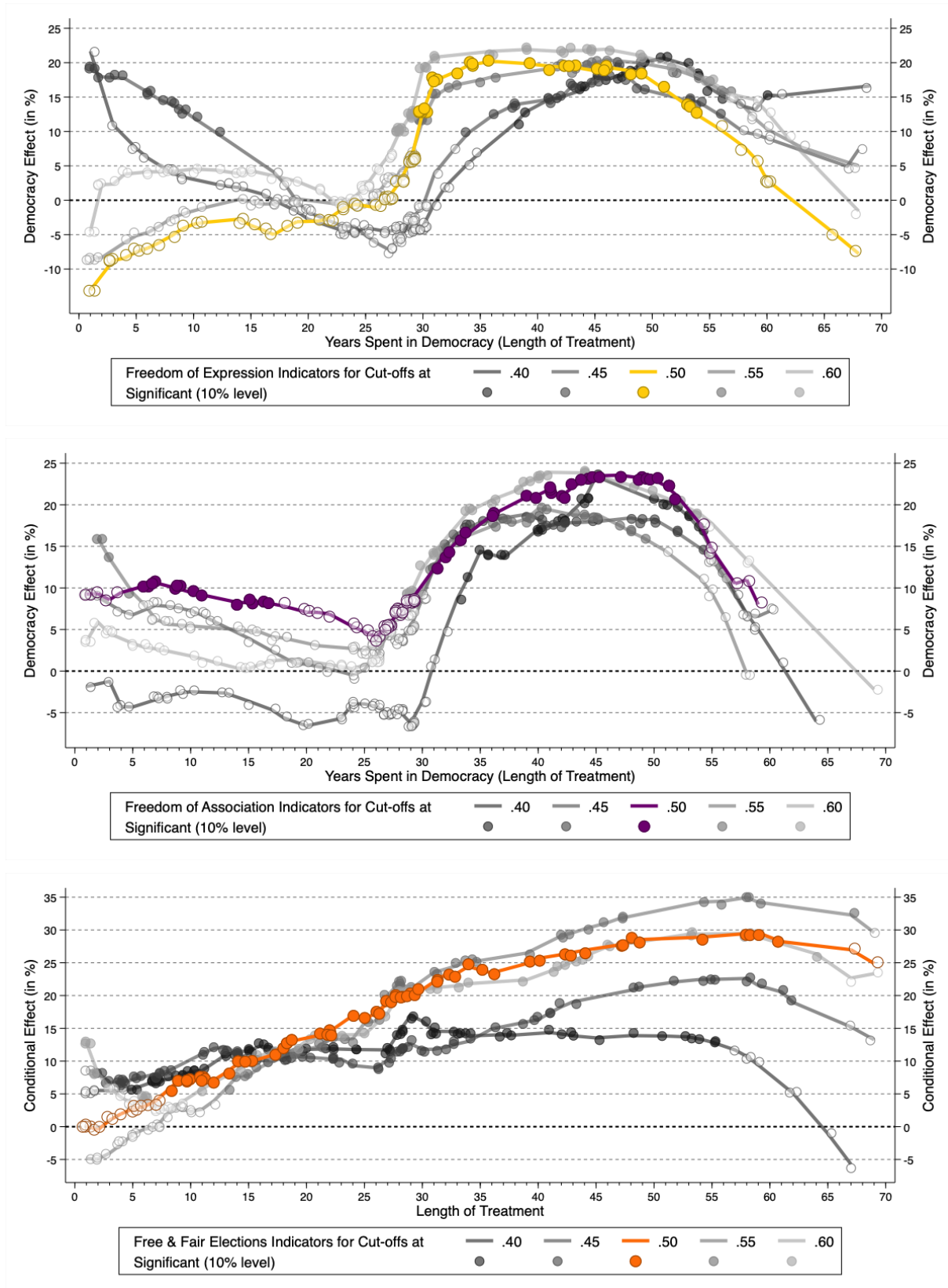


(c) Horserace: Conditional 'polyarchy' and 'liberal component' effects

**Notes:** The top and middle panel of the figure present running line plots for polyarchy and the liberal component using different cutoffs in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regression). In the bottom panel we run a horserace between the estimates of country results for the two mid-level democracy indicators: the polyarchy running line estimates linearly control for the country-specific estimates from the liberal component, as well as the number of regime switches and sample start year of each country; vice-versa for the liberal component running line estimates. The bars indicate the country count for each 5-year interval of experience of democracy. Note the difference in scale between all three plots.

