Representative Systems and Policy Punctuations*

by

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Abstract

This paper examines how the characteristics of political institutions impact the extensiveness of budget punctuations. We develop a theory based on an adaptive systems framework from policy process studies of budgeting, and posit that institutional factors that impede democratic responsiveness lead to inefficiencies that cause policy changes to become more punctuated. Based on previous research on policy responsiveness, we hypothesize that national budgets become more punctuated with increases in federalism, electoral proportionality, and executive dominance. We test our theory using Eurostat and International Monetary Fund (COFOG) budget data from 24 countries 1996-2011. Our results strongly support the proposition that more federalized systems produce more budget punctuations, but provide only weak support for the propositions that proportional systems and those with dominant executives do so. The general proposition that institutions can impede the efficient processing of information receives some support, and warrants further investigation.

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In this paper, we address the conditions associated with punctuations in government budgets. A change in either direction that is large in magnitude relative to what would be expected from a Normal distribution of budget changes is considered a *punctuation*. It is well established that budget punctuations are more frequent occurrences than the once-standard incrementalist models suggest (Jones and Baumgartner 2005). Moreover, the causes of general patterns of punctuations are likely associated with the processing of information in a political system and the nature of the system's governing institutions. The general resistance to the flow of information, termed *friction*, is particularly important, because it leads to earthquake-type change dynamics (Jones, Sulkin, and Larsen 2003; Jones and Baumgartner 2005; Jones and Baumgartner 2012).

Now students of comparative budget processes are beginning to examine the conditions under which budget punctuations are attenuated or acerbated. In particular, evidence is accumulating that the structure of government matters in the relative size of policy punctuations. Some systems allow for more efficient processing of information and demands from the external environment than others. For example, authoritarian regimes are characterized by larger policy punctuations than democratic ones (Baumgartner, Epp and Rey 2015). Moreover, within democratic regimes, there is evidence from comparative policy studies and from analyses of US state governments that variation in formal policymaking institutions can result in different patterns of policy change.

Here we extend this research by examining the proposition that differences in representational systems can affect budget punctuations. In particular, we hypothesize that political systems that more faithfully represent popular opinion in the councils of government experience less extreme budgetary punctuations. In political systems that are more responsive to public opinion, fewer major punctuations in budgetary outcomes should occur, and the punctuations that do occur should be less severe.

We examine three elements of political systems that have been shown to influence this policy responsiveness across countries – federalism, executive power, and the proportionality of the electoral system – each of which has been shown to dampen opinion representation (Wlezien and Soroka 2012). Specifically, we examine whether these institutional characteristics impact the size and extent of budget punctuations. Do we find that punctuations are greater in more centralized systems? In more proportional systems? In systems with a more dominant executive?

We answer these questions using International Monetary Fund (IMF) and Eurostat budget data for 24 countries over the period between 1996 and 2011. Specifically, we use the now-standard measure of kurtosis in each country (Jones and Baumgartner 2005: 180-82). The results indicate that political institutions do matter, and particularly in how they process inputs into the policymaking process.

Adaptive Systems

Theories of public budgeting emerged from what we would call today an *adaptive systems* framework (Miller and Page 2007). Any system interacts with its

environment in a way that reflects both the nature of the environment and the internal

constraints of the system itself. Most of the early budget studies focused on the

internal dynamics of budgetary processes, and yielded major advances.   As Simon

(1996; see also Jones 2001) emphasizes, human organizations are continually adapting

both to external flows of information and the internal structure of the organization,

including the cognitive capacities of the human actors who occupy positions in the

organization.

Early models of budgeting emphasized internal organizational dynamics.

Wildavsky's (1964) incrementalist model, developed from his incisive observations of

budget construction in the US federal government, centers on the limited rationalities of

decision-makers and the emergence of heuristic rules for building budgets. The first

efforts at assessing the incrementalist model used a regression framework with

budgetary change within policy categories as the dependent variable (Davis, Dempster,

and Wildavsky 1966; 1974). While this system worked reasonably well, the investigators

had to insert dichotomous variables to indicate differences in "budgetary eras" to

achieve satisfactory statistical fits.

