ABSTRACT

Policy responses to issues of national interest are usually disproportionate to the potential costs of, or benefits derived from, policy. These patterns are explained by punctuated equilibrium dynamics. While the body of literature is rich in its empirical support for PET dynamics, less is known about whether these generalize to a broad range of democratic and autocratic systems and hold true in compressed timeframes. Using time series data from January 2020 to April 2022, we examine univariate distributions of COVID-19 related policy changes for four groups of political systems. We test an implicit assumption of PET (i.e., temporal invariance), and demonstrate that PET dynamics exist in shortened timeframes during crisis.

Keywords: punctuated equilibrium, temporal invariance, crisis

PUNCTUATED EQUILIBRIUM DYNAMICS IN TIMES OF CRISIS: ASSESSING GENERALIZABILITY TO DIFFERENT POLITICAL SYSTEMS AND TEMPORAL INVARIANCE

INTRODUCTION

The public health crisis generated by the COVID-19 pandemic has put international policy systems under a microscope (Hsiang et al., 2020; Legido-Quigley et al., 2020). The pandemic differs considerably from time-bound and geographically isolated crises such as natural disasters (i.e., hurricanes, earthquakes, floods, etc.) and technological accidents (i.e., structural collapses, industrial accidents). It continues to grind on into a third year and is ubiquitous in its impacts, with over 200 countries and territories affected (DeLeo, Taylor, Crow, & Birkland, 2021; World Health Organization, 2020). Unprecedented in its magnitude and with widespread repercussions on social, economic, and political systems worldwide (Filiz Karabag, 2020; McCloskey et al., 2020; Nicola et al., 2020), the pandemic is a "slow-onset, long-duration phenomenon" with immediate and enduring consequences (DeLeo, Taylor, Crow, & Birkland, 2021, p. 2). As a global public health crisis impacting many political systems over an extended duration, the pandemic provides a unique context for examining how governments respond to crises across different political systems and within a condensed period.

The broad range of mitigation approaches chosen by nations is indicative of disproportionate policy responses—that is, policy responses that are not proportional to perceived costs, or benefits, of policy outcomes. Some nations have pursued strong policy responses (i.e., maximal or near maximal responses relative to low COVID-19 case rates), while others have pursued weak policy responses (i.e., minimal responses relative to high case rates) (Shafi & Mallinson, 2022). We argue that these disproportionate policy dynamics are not unique to the handling of the COVID-19 crisis but follow the general pattern of policy processes observed in political institutions that feature multiple venues of policymaking and are explained by punctuated equilibrium theory (PET) (Jones & Baumgartner, 2005).

PET describes disproportionate policy responses as being the product of the bounded rationality of decision-makers and institutional friction. While decision-makers engage in the serial processing of information and are cognitively limited (Simon, 1957), policy subsystems within political systems are more flexible and capable of parallel processing information (Jones, 1994). This combination of the serial and parallel processing of information, as well as institutional friction, generates disproportionate policy dynamics in which policy subsystems oscillate between periods of policy under-response (or non-response) and periods of over-response to information (Baumgartner, Jones, & Mortensen, 2014; Workman, Jones, & Jochim, 2009). The disproportionate and punctuated policy dynamics that result from these factors are further exacerbated by conditions of uncertainty, as found in crises.

In crises, policy decisions are made under conditions of scientific uncertainty, significant time pressure, minimal quality evidence, and among disagreements in expert opinion (Berger et al., 2020). Disagreements between key stakeholders, amid such uncertainty and urgency, tend to result in conflicting policy images that influence the serial and parallel processing of information by individuals and policy subsystems and can either support policy monopolies (contributing to stability) or lead to their collapse (contributing to punctuations) (Baumgartner, Jones, & Mortensen, 2014). For example, in the context of the COVID-19 pandemic, disagreements among stakeholders with respect to the severity, transmissibility, and origin of the virus has translated into uncertainty regarding the plausibility and effectiveness of different interventions like school closures and masking requirements (Berger et al., 2020). The

consequences of such uncertainty have been disproportionate policy responses—policy over-responses, under-responses, or some combination of both (Shafi & Mallinson, 2022).

As disproportionate policy dynamics have been observed in a wide array of countries in response to the COVID-19 crisis and these dynamics are explained by PET, in this article, we evaluate whether PET dynamics hold true in a broad range of political systems (i.e., democratic and non-democratic nations). Additionally, we build upon PET's hypothesis of scale invariance and postulate that PET dynamics are also characterized by temporal invariance—and therefore expected to occur in both extended and condensed periods of time, including in periods of crisis. We begin with a review of the existing empirical evidence on PET dynamics and its limitations. We then discuss the nuances of policymaking in times of crisis, and the implications for policy response, with a particular focus on the COVID-19 global public health crisis. Using data on country-level policies from January 2020 to April 2022, we examine PET dynamics across different political systems. We conclude with the implications for PET and crisis response.

BOUNDED RATIONALITY, INSTITUTIONAL FRICTION, AND DISPROPORTIONATE POLICY DYNAMICS

Policy responses to issues of national interest tend to differ between nations and are usually disproportionate to the potential costs of, or benefits derived from, policy (Baumgartner, Jones, & Mortensen, 2014; Jones & Baumgartner, 2005). This is because political processes tend to oscillate between protracted periods of stability (i.e., incrementalism) and occasional radical policy changes (i.e., punctuations) (Kingdon, 1995; Baumgartner & Jones, 1991). These patterns are explained by PET as proceeding from the nexus between bounded rationality—both of individuals and governments—and friction within political institutions (Baumgartner, Jones, & Mortensen, 2014). Bounded rationality is the notion that decision makers have cognitive limitations in their information processing abilities, pursue satisficing rather than maximizing behavior, and therefore, tend to pursue suboptimal outcomes (Simon, 1957). Because of the bounded rationality of individuals and governments, information is subject to serial and parallel processing at micro-, meso-, and macro-levels of decision-making. At the micro level, individuals process information serially, considering issues one at a time. At the meso-level, policy subsystems enable issues to be processed in parallel within political systems (Jones, 1994). And at the macro-level, high profile issues that gain momentum through various mobilizing forces (i.e., exogenous shocks, a buildup of unaddressed grievances, shifting norms, etc.) lead to heightened attention allocation, generating windows of opportunity that enable policies to be pushed to the forefront of government decision agendas and processed serially (Baumgartner, Jones, & Mortensen, 2014; Jones 1994; Kingdon, 1995).