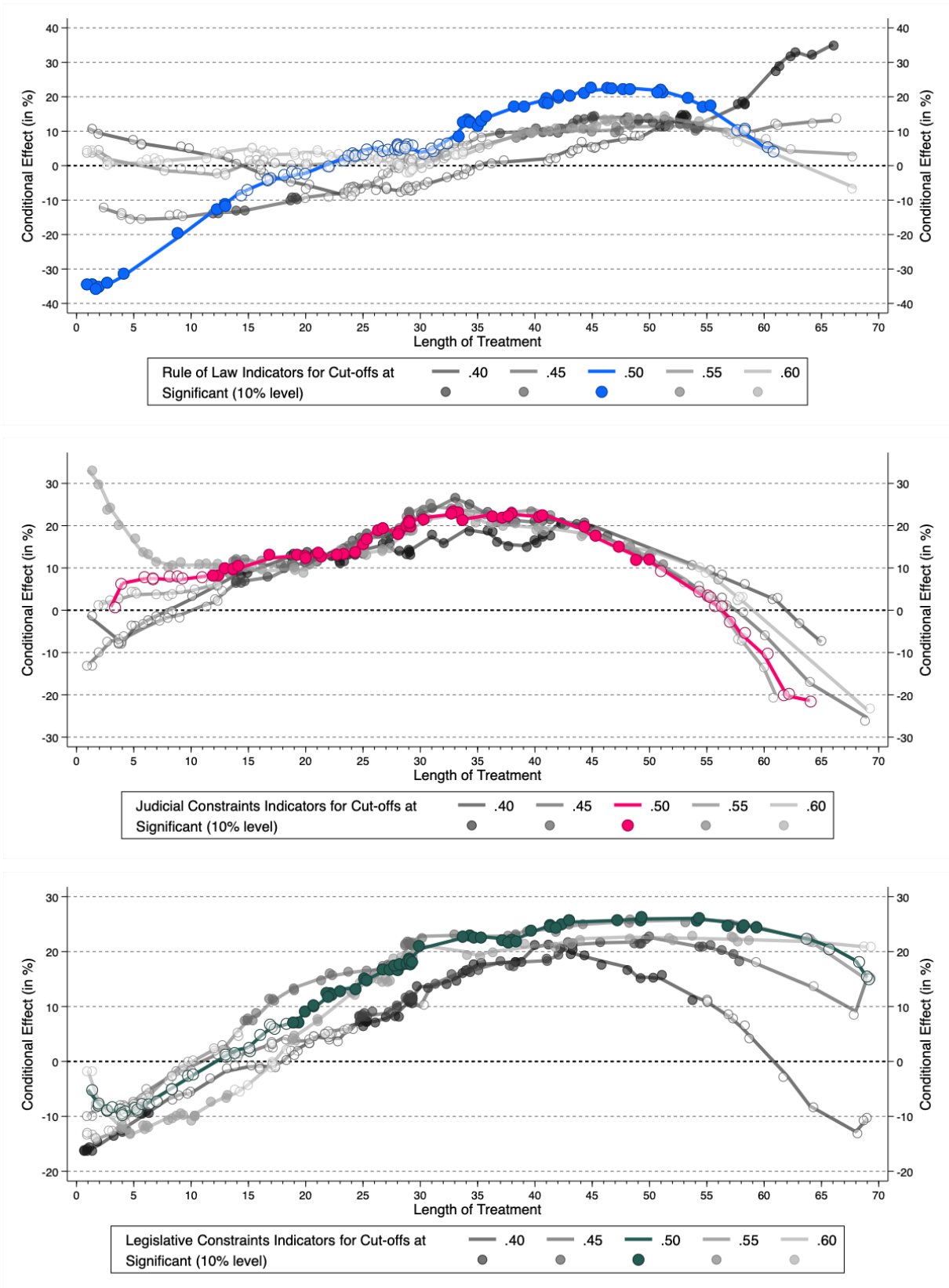


**Figure E-3: Indicators from Low-Level Indices of (Electoral) Democracy: Multiple Cutoffs**



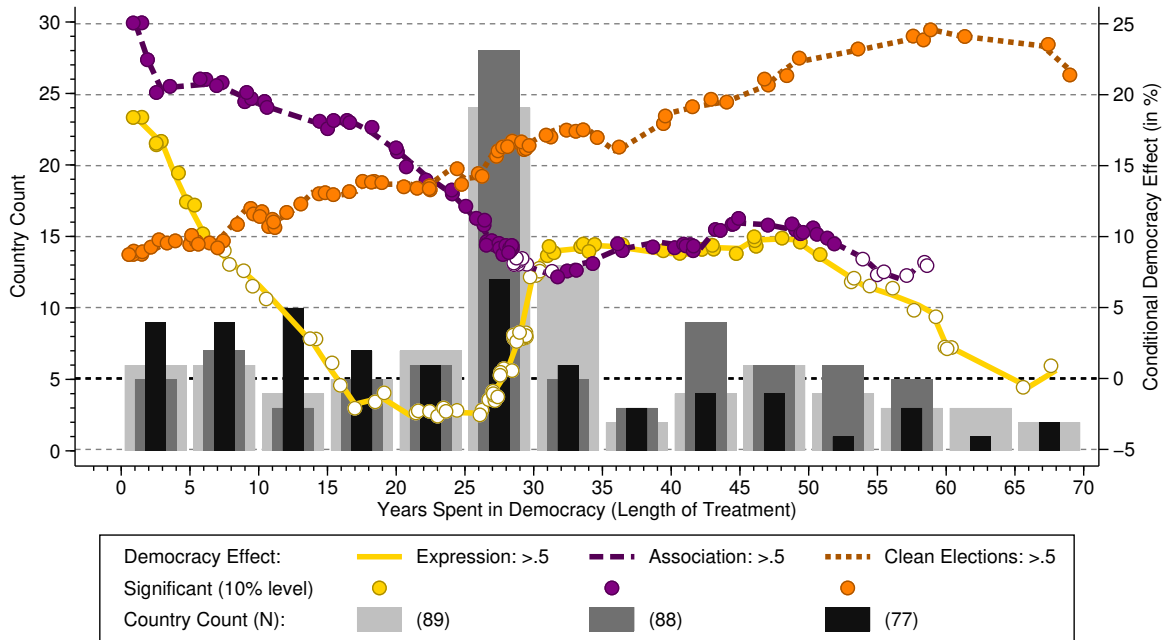
**Notes:** The plots in this figure present running line regressions for three sub-components of polyarchy (Freedom of Expression, Freedom of Association, and Free and Fair Elections) using different cutoffs for the indicator variable used, in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regression). We do not include analysis of 'suffrage' or 'elected chief executive' here because these are near-universally achieved during our sample period.