John Padgett transformed our view of the incrementalist model in a path-

breaking paper in 1980 in which he showed that the incrementalist model implied that a

distribution of first budget differences would be Normal.[1]   Padgett's data on annual

budget requests were far from Normal. His paper exposed a serious flaw in the

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[1] Heterogeneous budget estimates, that is, cross-category estimates, imply Student's t
distributions.

incrementalist model, and offered an approach to addressing the internal dynamics of budget systems. But it did not grapple with the impacts on a budgetary system of external flows of information.   A decade and a half later, Padgett's stochastic process approach became central to tests of the punctuated equilibrium model (PET) of policy change (Jones, Baumgartner, and True 1998; True, Jones, and Baumgartner 1999).[2]

Neither punctuated equilibrium nor Padgett's serial search model imply a direction to change; rather they specify a distribution of magnitudes of change across budget categories. In particular, punctuated equilibrium theory implies a distribution, by comparison with the Normal distribution expected in incremental models, in which many budget changes are very small, more than expected are very large, and fewer than expected are moderate. As a consequence of this expectation, scholars use kurtosis as the appropriate measure of distributional budget changes.

As the punctuated equilibrium approach developed, it became clear that any successful approach would need to incorporate both the external flows of information and demands into a system and the internal organizational dynamics of the budgetary system. In each case, simplifying assumptions were necessary to make progress. The general approach was based in information-processing at the system level. Any adaptive systems processes information from its environment, but it does not do so in a perfectly efficient manner. Environments are complex, providing multiple streams of

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[2] The stochastic process approach used by Jones, Baumgartner, and True continued to meet considerable resistance among budget scholars, and their early studies were set up as time series regressions until 1999—almost 20 years after Padgett's breakthrough paper.

information, including demands and incentives for action. Signals are uncertain and often hard to decipher and order relative to their relevance.

Response is limited (or facilitated) by the internal structure of the system. Response can be limited by the particular heuristic rules that the budget system uses to set appropriations levels to agencies, which often operate against moving aggressively even in the face of strong signals of problems. Or the detection and interpretation of signals may be limited by the system's structure—incentives, for example, that encourage focusing on internal dynamics, such as bureaucratic infighting rather than problem detection. Jones (2001) summarized this inability of human organizations to match actions to information *disproportionate information processing*, in which policymaking systems underreact to flows of information, only to overreact at a later time. Jones, Sulkin, and Larsen (2003) and Jones and Baumgartner (2005) set the question of response to incoming signals as a cost problem in which a political system would respond only if the costs of action were not too high. They summarized this cost structure as *friction*, of which there were two types: cognitive friction and institutional friction. The former results from the boundedly rational cognitive abilities of actors, whereas the latter stems from the institutional and organizational structure of policymaking institutions.

Friction

Policy punctuations may be viewed through the lens of a particular form of friction: stick-slip dynamics, which describes earthquakes, avalanches, sinkholes, and other processes in which resistance is overcome suddenly (Jones and Baumgartner

2012). Scholars investigating policy punctuations have developed models, termed *error accumulation* models (Jones and Baumgartner 2005) to account for this form of major change. Error accumulation captures the common observation that the earlier a problem is addressed, the less resources have to be directed at solving it. Errors, or mismatches between problems emerging in the system's environment, may accumulate over time as problems are neglected. The longer errors accumulate, the more powerful the punctuation that results as the adaptive system adjusts**.**

Earliest studies traced the level of institutional friction along the policy cycle— from agenda-setting to decision-making to outputs within the US national policymaking system. As a proposal moves along the policy cycle, punctuations increase (Jones, Sulkin, and Larsen 2003). The level of friction was approximated by the magnitude of kurtosis in policy change distributions. Similarly, public opinion weakens as an influence on policy as policy action moves from agenda-setting to decision-making to law passage (Jones, Larsen, and Wilkerson 2009). A study of the US, Denmark, and Belgium using similar methods indicated variations in punctuations across the policy cycle, but resistance was higher earlier in the process in those parliamentary systems (Baumgartner et.al 2009; see also Bevan and Jennings 2013). There also is evidence, although weaker than the within-system results, relatively more policy punctuations occur in political systems characterized by high levels of friction (Jones et al 2009).