Institutional friction refers to institutional or organizational barriers that are consciously structured into political systems to preserve stability with "decision clearance points in the policymaking process" (Flink, 2017, p. 105). Within PET literature, institutional friction is measured in several ways including presidential vs. parliamentary political systems, dimensions of bureaucratization, separation of powers, federalism, and multi-party governments (Baumgartner et al., 2009; Jones et al., 2009; Robinson et al., 2007). For instance, structural differences in presidential systems are designed to inhibit responsiveness in the interest of political stability. Thus, presidential systems feature greater institutional friction than parliamentary systems, which are designed to be more sensitive to the demands of parliamentary majorities (Baumgartner et al., 2009). Similarly, the two dimensions of bureaucratization—centralization and organization size—are suggestive of institutional friction. While greater centralization of authority

denotes lower levels of friction, larger organization size—indicative of more complex decision-making processes—denotes higher levels of friction in policy making (Robinson et al., 2007). Similarly, separation of powers, federalism, and multi-party governing coalitions all represent different types of institutional friction as these characteristics of political systems indicate various checks and balances that tend to slow down decision-making (Jones et al., 2009). Each of these types of institutional friction exist in the US political system and can be found to exist in varying degrees in other political systems. The serial and parallel information processing that occurs at all levels of decision-making, when combined with institutional friction, generates disproportionate information processing, and correspondingly, disproportionate policy dynamics (Jones & Baumgartner, 2012).

As a prominent theory of the policy process, PET has generated a large body of work that extends its generalizability beyond its original rooting in the US (Baumgartner, Jones, & Mortensen, 2014). PET dynamics have been observed in other democratic systems such as Belgium (Maesschalck, 2002; Walgrave, Varone, & Dumont, 2006), the United Kingdom (John, 2006; Timmermans, 2001), France (Baumgartner, Foucault, & François, 2006), Canada, the Netherlands, and Switzerland (Timmermans, 2001). A few studies have recently emerged exploring whether PET dynamics exist in autocracies, however, these are limited to a few nations/regions such as China (Chan & Zhao, 2016), Hong Kong (Lam & Chan, 2015), and Hungarian regimes (Sebők & Berki, 2018; Sebők, Balázs, & Molnár, 2022). While there is rich empirical support for PET, there are areas that remain unexplored. The literature demonstrates that PET dynamics are generalizable to political systems outside of the US, however the empirical evidence is generally limited to a few democratic, and even fewer, autocratic nations. We argue that the body of work would benefit from research evaluating the generalizability of PET dynamics to a broad range of political systems (i.e., both democratic and non-democratic), and in a comparative context.

ANNUAL EVALUATIONS OF POLICY CHANGE

Beyond the limited scope of application of PET to different political systems with varying types of institutional friction, the assessment of PET dynamics using annual data over long periods of time presents an additional limitation. PET initially emerged as a theory of national budgeting; thus, the patterns of decisional stasis and episodic large-scale policy changes generated by boundedly rational decision making and institutional friction, have historically been observed using the distribution of annual budget changes (Jones, Baumgartner, & True, 1998; Jones et al., 2009; Jones, Sulkin, & Larsen, 2003; Jones, Zalányi, & Érdi, 2014; Mallinson, 2016). In these analyses, univariate distributions of annual budget changes demonstrate the existence of PET dynamics (Baumgartner, Jones, & Wilkerson, 2002; Baumgartner, Jones, & Mortensen, 2014).

Following the expectations of PET, non-incremental and punctuated budgeting is illustrated by leptokurtic distributions. Many incremental changes and general stability result in frequency distributions of budget change characterized by a strong central peak, weak shoulders which indicate a relative lack of moderate changes, and wide tails which suggest a few episodic punctuations (Baumgartner, Jones, & Mortensen, 2014). In those instances where PET dynamics exist, budget (or policy) changes should follow a leptokurtic, rather than a normal, distribution as normally distributed changes indicate continuous and dynamic change. As PET dynamics are historically modeled with budgetary data, and budgets follow a fiscal cycle, this approach is limited to the use of annual data. While annual data assessments provide important insights into patterns of policy change over a long duration, these do not shed light on how policy changes may fluctuate within the short-term, and particularly during periods of crisis.

PET DYNAMICS IN CONDENSED TIME PERIODS UNDER CRISIS CONDITIONS

Crises, as exogenous shocks or endogenous events, are generally understood to destabilize policies and result in new policy paradigms (i.e., punctuations) (Greener, 2001). This is because periods of crisis expose critical problems with the status quo and generate windows of opportunity for advancing policies on the government's decision agenda, thereby enabling key decision-makers to endorse, and gain acceptance for, alternative policies (Kingdon, 1995; Keeler, 1993). It follows then, that periods of crisis will present opportunities or "critical junctures" for policy reform (Gorges, 2001), and, when evaluated annually, major policy change will tend to be most likely during those years when a crisis has taken place. Little is known, however, of how policy change proceeds over the course of a crisis in the presence of policy feedback/learning and as information becomes more readily available. This leads to the question: Do the expectations of PET hold true within condensed time periods under conditions of crisis?

We argue that, given the role that attention allocation and institutional friction plays in policy punctuations, punctuated equilibrium dynamics should be observable in the short-term in crisis situations. Crises influence issue attention and challenge existing policy images. Though institutional friction acts as an impeding force, causing a delay between exogenous shocks and policy change (Walgrave & Varone, 2008), the expansion of institutional powers (e.g., using emergency declarations) and centralized decision-making that is characteristic of crisis management (Scheppele, 2010) should speed up policy decision-making and generate policy punctuations over a condensed period.

PET dynamics, particularly in terms of budget decision making, are theorized to be scale invariant (Baumgartner, Jones, & Mortensen, 2014). That is, policy punctuations are expected to occur "at all levels of aggregation (program, function, subfunction, and agency)" for two reasons: (1) budget decision-making at all levels is prone to the dynamics of selective attention allocation and (2) policy punctuations follow a bottom-up process in which policy changes may be impacted by external shocks or have spillover effects from one policy subsystem to other, related subsystems (Baumgartner, Jones, & Mortensen, 2014, p. 74). Though scale invariance is an explicit premise of PET, temporal dynamics—that is, whether PET dynamics occur in different time periods, and particularly condensed time periods—is not explicitly addressed in the literature. Baumgartner, Jones, and Mortensen mention the expectation that punctuations in budgeting occur at "all levels of scale in the budget…and…during all time periods" (2014, p. 72) in passing, however the mention of time periods in reference to budgets appears to refer to annual data rather than sub-annual. The implicit assumption of temporal invariance with little evidence to support whether PET dynamics hold true in different time periods, particularly condensed time periods, is a significant limitation of this body of work and one that we aim to address in this article.

Policy Learning & Bounded Emulation

Periods of crisis, characterized by high levels of uncertainty and/or high levels of urgency, tend to produce two types of policy processes—policy learning and bounded emulation (Lesch & Millar, 2021)—both of which have implications for disproportionate policy change in extended and condensed periods of time. Under conditions of crisis, policy learning at the microlevel includes decision-makers updating their policy beliefs—through soliciting expert advice (Haas, 2004), engaging with the communities under their jurisdiction (Millar et al., 2020), or gathering stakeholder input (Breetz, Mildenberger, & Stokes, 2018). At the meso-level, policy learning includes the use of extensive resources for expert consultation and policymaking that follows an iterative process of deliberation, carried out over months or even years.