**Figure E-4:** Indicators from Low-Level Indices of Democracy (liberal component): Multiple Cutoffs

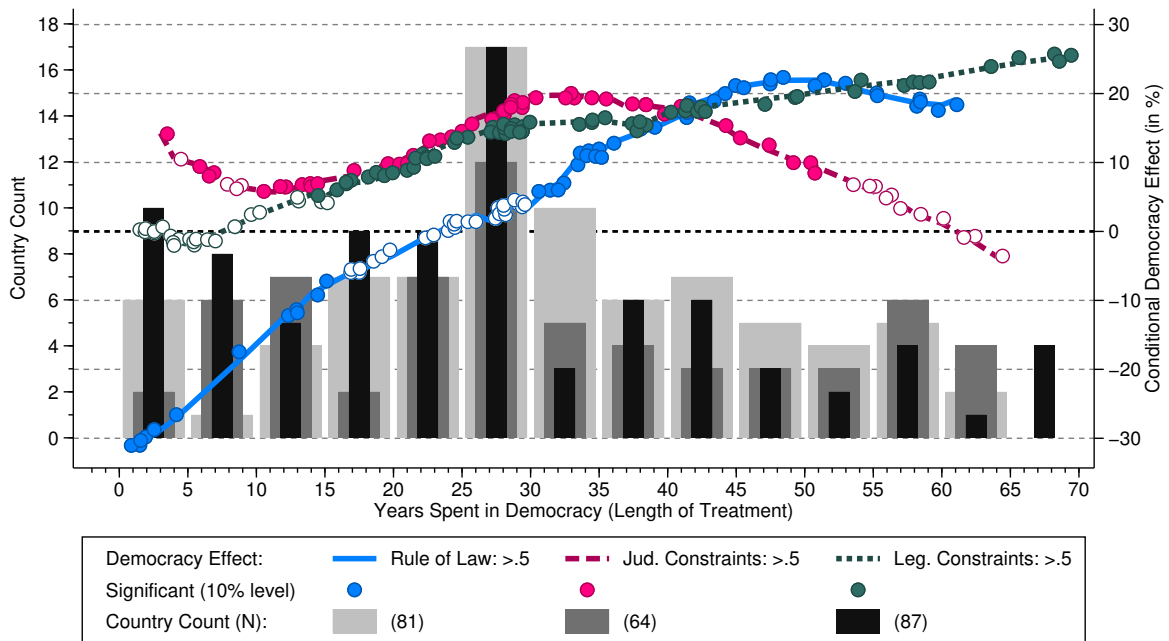


**Notes:** The plots in this figure present running line regressions for three sub-components of the liberal component (Rule of Law, Judicial Constraints on the Executive, and Legislative Constraints on the Executive) using different cutoffs for the indicator variable used, in analogy to the plot presented in the lower panel of Figure 3 (see that figure for further details on the running line regression).

Figure E-5: Horseraces between Low-level Indicators of Democracy



(a) Components of Electoral Democracy (Polyarchy)

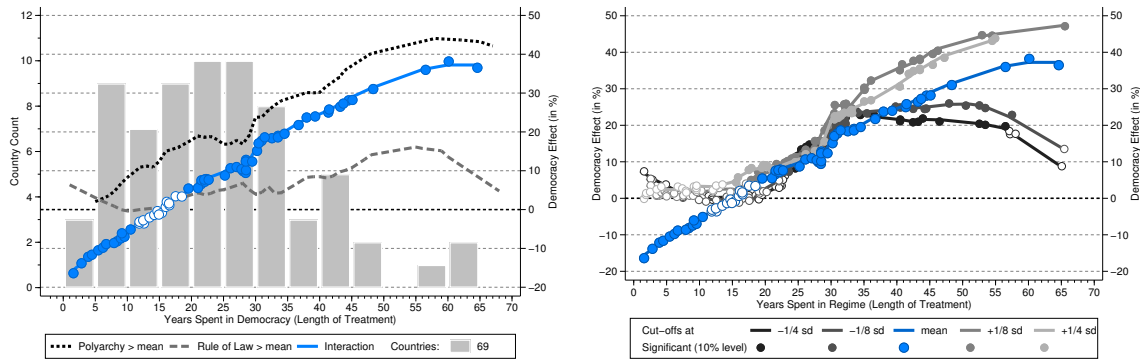


(b) Components of the Liberal Component

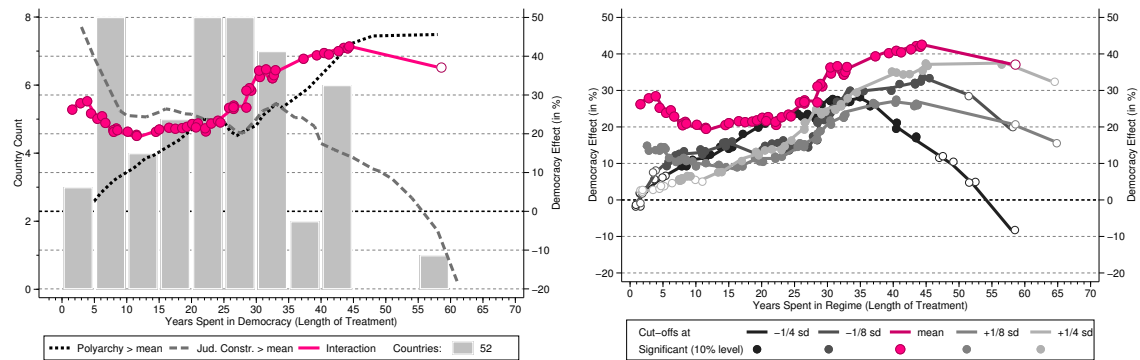
**Notes:** This analysis uses running line regressions which regress the estimate of the diff-in-diff model on the years of treatment, conditioning on the value and standard deviation of ‘other’ mid- and low-level democracy indices: for the ‘freedom of expression’ analysis (subcomponent of polyarchy) this is the liberal component, freedom of association, and clean elections. Additional controls are the number of threshold crossings (‘democratisations’ and ‘reversals’), and the start year of the country’s data series

## **F PCDID Results – multiple cutoffs in the interaction models**

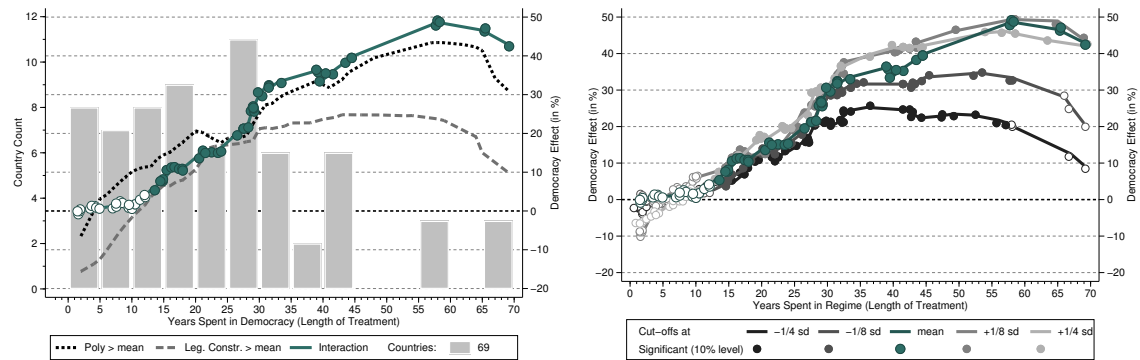
**Figure F-1:** Indicators from Low-Level Indices of Democracy (liberal component): Interaction with Polyarchy