These studies focused primarily on institutional friction. As traditionally viewed, for example via the veto players literature (Tsbellis 2002), these costs are what Buchanan and Tullock (1962) called *decision costs*, a term adopted by Jones, Sulkin and

Larsen (2003). These are costs of coming to a decision when preferences differ. But systems can incur costs even when all actors agree on a goal. People do not process multiple streams of information very well and neither do organizations when these streams must be combined (Jones 2001). In some cases, organizational design can affect the ability of a system to detect and prioritize problems (May, Workman, and Jones 2006). In general, centralized organizational structures are less consistent in output production due to the inability to process multiple diverse streams of information (Baumgartner and Jones 2015).

Information

This line of thought has led to the idea that policy punctuations are in some sense pathological, in that they indicate a more severe mismatch between problems in the system's environment and an appropriate policy response by government. Research implies that centralized authoritarian regimes are less efficient at in processing information, as they generate more punctuated policy changes. Lam and Chan (2015) found that budget punctuations were more prevalent after the transition from British to Chinese rule in Hong Kong. Baumgartner, Epp, and Rey (2015) present a more general analysis in regimes moving from more to less authoritarian regimes, with similar results.

Like all organizations, a political system adapts to the information coming in from its environment, subject to the system's internal constraints. Any internal aspects of the political system that make this processing more efficient should lead to less severe policy punctuations. Robinson (2004); Robinson, Meier, O'Toole, and Caver (2006) show that budget punctuations are less likely in school districts where more

professional governing structures are employed. It is likely that these systems make

fewer errors in estimating revenues, and hence have to initiate fewer budget

corrections.

The size of policy punctuations can be reduced in two ways: either by lowering

the friction in the system (Jones and Baumgartner 2012; Jones et al 2009; Bevan and

Jennings 2014) or decreasing the error in signals that point to needed policy

adjustments (Robinson 2004). A system that is better at processing information is more

likely to experience less extreme punctuations. This is a direct implication of the error

accumulation model (Jones and Baumgartner 2005), which predicts that the extent to

which errors accumulate in a system related to the magnitude of policy punctuations.

One major element of the flow of information is public opinion. What the public

wants is especially important because it carries an implicit electoral threat to political

leaders, at least in representative democracies. Expressed opinion also communicates

information for officials interested in representing the public for other reasons. The

match between preferences and policy represents an equilibrium of sorts; a mismatch,

by contrast, is disequilibrium, in effect an error susceptible to correction.[3] A

government is considered to be *responsive* when its public policy outputs follow public

preferences, particularly as those preferences change. It provides greater *representation*

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[3] Of course, representational inefficiency also can result from the failure to correctly
represent priorities (Baumgartner and Jones 2004; Jones, et al 2009; Bevan and
Jennings 2014).

when public policy is brought closer to public preferences.[4]

A considerable body of evidence has accumulated in support of the thermostatic model of opinion and policy (Wlezien 1995, 1996; Erikson et al. 2002; Soroka and Wlezien 2005, 2010; Jennings 2009; Wlezien and Soroka 2012; Ura and Ellis 2012; Ellis and Faricy 2011; Enns and Kellstedt 2008; Kellstedt 2003; Bartle et al. 2011). In the model, when the actual policy "temperature" differs from the preferred policy temperature, the public would send a signal to adjust policy accordingly. If policymakers in turn respond, by producing policy that is closer to what the public wants, the public would prefer less policy change, that is, there would be negative feedback.