Conversely, bounded emulation at the microlevel includes decision makers that, under pressures to act swiftly, forego policy learning and instead display heuristic information processing, emulating readily accessible policy solutions from geographically or ideationally proximate governing peers (Kamkhaji & Radaelli, 2017; Lesch, 2021; Lesch & Millar, 2021; Weyland, 2005). At the meso-level, bounded emulation includes the use of limited resources in consultation, and policymaking that is carried out in a short period of days or weeks (Lesch & Millar, 2021).

What then are the implications of these policy processes for temporal dynamics? The likelihood of policymakers relying on either policy learning or bounded emulation is associated with whether crises are characterized by high uncertainty or high urgency. In the case of crises characterized by high uncertainty, policy learning is likely as decision-makers will seek out new information and engage in deliberative processes of problem and solution identification. In the case of crises characterized by high urgency, bounded emulation is likely as decision-makers draw on heuristics to act quickly (Lesch & Millar, 2021). In each of these cases, it is important to note that given the contextual complexities that surround policymaking in practice, and particularly in crises, policies that are implemented must be modified over time. Policy environments are dynamic and pragmaticism dictates that policies formulated and implemented based on static analyses at one juncture will need to be adjusted based on changes in external conditions and as new information becomes available (Walker, Rahman, & Cave, 2001).

Policy processes during periods of crisis may be characterized by policy learning or bounded emulation—with policymaking carried out in days, weeks, or months—and policy adjustments necessary based on contextual complexities. As institutional friction and serial and parallel processing of information are found to be enduring characteristics of political systems with multiple venues of policymaking, it follows then that policy change during condensed time periods and in crisis conditions will be both punctuated and incremental. Additionally, as policies are enacted based on static analysis at critical junctures, and subsequently adjusted based on changes in external environments and the availability of new information, PET dynamics will also be characterized by temporal invariance. Then, how can this theoretical argument be substantiated with empirical evidence? One such crisis that has presented a rich amount of data for evaluation is the COVID-19 pandemic. This context presents an opportunity to evaluate whether policy change during condensed time periods and in crisis conditions is characterized by PET dynamics.

In the following analyses, we aim to follow the methods used by PET scholars in modelling univariate distributions of budget changes. In their efforts to conduct outbreak research and contain the pandemic, scientists and researchers have worked together to bring forward an unprecedented era of global data sharing (Le-Guillou, 2020). Publicly available data on COVID-19 cases/deaths and national policy responses enables us to move beyond the limitations of annual budget data and instead evaluate weekly policy changes over a 28-month timeframe. This provides a means to evaluate whether PET dynamics hold true in the short-term during crisis conditions. We expect to find leptokurtic distributions indicating non-incremental and punctuated policy changes in line with PET dynamics.

Another purpose of this study is to examine the relationship between policy changes and different political systems (ranging from most to least democratic). This relationship is evaluated in the context of the COVID-19 pandemic for two reasons. First, the prevalence of the pandemic across over 200 countries worldwide presents a situation where governments of all types have been impacted (World Health Organization, 2020), thus providing a relatively level playing field with which to evaluate policy changes. And second, given the unprecedented global data sharing made possible by scientists and researchers, the avialability of weekly data enables us to contribute to the body of literature by modelling the normal (or non-normal) distributions of policy change for each country and empirically evaluating the relationships

between our variables of interest. In sum, this study aims to build upon the existing body of work by addressing the following research questions:

1. Do punctuated equilibrium dynamics hold true in a broad range of democratic political systems?
2. Do punctuated equilibrium dynamics hold true in a broad range of non-democratic political systems? If yes, then, are there pronounced differences in the magnitude of punctuations in non-democratic versus democratic systems?
3. Are PET dynamics characterized by temporal invariance in times of crisis? That is, do punctuated equilibrium dynamics hold true when analyzing weekly data on policy change?

DATA AND METHODS

The data sources that are used in this paper are the Varieties of Democracy (V-Dem) datasets, which report on 179 countries and territories annually (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, ... & Lührmann, 2021a), and the Oxford COVID-19 Government Response Tracker (OxCGRT) daily times series data, which reports on 178 countries and territories (Hale, Webster, Petherick, Phillips, & Kira, 2020).

V-Dem presents multidimensional measures of democracy and distinguishes between high-level and low-level disaggregated measures of democracy (such as a nation's domestic autonomy, judicial constraints, etc.). This data is collected by a team of over 50 social scientists working with over three thousand country experts and a global International Advisory Board. V-Dem reports interval data on over 470 democracy indicators, 82 mid-level indices, and five high-level indices.

As this study focuses on institutional friction as a key factor that influences PET dynamics, and centralization of authority and checks and balances are two indicators of institutional friction, the following ordinal democracy indicator derived from V-Dem— "To what extent is the ideal of liberal democracy achieved?" (Coppedge et al., 2021, p. 338) is used as a proxy for institutional friction. This measure of liberal representative democracy aggregated by V-Dem (coded as e_v2x_libdem_5C) "judges the quality of democracy by the limits placed on government. This is achieved by constitutionally protected civil liberties, strong rule of law, an independent judiciary, and effective checks and balances that, together, limit the exercise of executive power" (Coppedge et al., 2021, p. 44). That is, a nation will be characterized as more democratic based upon the checks and balances placed on governance and limitations on centralized authority. This measure of liberal representative democracy ranges from zero to one and groups each nation into five mutually exclusive and progressively democratic categories: closed autocratic (0.0), autocratic (0.25), ambivalent (0.5), minimally democratic (.75), and democratic (1.0). When represented on an ordinal scale, from closed autocratic to democratic political systems, this measure of liberal representative democracy indicates progressively higher levels of institutional friction. It follows then, that countries with higher levels of institutional friction (i.e., liberal representative democracies) would be more prone to punctuated equilibrium dynamics than countries with lower levels of institutional friction (i.e., closed autocracies).

OxCGRT data is aggregated from publicly available sources by over 100 Oxford University students and staff members. This dataset reports on 20 indicators of national and subnational policy responses to the COVID-19 pandemic across four main policy categories: containment & closure policies, health system policies, economic policies, and vaccination policies. This includes eight indicators for containment and closure policies (i.e., international/domestic movement restrictions and school closures), eight indicators

for healthcare system policies (i.e., COVID-19 testing and emergency healthcare investment), four indicators for economic policies (i.e., income support), and three indicators for vaccination policies (i.e., per capita cost of vaccination and eligible groups). These 23 indicators are comprised of nominal (1), scale (4), and ordinal (18) measures. The ordinal measures for containment, economic, and healthcare system policies are aggregated into four indices of government policy: the Government Response Index (GRI), Containment Health Index (CHI), Stringency Index (SI), and Economic Support Index (ESI). Each index aggregates the data and is measured on a scale from zero to 100, where zero indicates an absence of policy and 100 indicates the most extensive use of policy.