(a) Rule of Law  $\times$  Polyarchy vs its components (left,  $N = 69$ ), alternative cutoffs (right)



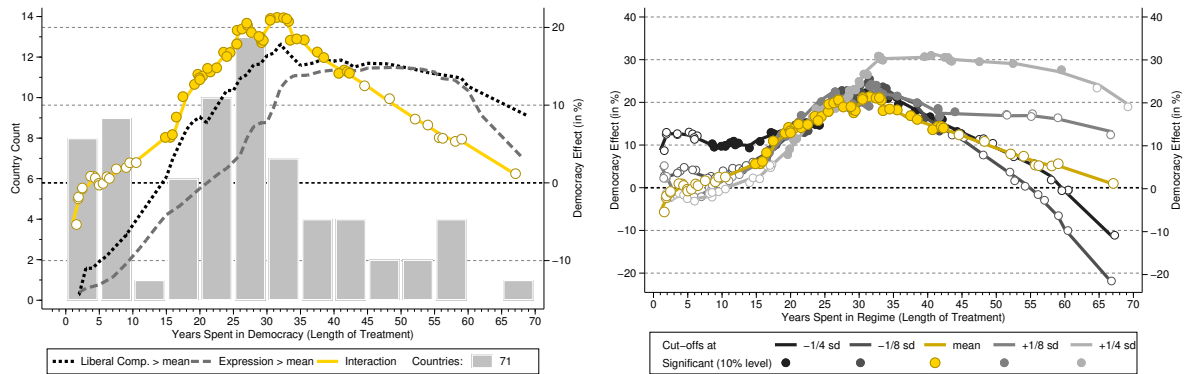
(b) Judicial Constraints  $\times$  Polyarchy vs its components (left,  $N = 52$ ), alternative cutoffs (right)



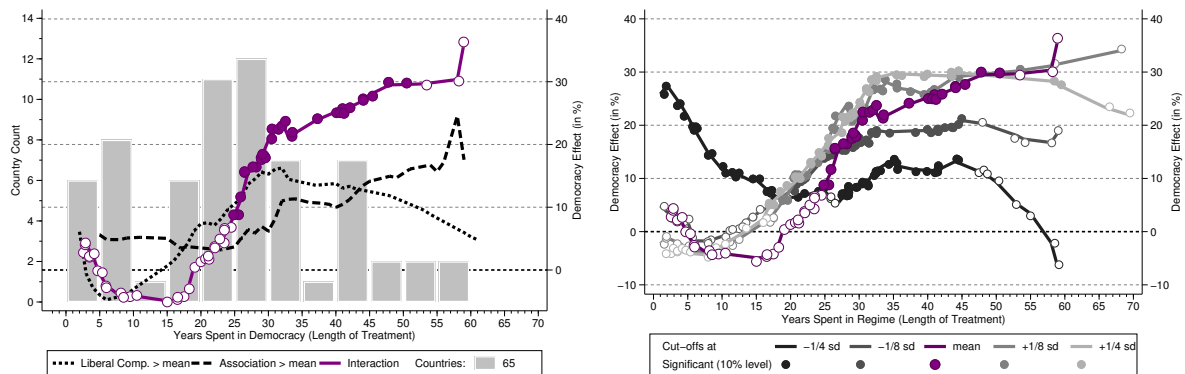
(c) Legislative Constraints  $\times$  Polyarchy vs its components (left,  $N = 69$ ), alternative cutoffs (right)

**Notes:** The plots in this figure present running line regressions for three sub-components of the liberal component (Rule of Law, Judicial Constraints on the Executive, and Legislative Constraints on the Executive). In each case of the left panel we show the sample-specific running line estimates for polyarchy (short-dashed line), that for the sub-component (dashed line) and that for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries) for the interaction model. In each plot of the right panel we investigate different cutoffs to create the standardised 'regime change' dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. The different interaction models imply different length of time in regime, for illustration we report the medians in years: (a) lib 27, component 30, interaction 25; (b) lib 27, component 30, interaction 25; (c) lib 28, component 26, interaction 21.

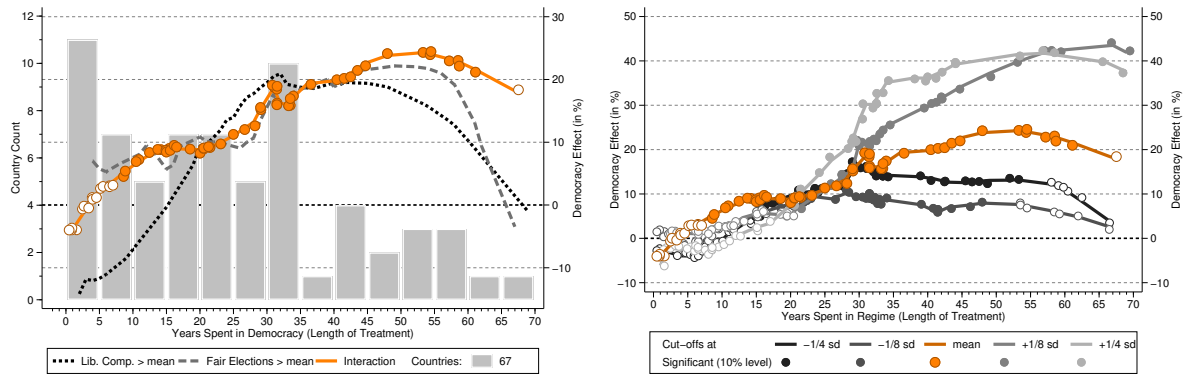
**Figure F-2: Indicators from Low-Level Indices of (Electoral) Democracy: Interaction with the Liberal Comp.**