The GRI, CHI, SI, and ESI are nested. Though the SI and ESI are distinct indices with no overlap, the CHI includes the SI. The GRI is the broadest index and encompasses each of the other three indices (CHI, SI, and ESI). The SI reports aggregate policy responses across containment dimensions. The ESI reports aggregate policy responses across economic support dimensions. The CHI reports aggregate policy responses across both containment and healthcare dimensions. And finally, the GRI reports an aggregate level of policy response across the three dimensions of containment, economic support, and healthcare. Each of the indices and the policy measures they represent are shown in Table 1. While these indices represent the quantity and austerity of enacted policies, it is worth noting that these do not indicate a score of effectiveness (i.e., higher measures do not indicate better policy responses and vice versa). OxCGRT provides daily times series data from January 2020 to present and is updated in real time, thus enabling a large sample size for modelling.

Table 1. Components of Policy Indices

ID	Name	Type	GRI	CHI	SI	ESI
	Containment and Closure Policies					
C1	School Closing	Ordinal	X	X	X	
C2	Workplace Closing	Ordinal	X	X	X	
C3	Cancel Public Events	Ordinal	X	X	X	
C4	Restrictions on Gatherings	Ordinal	X	X	X	
C5	Close Public Transport	Ordinal	X	X	X	
C6	Stay at Home Requirements	Ordinal	X	X	X	
C7	Restrictions on Internal Movement	Ordinal	X	X	X	
C8	International Travel Controls	Ordinal	X	X	X	
	Economic Policies					
E1	Income Support	Ordinal	X			X
E2	Debt/Contract Relief for Households	Ordinal	X			X
E3	Fiscal Measures	Numeric				
E4	Giving International Support	Numeric				
	Health Policies					
H1	Public Information Campaign	Ordinal	X	X	X	
H2	Testing Policy	Ordinal	X	X		
H3	Contract Tracing	Ordinal	X	X		

H4	Emergency Investment in Healthcare	Numeric		
H5	Investment in COVID-19 Vaccines	Numeric		
H6	Facial Coverings	Ordinal	X	X
H7	Vaccination Policy	Ordinal	X	X
H8	Protection of Elderly People	Ordinal	X	X
	Vaccination Policies			
V1	Vaccine Prioritization	Ordinal		
V2	Vaccine Eligibility/Availability	Nominal		
V3	Vaccine Financial Support	Ordinal		

Note: The full explanation of each index can be found at www.bsg.ox.ac.uk/covidtracker.

Data Merging and Transformation

Before proceeding with the analysis, both OxCGRT and V-Dem were merged. As the datasets were asymmetrical, with OxCGRT reporting on 178 countries and territories compared to the V-Dem's 202 countries and territories, listwise deletion was used to remove countries and territories that were not found in both datasets (Little, 1992). Next, daily data on GRI, CHI, SI, and ESI measures was converted to weekly by capturing policy index measures on the 7^{th}, 14^{th}, 21^{st}, and 28^{th} days of each month over the 28-month period. The weekly values of GRI, CHI, SI, and ESI measures were transformed into measures of policy change, where each policy index measure on week *t* was subtracted from the policy index measure on week *t-1* to generate a measure of weekly policy change across all policy indices. Finally, the first three weeks of raw data from January 2020 represented missing data across all countries—prior to the coordinated global effort to track policy responses and pandemic outcomes – and were thus excluded. The final dataset used in our evaluation was composed of 166 countries with weekly times series data from January 28, 2020, to April 21, 2022.

Data Analysis

Two types of analysis are conducted using the merged data. First, univariate distributions of policy change for the GRI and SI are displayed across the different political systems. Second, kurtosis values are calculated for each of the 166 countries in our analysis and displayed in box plots to illustrate the range of leptokurtic distributions across the different groups of political systems. By displaying the univariate distributions of policy change and box plots of leptokurtic distributions, we determine the presence of punctuated equilibrium dynamics in a condensed 28-month period (indicating whether PET dynamics are characterized by temporal invariance) and the variation of punctuated equilibrium dynamics across different political systems and countries (indicating how PET dynamics may be influenced by varying levels of institutional friction).

L-kurtosis is used to indicate PET dynamics in COVID-19 related policy changes across nations and political systems (Breunig & Koski, 2006). This is because L-kurtosis, a commonly used metric in past studies of PET and budgetary change, generates more correct parameter estimates when compared with normal kurtosis and is more robust to data outliers. Values for L-kurtosis range from zero to one, with 0.123 suggesting a normal or Gaussian distribution—indicating continuous and dynamic policy adjustments. Values above this threshold indicate leptokurtosis and PET dynamics (i.e., periods of stability

interrupted with episodic punctuations). And values below this threshold suggest platykurtic distributions (i.e., incrementalism and the absence of policy punctuations).

By characterizing the univariate distributions of policy change across political systems that fall into each of the five selected categories (i.e., democratic, minimally democratic, ambivalent, autocratic, and closed autocratic), we aim to evaluate (1) the extent to which distributions for each group of political systems are normal, leptokurtic, or platykurtic, and (2) whether punctuated equilibrium dynamics hold true when analyzing weekly data on policy change in times of crisis. V-Dem's categorization of countries into five different types of political systems is shown in Table 2. Modelling the univariate distributions for each group of countries should provide valuable insights into the general patterns of policy stability and change that characterize different types of political systems. That is, leptokurtic distributions will suggest that nations have generally been characterized by policy stability and incremental policy change with a few large-scale changes, or punctuations, over the course of the 28-month period analyzed. Conversely, platykurtic distributions would suggest incrementalism and the absence of policy punctuations—represented by evenly distributed changes throughout the range of the distribution of policy change.

Table 2. Categorization of Countries into Types of Political Systems

To what extent is the ideal of liberal democracy achieved?	
Democratic	Belgium, Costa Rica, Denmark, Estonia, Finland, Germany, Ireland, Netherlands, New Zealand, Norway, Sweden, Switzerland
Minimally Democratic	Argentina, Australia, Austria, Barbados, Canada, Cape Verde, Chile, Croatia, Cyprus, Czech Republic, France, Greece, Iceland, Israel, Italy, Jamaica, Japan, Latvia, Lithuania, Luxembourg, Malta, Peru, Portugal, Slovakia, Slovenia, South Korea, Spain, Trinidad and Tobago, Tunisia, United Kingdom, United States of America, Uruguay, Vanuatu
Ambivalent	Albania, Bhutan, Botswana, Brazil, Bulgaria, Burkina Faso, Colombia, Ecuador, Georgia, Ghana, Guatemala, Guyana, Indonesia, Lesotho, Liberia, Malawi, Mauritius, Mexico, Moldova, Mongolia, Namibia, Nepal, Panama, Paraguay, Poland, Romania, Senegal, Seychelles, Sierra Leone, Solomon Islands, South Africa, Suriname, The Gambia, Timor-Leste
Autocratic	Angola, Benin, Bolivia, Bosnia and Herzegovina, Central African Republic, Dominican Republic, El Salvador, Fiji, Gabon, Guinea-Bissau, Haiti, Honduras, Hong Kong, Hungary, India, Iraq, Jordan, Kenya, Kuwait, Kyrgyzstan, Lebanon, Madagascar, Malaysia, Mali, Morocco, Mozambique, Niger, Nigeria, Pakistan, Papua New Guinea, Philippines, Serbia, Singapore, Sri Lanka, Tanzania, Uganda, Ukraine, Zambia
Closed Autocratic	Afghanistan, Algeria, Azerbaijan, Bahrain, Bangladesh, Belarus, Burundi, Cambodia, Cameroon, Chad, China, Cuba, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Eswatini, Ethiopia, Guinea, Iran, Kazakhstan, Laos, Libya, Mauritania, Nicaragua, Oman, Qatar, Republic of the Congo, Russia, Rwanda, Saudi Arabia, Somalia, South Sudan, Sudan, Syria, Tajikistan, Thailand, Togo, Turkey, United Arab Emirates, Uzbekistan, Venezuela, Vietnam, Yemen, and Zimbabwe

EMPIRICAL RESULTS

Prior to displaying the L-kurtosis for policy change across the different types of political systems for each of the four policy indices (i.e., GRI, SI, CHI, and ESI), we display the univariate distributions of percent weekly policy changes for two of these indices—the GRI and SI. The nested nature of the four indices results in univariate distributions that are not substantively different from each other. For example, the considerable overlap between the GRI and CHI causes the policy changes for each of these indices to be relatively similar across the different political systems. For this reason, the GRI and SI are chosen for display as these two are the most distinct, shown in Figures 1 and 2.

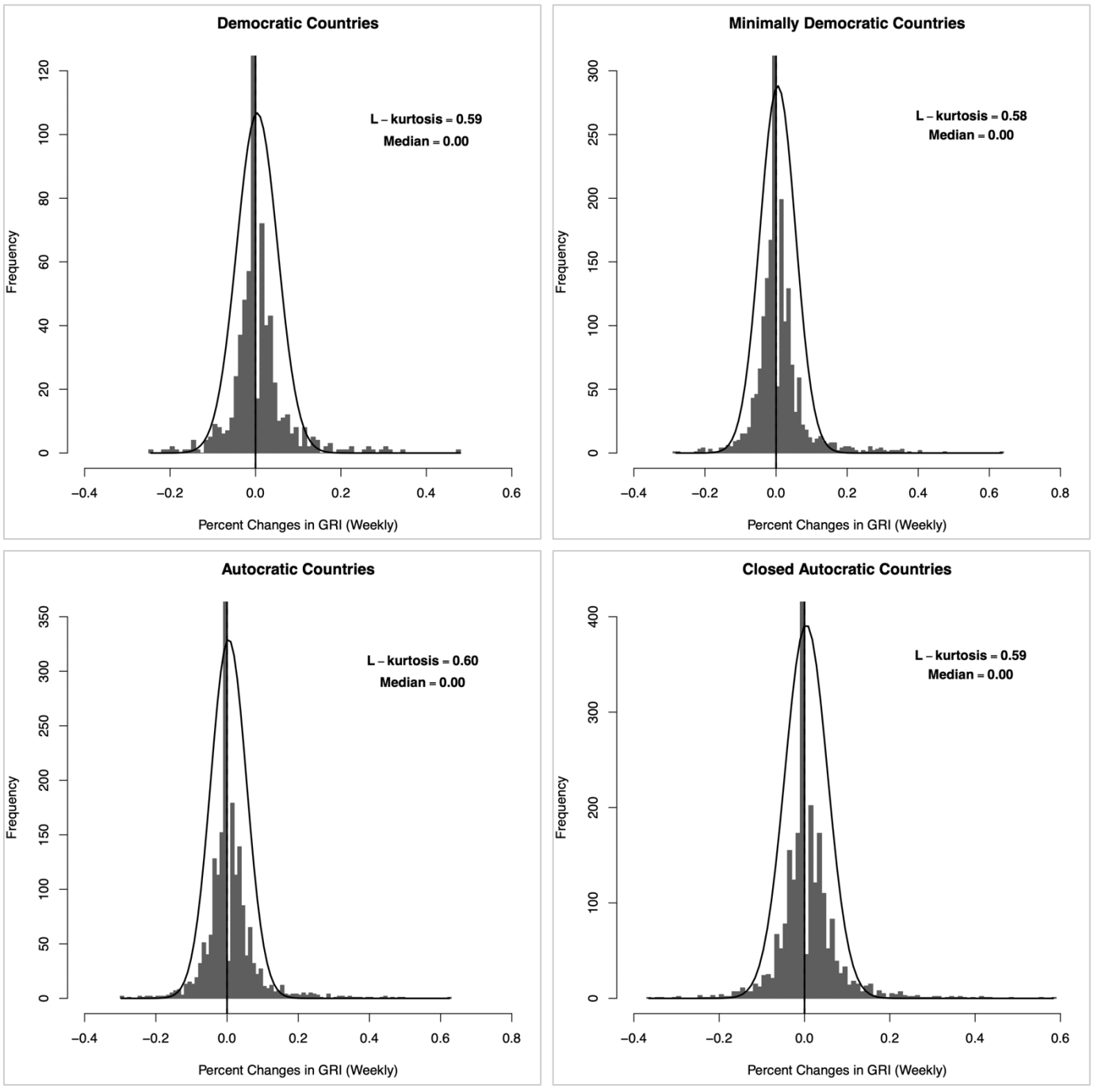
GRI Policy Change Distributions

In Figure 1, the univariate distributions of weekly GRI policy changes are displayed for the four types of political systems. The L-kurtosis for each distribution ranges from .58 to .60 and is much higher than the threshold for normal distributions (.123), indicating leptokurtic distributions across all political systems. As leptokurtic distributions of policy change suggest periods of policy stability interrupted with episodic punctuations, this indicates that punctuated equilibrium dynamics exist for the broad range of COVID-19 related policies put into place from January 2020 through April 2022 and hold true even with weekly data.

It is noteworthy that the L-kurtosis of the GRI policy change distributions for each of the different political systems are nearly identical (ranging from .58 to .60). Though we would expect there to be clear differences between political systems in terms of punctuations, such differences are not observed in this analysis. These results are surprising and suggest that variations in types of political systems (i.e., levels of institutional friction) did not have noticeable influences on the degree of policy punctuations—at least for the broad range of COVID-19 policies—across nations. One plausible explanation for this is that the high level of urgency surrounding the COVID-19 pandemic has caused nations to pursue bounded emulation, particularly in the case of virus containment policies. That is, rather than pursuing deliberative policy learning based on consultation and the comprehensive analysis of domestic policy issues and alternative solutions, nations appear to have relied on heuristics in decision making—emulating the containment policies put into place by other nations. Indeed, it has been observed that many developed and developing nations instituted blanket lockdowns early in the pandemic, resembling those first undertaken in China, irrespective of domestic transmission rates (Haas, Khan, & Khwaja, 2020). The results provide empirical evidence to support this observation.