(a) Freedom of Expression  $\times$  Liberal Component vs its components (left,  $N = 71$ ), alternative cutoffs (right)



(b) Freedom of Association  $\times$  Liberal Component vs its components (left,  $N = 65$ ), alternative cutoffs (right)

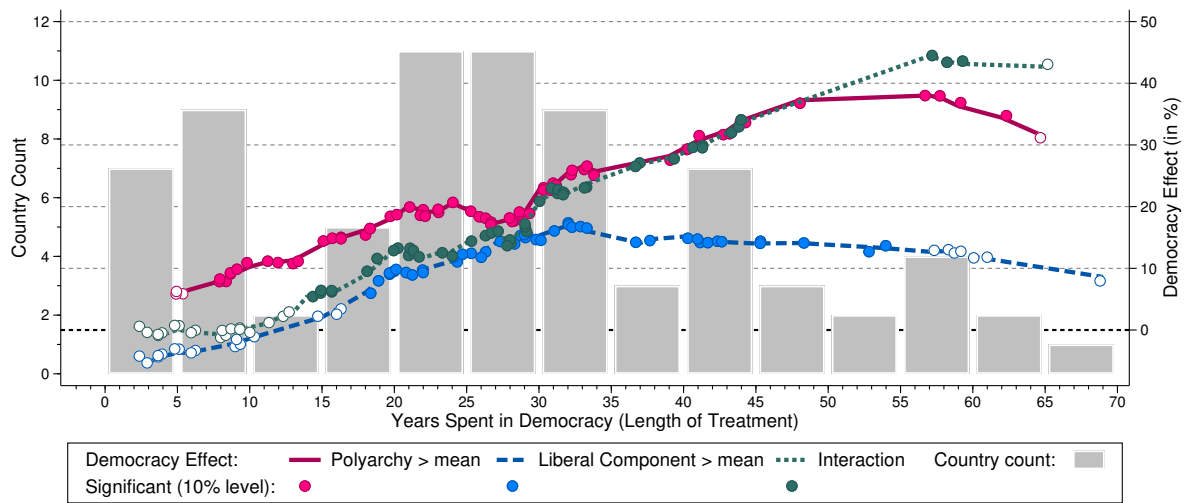


(c) Free and Fair Elections  $\times$  Liberal Component vs its components (left,  $N = 67$ ), alternative cutoffs (right)

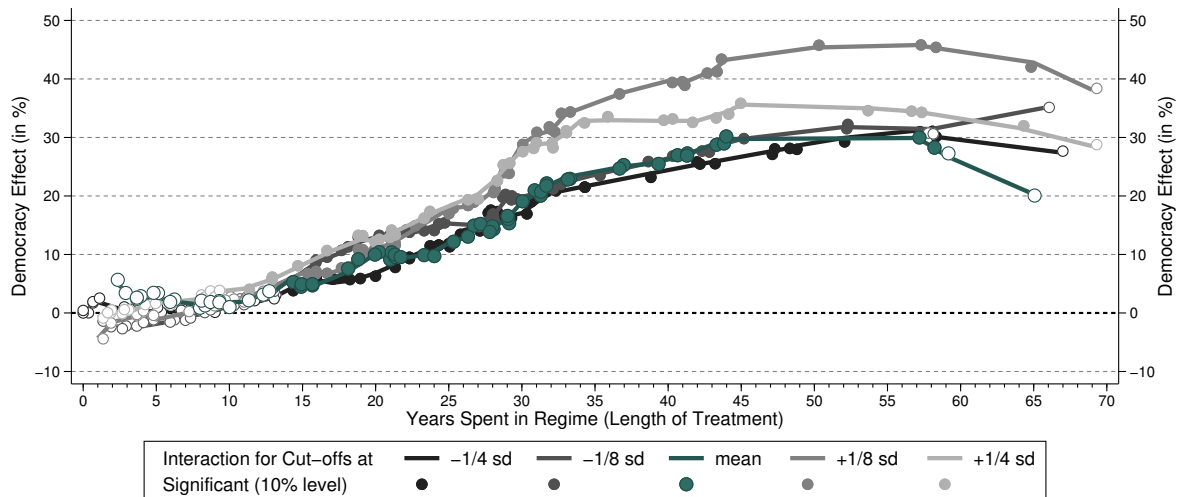
**Notes:** The plots in this figure present running line regressions for three sub-components of polyarchy (freedom of expression and association, respectively; free and fair elections). In each case of the left panel we show the sample-specific running line estimates for the liberal component (short-dashed line), that for the sub-component (dashed line) and that for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries) for the interaction model. In each plot of the right panel we investigate different cutoffs to create the standardised ‘regime change’ dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. The different interaction models imply different length of time in regime, for illustration we report the medians in years: (a) poly 26, component 30, interaction 22; (b) poly 27, component 31, interaction 23; (c) poly 26, component 29, interaction 22.

## G PCDID Results – simpler interaction model specification

Figure G-1: Mid-Level Democracy Indicators: Interaction



(a) Liberal Component  $\times$  Polyarchy vs its components ( $N = 66$ )