Further, as the univariate distributions represent weekly policy change data across a 28-month period and are consistently leptokurtic across all political systems shown, this has implications for the temporal invariance hypothesis. Based on the results of this analysis, our results indicate that PET dynamics are characterized by temporal invariance within compressed time frames, particularly during crises.

Figure 1. Univariate Distributions of Percent Weekly Changes in GRI Policy Indicators across Four Different Political Systems



SI Policy Change Distributions

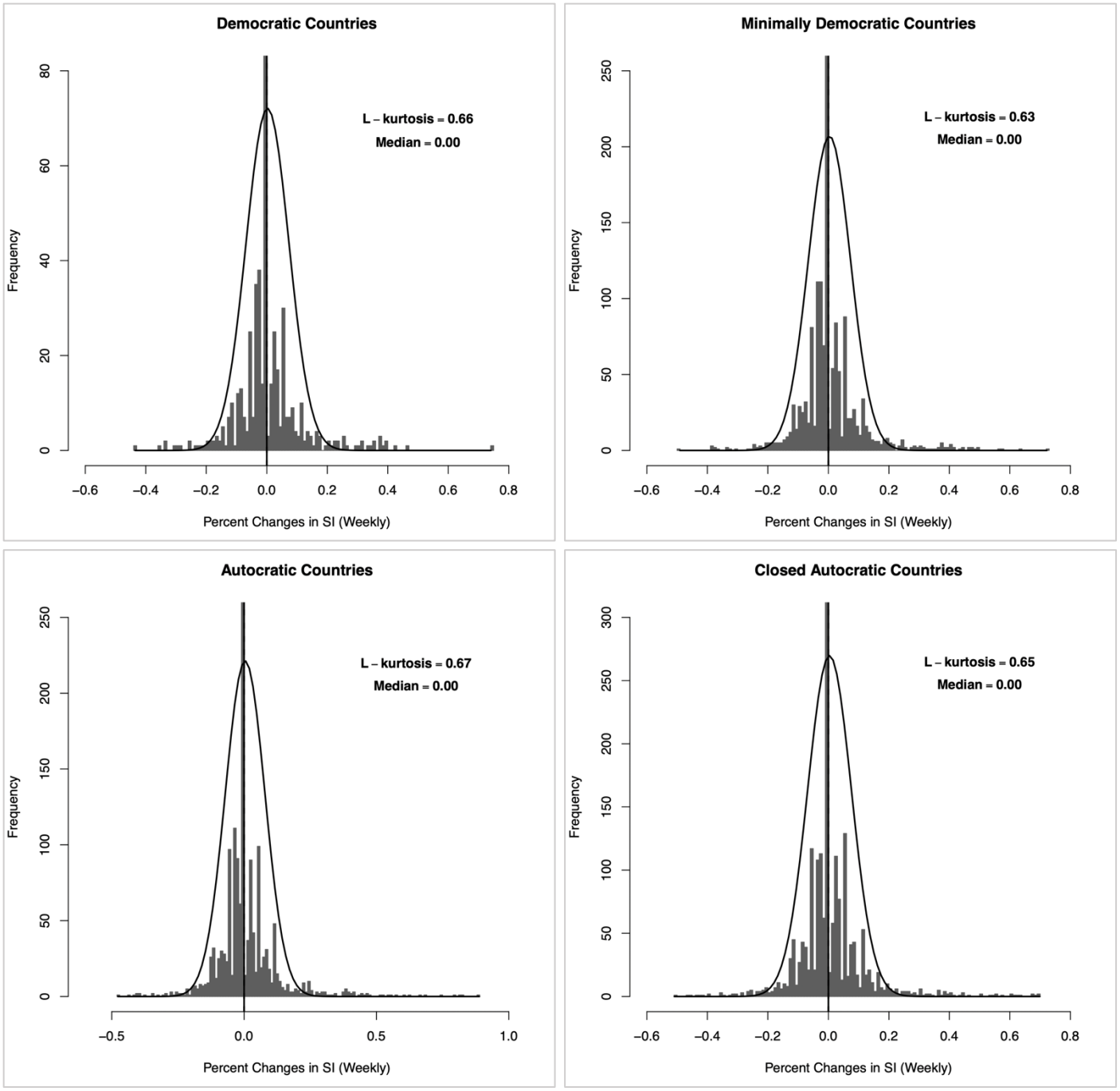
The univariate distributions of percent weekly SI policy changes across the four different political systems are shown in Figure 2. Unlike the GRI, which represents COVID-19 related policy across the three broad categories of containment, economic support, and healthcare, the SI is a measure of policy with respect to containment measures (i.e., school and workplace closings, restrictions of public gatherings, restrictions

on domestic and international travel, etc.). Evaluating the distributions of these policy changes adds another dimension to our analysis as it focuses on a subset of containment policies that have been heavily politicized owing to their adverse impact on economic activity and violations of human rights (Akovali & Yilmaz, 2020; Deb et al., 2020; de Mesquita, Kapilashrami, & Meier, 2021; Vervoort & Bookholane, 2021; Zweig et al., 2021). For instance, in the US, though containment policies had broad support across partisan lines in the initial stages of the pandemic, their impact on economic activity and mental health (Deb et al., 2020; Henssler et al., 2020) resulted in acute partisan differences in later stages (e.g., February 2021) (Schaeffer, 2021). By evaluating the changes in containment policies, the idea is to capture whether the distributions of such divisive policies are characterized by PET dynamics and whether there are substantial variations in these dynamics between nations.

Figure 2 further corroborates the finding that PET dynamics hold true across different political systems. Percent changes in SI policy indicators show high L-kurtosis (> .123) and leptokurtic distributions. Similar to Figure 1 above, the distributions of SI policy changes demonstrate comparably leptokurtic policy change distributions with only slight nuances between the different political systems. The univariate distributions for minimally democratic countries are observed to be only slightly less leptokurtic (L-kurtosis = .63) when compared to the distributions for democratic (.66) and autocratic countries (.67). The distribution for autocratic countries is observed to be the most leptokurtic—featuring larger policy punctuations—though relative to the other types of political systems, the difference is insubstantial. These results indicate that PET dynamics are observable in different political systems in times of crisis, however policy punctuations are not noticeably different between the different systems, at least not in the case of COVID-19 containment policies as measured by the SI.

The results displayed in Figure 2 corroborate the findings of Figure 1. Thus, we can conclude that the existence of PET dynamics is not limited to annual policy change trends. The results of this analysis further support the findings and demonstrate that PET dynamics are characterized by temporal invariance and the expectations of the general punctuation thesis hold true even in compressed time frames, particularly during crises.

Figure 2. Univariate Distributions of Percent Weekly Changes in SI Policy Indicators Across Different Political Systems



In the next stage of analysis, the countries within each of the groupings of political systems are disaggregated to get a finer picture of punctuated policymaking across groups of nations and the variation within each grouping. This is displayed in box plots.

Policy Change Distributions – All Indices

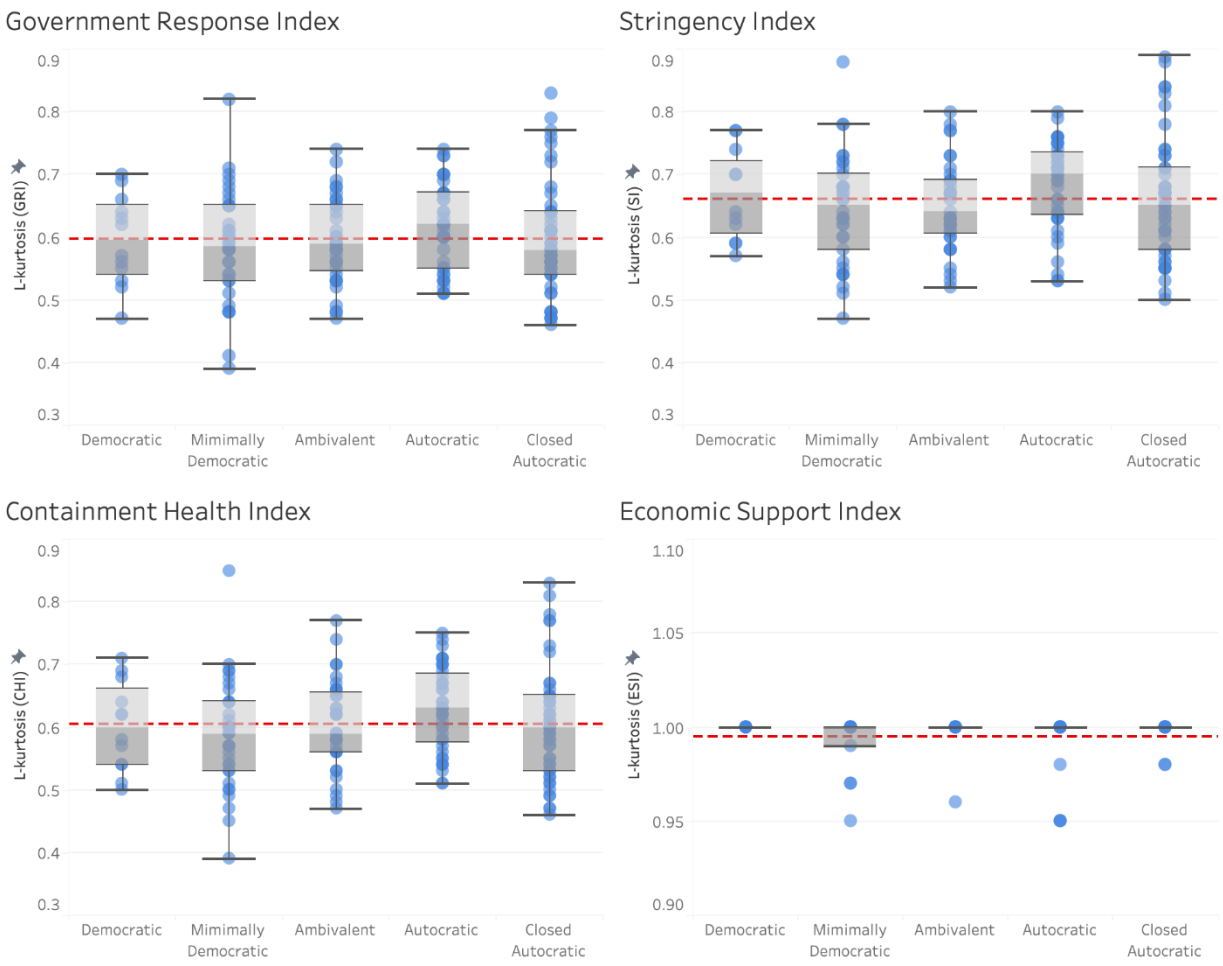
The L-kurtosis for policy change across the different types of political systems for each of the four policy indices (i.e., GRI, SI, CHI, and ESI) are displayed in Figure 3. Each of the box plots illustrate the range and average L-kurtosis for the countries within each type of political system as well as averages across political systems. L-kurtosis values are consistently high across all nations and political systems (>0.39) for each of the policy indices. For the GRI, minimally democratic, ambivalent, and closed autocratic[1] nations have median L-kurtosis values (.60) that are lower than the average across all political systems, while median L-kurtosis values for autocratic nations (.62) are above the average. This suggests that autocratic nations undertook more radical policy changes than other political systems, however the difference again is quite minimal.

The spread of L-kurtosis values for democratic nations is the smallest, indicating that democratic nations pursued quite similar policy responses. In contrast, the spread of L-kurtosis values for minimally democratic and closed autocratic nations shows the most variation, with minimally democratic nations showing substantial outliers, including Vanuatu showing a highly leptokurtic policy change distribution (.82) and Australia showing a lesser leptokurtosis (.39). It is worth noting that L-kurtosis values for policy change for the GRI and CHI policy indices are quite similar across nations—which appears to be in large part due to the nested nature of the indices.

L-kurtosis for SI policy changes suggest a wide variation for minimally democratic nations as opposed to democratic nations, which again appear to have more uniform policy responses. Democratic nations illustrate slightly more punctuated policy changes (median L-kurtosis = .67) than average with respect to containment policies. In comparison, minimally democratic and ambivalent nations demonstrated median L-kurtosis values lower than average and autocratic nations once again demonstrated more punctuated policy making (median L-kurtosis = .70). Again, the differences in median L-kurtosis between types of political systems are quite small, ranging from .64 to .70.

[1] It is worth noting that although these results suggest that closed autocratic nations were characterized by slightly less punctuated policymaking during the pandemic as compared with the other types of political systems, there have been criticisms regarding whether some closed autocratic countries (i.e., China, Guatemala, Iran) have objectively reported data on pandemic policies (Calgua, 2022; Osmani, 2020). For this reason, the results, particularly as they relate to closed autocratic nations, must be interpreted with caution.

Figure 3. Box Plots of Policy Change Distributions



CONCLUSION

Evaluating policy change distributions across a wide range of political systems in a compressed timeframe and during crisis conditions offers notable insights into the generalizability of PET dynamics. The results of the preceding analyses indicate the presence of PET dynamics across a broad range of political systems. Surprisingly, contrary to the expectations of PET literature, the results of our analyses demonstrate the *absence* of notable variations in univariate distributions of policy change between democratic and non-democratic nations. Though there are relatively higher L-kurtosis values and more leptokurtic policy change distributions in autocratic nations, indicating the presence of greater episodic punctuations (Baumgartner, Jones, & Mortensen, 2014), on average, the differences are not large when compared to other types of political systems. As autocratic nations feature less institutional friction—in the form of fewer checks and balances—and greater centralization in decision making than their democratic counterparts, the expectation is that these lower levels of institutional friction should be associated with more large-scale policy changes (i.e., policy punctuations) (Jones, Sulkin, & Larsen, 2003).