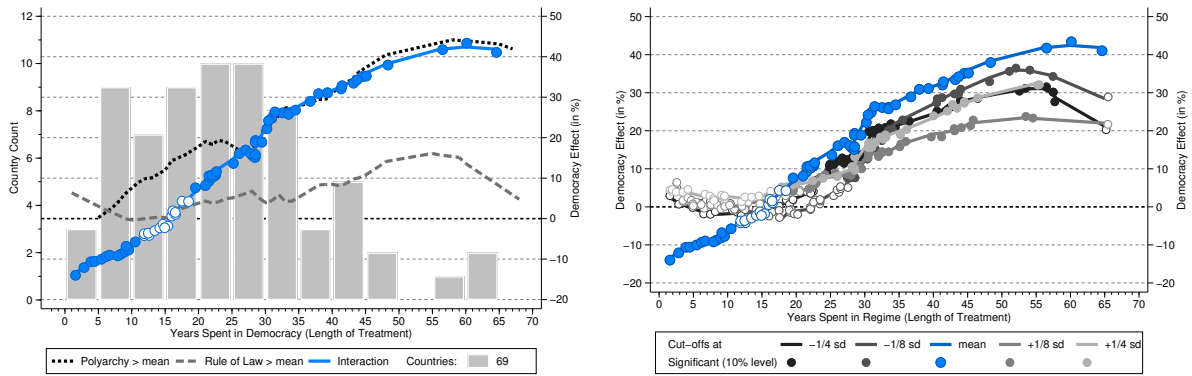


(b) Various cutoffs

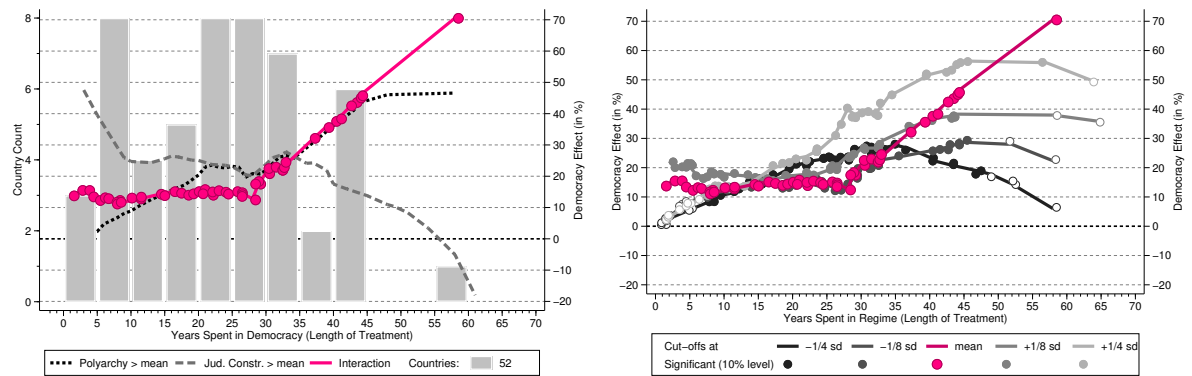
**Notes:** The plot in panel (a) of this figure presents sample-specific running line estimates for polyarchy (short-dashed line), for the liberal component (dashed line) and for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries). In panel (b) we investigate different cutoffs to create the standardised ‘regime change’ dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. The results in this figure are based on the specification in equation (9), which includes factors from one control group (those countries w/out regime change in polyarchy and liberal component). Results for the alternative (less restrictive) specification in equation (10) can be found in Figure 6 in the maintext.



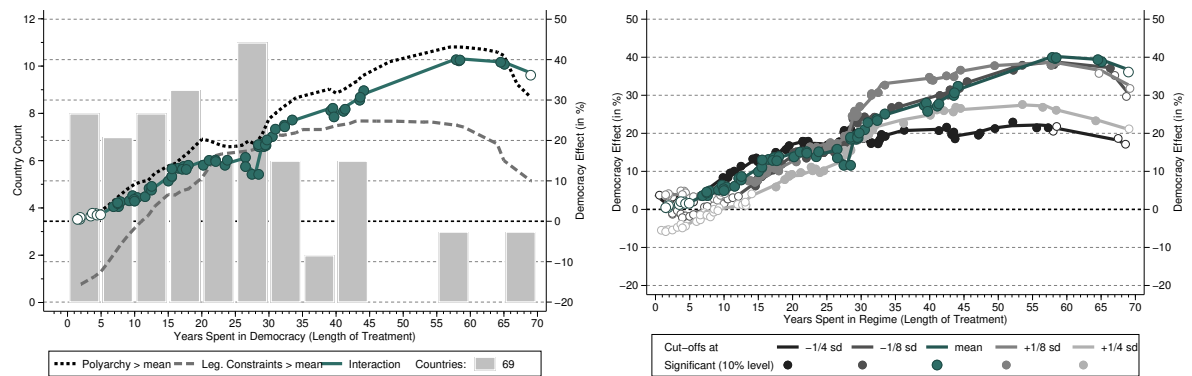
**Figure G-2: Indicators from Low-Level Indices of Democracy (liberal component): Interaction with Polyarchy**



(a) Rule of Law  $\times$  Polyarchy vs its components (left,  $N = 69$ ), alternative cutoffs (right)



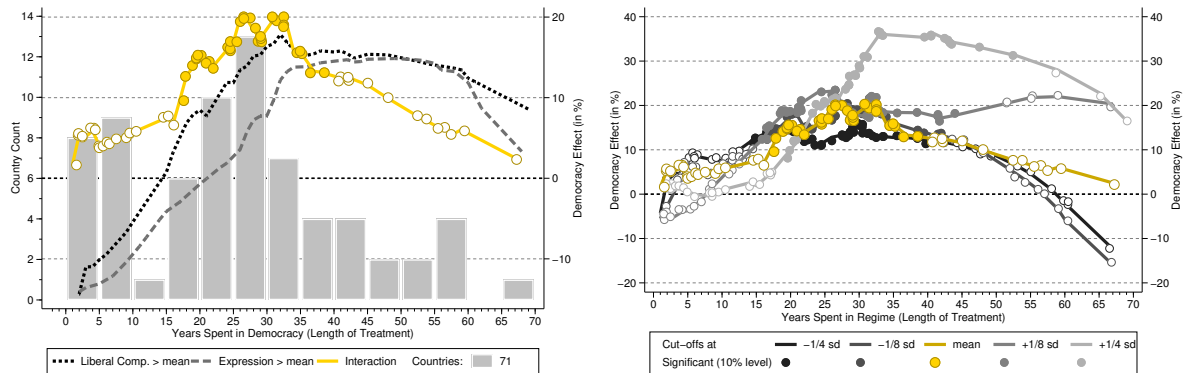
(b) Judicial Constraints  $\times$  Polyarchy vs its components (left,  $N = 52$ ), alternative cutoffs (right)