Like changes in broad policy indicators captured by the GRI, the distributions of containment policy changes captured by the SI are highly leptokurtic for all political systems and characterized by many episodic punctuations. In fact, distributions of changes for containment policies are nearly identical for democratic and autocratic countries—indicating that varying levels of institutional friction have had little influence on the PET dynamics displayed in each of these groups of political systems. There are a few explanations for this including (1) the presence of bounded emulation and (2) policy learning influenced by ideational and institutional factors. As democratic and autocratic nations are characterized by similar leptokurtic distributions of policy changes in containment policies (L-Kurtosis = .66 and .67 respectively) and blanket national-level lockdowns have been observed across both developed and developing countries (Haas, Khan, & Khwaja, 2020), our analysis provides empirical evidence for the presence of bounded emulation. As policy processes in crises tend to be characterized by bounded emulation or policy learning, with each of these associated with either high levels of urgency or high levels of uncertainty (Lesch & Millar, 2021), it stands to reason that the high levels of urgency that have characterized the COVID-19 pandemic have brought about bounded emulation in policymaking.

The use of heuristics to guide policymaking enables decision makers to take advantage of cognitively accessible policy solutions of geographically or ideationally proximate peer nations (Lesch. 2021; Lesch & Millar, 2021). This type of policymaking offers the benefits of efficiency—enabling decision makers to swiftly respond to policy situations where high levels of urgency require immediate action and delays, or inaction, can be costly (Lesch & Millar, 2021). Further, such emulation, particularly when governments adopt perceived policy successes, results in policy innovations that are non-incremental (i.e., punctuations), though they are the result of an incremental learning process that focuses on the simplification of complex policy decisions (Boushey, 2010). In fact, this may explain the disproportionate policy responses depicted by countries in the pandemic (Shafi & Mallinson, 2022). For instance, countries that followed bounded emulation in policymaking rather than policy learning may have adopted a one-size-fits all approach to policymaking via emulating peer nations. This explains policy responses that are incompatible with actual virus transmission in each nation, as nations pursuing bounded emulation would not necessarily be tailoring their responses to domestic circumstances.

Nearly identical leptokurtic policy change distributions for containment policies across democracies and autocracies are also explained by policy learning processes that are influenced by ideational or institutional factors. Democratic nations have been more reluctant to implement restrictive policies as these are in stark contrast to the fundamental principles and ideologies of democratic institutions (Engler et al., 2021). Instead, they opted to implement such policies only once containment become unavoidable due to rapidly rising COVID-19 case rates, and then rapidly de-escalated once case rates stabilized (e.g., New Zealand).

It is worth bearing in mind that though autocratic and democratic countries have shown comparative similarities in L-kurtosis, with highly leptokurtic distributions (particularly for SI policy changes), the reasonings behind such similarities are arguably quite varied. For instance, the reluctance to implement restrictive policies in keeping with democratic principles and ideologies may hold true for democratic nations but is hardly applicable to autocracies and closed autocracies. Rather, in the case of non-democratic nations, the factors which influence policy learning processes would be institutional rather than ideational—as is the case in democracies. The presence of highly centralized institutions of governance and restrictions on the flow of information present barriers to policy decision-making. As policy learning processes involve decisionmakers updating their policy beliefs through community engagement, expert consultation, and stakeholder input (Breetz, Mildenberger, & Stokes, 2018; Haas, 2004; Millar et al., 2020), the centralized nature of autocratic and closed autocratic nations can present an obstacle to policy learning. This is because concentrated power in autocratic institutions provides little

opportunity for broad groups of stakeholders to participate in politics or articulate their interests, and this lack of opportunity extends to public interests as well (Schmidt, 2014). Such barriers to learning cause delays in policy responses and result in severe policy punctuations as political systems are less efficient or capable of addressing policy issues judiciously (Jones, Epp, & Baumgartner, 2019).

As policy change distributions across all political systems and for each of the policy indices for the 28-month period are consistently leptokurtic (see Figure 3), our analyses demonstrate that punctuated equilibrium dynamics are characterized by temporal invariance, holding true in compressed time frames during periods of crisis. This is explained by policy processes, following policy learning or bounded emulation, that are dynamic and adaptive with policy innovations adjusted as new information, quality evidence, and contextual conditions change (Walker, Rahman, & Cave, 2001). In the case of COVID-19, this has been demonstrated by the shifting of policymakers' stances on masking mandates—initially discouraging and later supporting and even requiring mask-wearing—as new information and scientific evidence became available (Bai, 2020; Davidson, 2020). As temporal invariance is an implicit assumption of PET and has remained unaddressed in the subsequent and prolific body of work that has assessed its generalizability. Thus, this study is a consequential contribution to PET scholarship, as prior research has focused on annual budgetary changes, whereas the evaluation of sub-annual policy changes warrants attention.

There are a few limitations to these analyses. For one, this study uses descriptive analyses only. Granted, much of the PET literature evaluates the presence of PET dynamics with univariate analyses. Another limitation is the aggregation of policy at the country-level. As policy indicators are coded at the country level, the indices capture the most stringent government policy in effect in each nation—despite variations in policy across different subnational jurisdictions (i.e., states or provinces). For instance, there has been substantial variation in policies adopted across states in the US, with Republican-led states instituting less stringent policy reforms than Democratic-led states, regardless of local COVID-19 spread (Hallas et al., 2021).

This study presents opportunities for future research and engagement with PET scholarship and the literature on different types of policy processes during periods of crisis. The conceptual and empirical distinctions between policy learning and bounded emulation warrant further exploration. Research would benefit from examining how these different processes influence PET dynamics. For instance, are bounded emulation processes more likely to produce policy punctuations in their aftermath as compared to policy learning that relies on greater deliberation and a comprehensive evaluation of policy issues and solution alternatives? Though it stands to reason that policy decisions made in haste (i.e., bounded emulation) would require more incremental adjustments than those made with greater deliberation (i.e., policy learning), an empirical evaluation of such an observation is warranted.

An additional challenge is the relationship between uncertainty and urgency and the types of policy processes followed. During a crisis, policy processes tend to follow policy learning under conditions of high uncertainty, whereas bounded emulation is more likely in cases of high urgency (Lesch & Millar, 2021). What then is the course of action when crises are characterized by *both* high uncertainty and high urgency such as the COVID-19 pandemic? In-depth case studies would be useful for evaluating whether each of the contextual factors may take precedence (i.e., urgency vs. uncertainty) depending on the salience of each to decisionmakers. For example, in the case of the COVID-19 pandemic, it may be argued that a high level of uncertainty was more salient to policymakers in the initial stages of the pandemic when minimal information and scientific evidence were available. However, spikes in virus transmission would

provide ample cause for high levels of urgency to be perceived as more salient to policymakers, resulting in the emulation of policy solutions by peer nations.

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