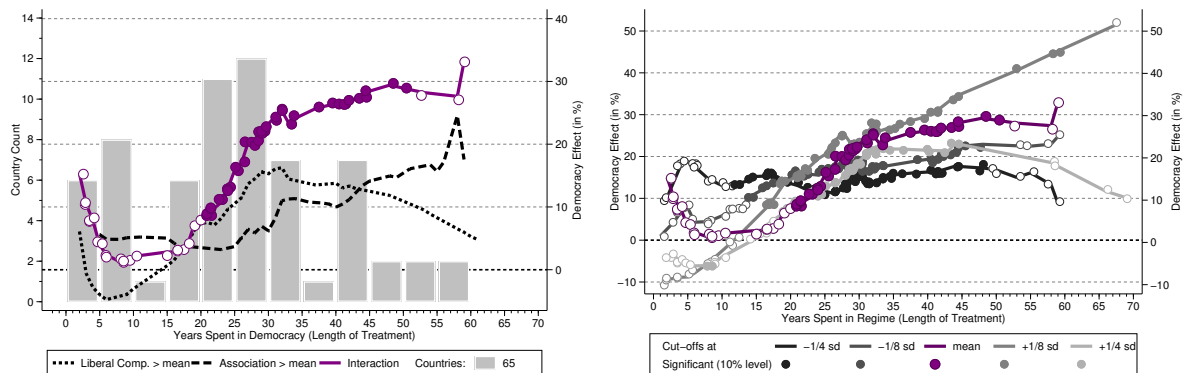
(c) Legislative Constraints  $\times$  Polyarchy vs its components (left,  $N = 69$ ), alternative cutoffs (right)

**Notes:** The plots in this figure present running line regressions for three sub-components of the liberal component (Rule of Law, Judicial Constraints on the Executive, and Legislative Constraints on the Executive). In each case of the left panel we show the sample-specific running line estimates for polyarchy (short-dashed line), that for the sub-component (dashed line) and that for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries). In each plot of the right panel we investigate different cutoffs to create the standardised 'regime change' dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. All interaction models presented in this figure adopt the 'simple' empirical implementation in equation (9) of the paper. The 'alternative' specification in equation (10) is presented in Figure F-1 of the paper.

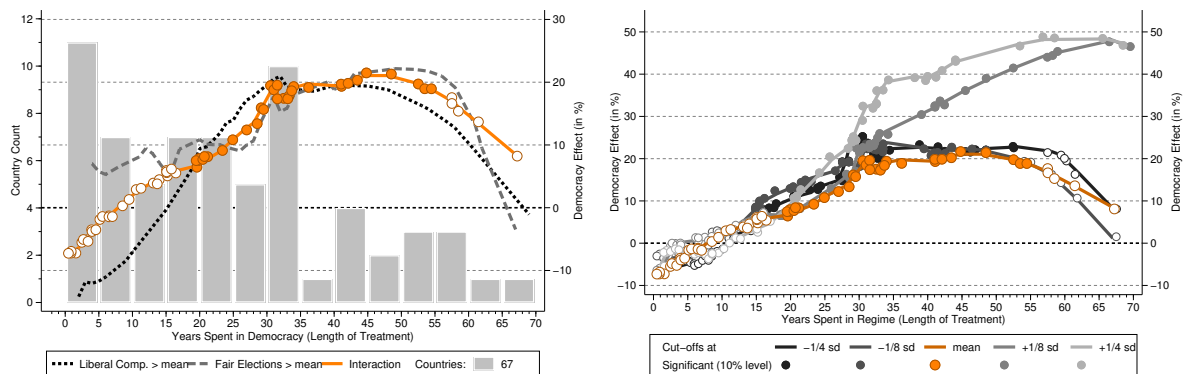
**Figure G-3: Indicators from Low-Level Indices of (Electoral) Democracy: Interaction with the Liberal Comp.**



(a) Freedom of Expression  $\times$  Liberal Component vs its components (left,  $N = 71$ ), alternative cutoffs (right)



(b) Freedom of Association  $\times$  Liberal Component vs its components (left,  $N = 65$ ), alternative cutoffs (right)

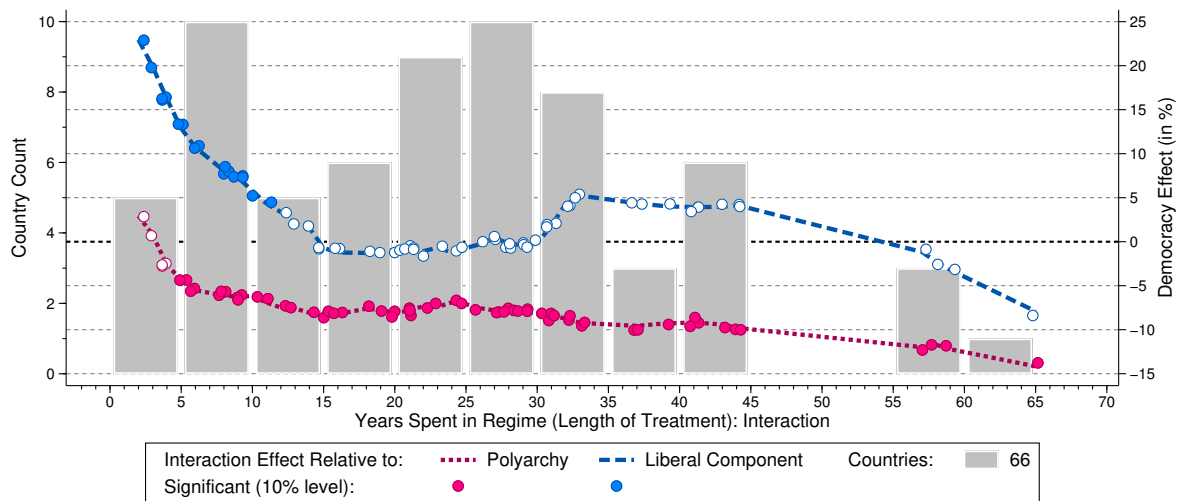


(c) Free and Fair Elections  $\times$  Liberal Component vs its components (left,  $N = 67$ ), alternative cutoffs (right)

**Notes:** The plots in this figure present running line regressions for three sub-components of polyarchy (freedom of expression and association, respectively; free and fair elections). In each case of the left panel we show the sample-specific running line estimates for the liberal component (short-dashed line), that for the sub-component (dashed line) and that for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries). In each plot of the right panel we investigate different cutoffs to create the standardised 'regime change' dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. All interaction models presented in this figure adopt the 'simple' empirical implementation in equation (9) of the paper. The 'alternative' specification in equation (10) is presented in Figure F-1 of the paper.

## H PCDID Results – Relative Effect of Interaction Specification

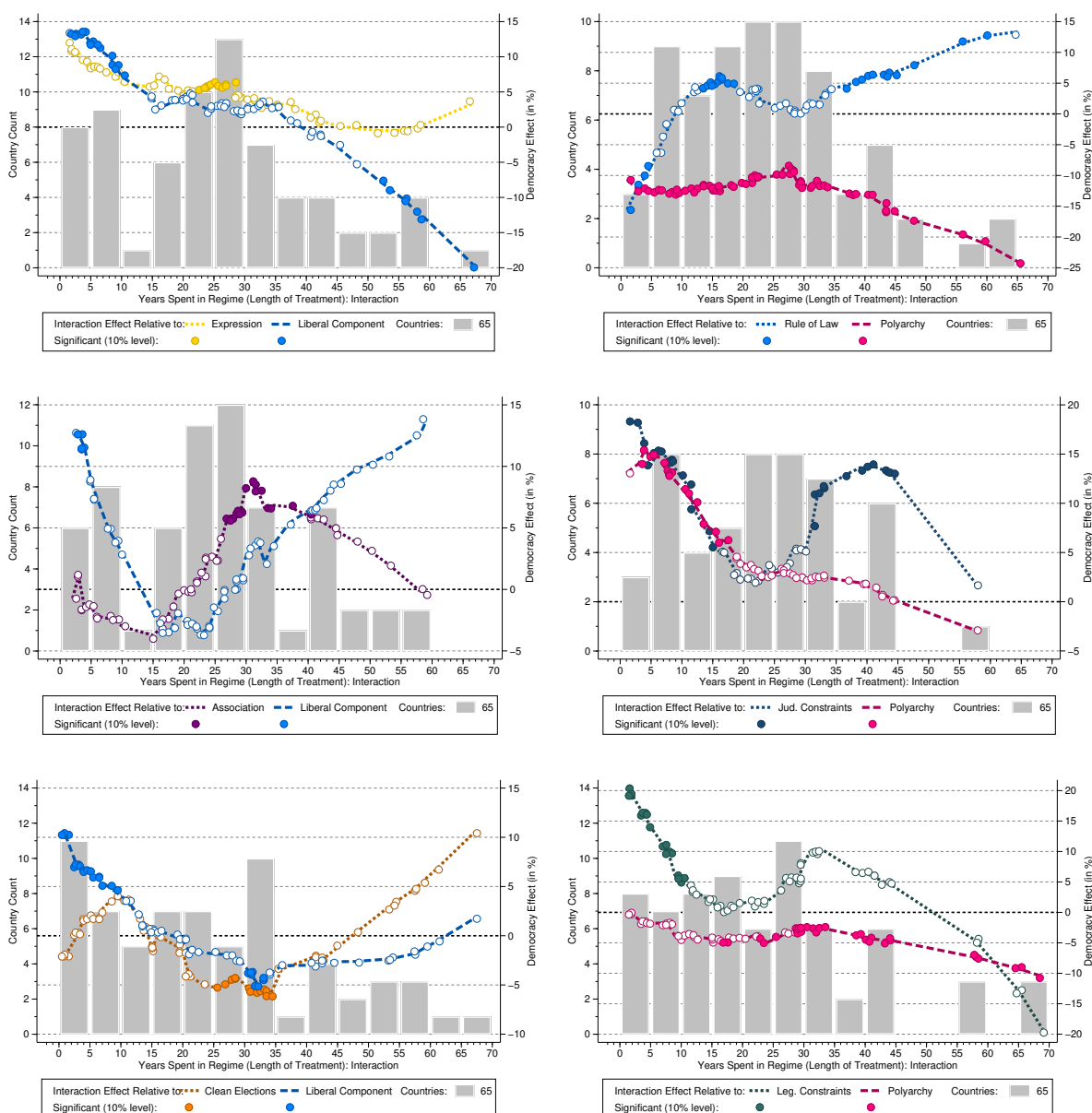
Figure H-1: Mid-Level Democracy Indicators: Interaction



(a) Liberal Component  $\times$  Polyarchy vs its components ( $N = 66$ )

**Notes:** The plot in panel (a) of this figure presents sample-specific running line estimates for polyarchy (short-dashed line), for the liberal component (dashed line) and for a specification adopting an interaction between the two (solid coloured line; filled markers indicate statistical significance at the 10% level), holding the sample constant. The grey bars in these plots indicate the sample distribution (countries). In panel (b) we investigate different cutoffs to create the standardised ‘regime change’ dummies in the interaction model: mean, mean  $\pm 1/8$  sd, mean  $\pm 1/4$  sd. The results in this figure are based on the specification in equation (10) like in Figure 6 in the maintext.

**Figure H-2: Indicators from Low-Level Indices of Democracy: Interaction**



**Notes:** The plots in this figure present running line regressions for three sub-components of polyarchy (from top to bottom: freedom of expression and association, respectively; free and fair elections) in the left column and the liberal component (rule of law; judicial constraints on the executive; legislative constraints on the executive) in the right column. The analysis here augments the results presented in Figures F-1 and F-2 of the paper: we show the sample-specific running line estimates for the interaction effect *relative to* the sub-component one (short-dashed line) and *relative to* the polyarchy or the liberal component one (dashed line), holding the sample constant. Coloured markers indicate statistical significance at the 10% level. If a line is above (below) zero and statistically significant this implies that the interaction effect is statistically significantly larger (smaller) than the effect of the component in question. The running line regression controls for sample start year, regime reversal of either components, as well as the difference between years spent in the interaction regime and years spend in the component regime. The grey bars in these plots indicate the sample distribution (countries). All interaction models presented in this figure adopt the ‘alternative’ empirical implementation in equation (10) in the main text.