Research indicates that the thermostatic model does not always work and that it does not work equally well even where it does. Issues matter. Political institutions do as well. This may have consequence for policy, as we expect larger punctuations where opinion is ignored or is difficult to respond to because of the level of friction in the system. The greater the responsiveness to opinion, we argue, the lower the accumulation of representational errors, which leads to fewer policy punctuations.

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[4]Thus, in terms of the literature on the opinion-policy relationship, we see "representation" occurring to the degree that there is *congruence* between public preferences and public policies, not responsiveness per se. For a demonstration of the distinction, see Achen (1978); for a review of what research does (and mostly does not) tell us about opinion-policy congruence, see Wlezien (n.d.).

Key Hypothesis: Efficient Opinion Representation Leads to More Efficient

Policymaking

This role for public opinion implies that facets of political systems that are associated with responsiveness to opinion would produce more efficient policymaking systems—that is, fewer and less extreme policy punctuations. Assessing representational efficiency directly is possible in theory by noting the correspondence between opinion and policy outputs (Soroka and Wlezien 2010; Wlezien and Soroka 2012; Bertelli and John 2014). Doing this in practice is seriously limited by data availability, however. First, it is difficult to assess actual opinion-policy congruence in most policy areas in most countries, so we cannot tell for sure whether the public is getting what it wants and, if not, how much more or less. This partly reflects the fact that we usually cannot tell how much policy the public wants but also from the difficulty in actually matching up measures of policy and those preferences (see Wlezien N.d.). Second, while we can more directly assess responsiveness, either across policy domains or within domains across time, even this is possible only in the handful of countries where we have reasonable time series (see Soroka and Wlezien 2010). That is, we simply do not know how well the thermostatic model works in any policy domains, taken separately or together, in most countries.

We can still make progress in unifying the thermostatic and punctuated models by testing our hypothesis indirectly. In other words, we can examine the effects of institutional characteristics that influence opinion representation based on previous research, discussed above. Specifically, research implies that three factors are

particularly important: federalism/decentralization, electoral proportionality and

executive dominance.

Federalism. Federalism contributes to the supply of information available for

policymaking, because of the experimentation that takes place in sub-national units of

government (Boushey 2012). But research shows that it also weakens the demand for

policy, and makes it more unreliable, by confusing lines of authority for voters (Soroka

and Wlezien 2010; Wlezien and Soroka 2011). This is true to the extent that there is a

mixing of different governments in particular policy domains, i.e., as in the classic

marble cake model.[5] Accordingly, federalism complicates the signals the public sends to

policymakers, making them less reflective of true public preferences.[6] By implication, it

complicates representation of those preferences. The result is error accumulation that

"needs" to be corrected. Thus, we propose the following hypothesis:

Hypothesis 1: *More federalized systems will have more budget punctuations*

Proportionality in Party Systems. The proportionality of electoral systems has

been shown to impact the degree of representation. Here, proportionality refers to the

number of parties, not the match between votes and seats. There is evidence that

governments in proportional systems mirror the preferences of the general public right

after an election (Powell 2000). But, other research shows that they have trouble

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[5] We might expect layer cake models of federalism to produce more efficient
representation. Clear jurisdictional boundaries direct signals from the public to the
appropriate policymakers (Soroka and Wlezien 2010), while parallel processing allows
each government unit to reduce disproportionate information processing (Jones 2001).
[6] For further consideration of the mechanisms involved, see Wlezien and Soroka
(2011).

adjusting to changing inputs in between elections (Wlezien and Soroka 2012; Soroka and

Wlezien 2015). Specifically, coalition governments have more difficulty in adjusting to

opinion changes, and this increases the more diverse and fragmented the government.

Larger and more diverse coalitions have difficulty collectively agreeing to the

appropriate policy change as signals from the electorate introduce new information into

the political environment (Wlezien and Soroka 2015). Again, error accumulation is a

possible result, particularly as the tenure of a government unfolds. Thus, we propose

the following hypothesis:

> Hypothesis 2: *Systems with a greater number of political parties will have more*
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> *budget punctuations.*

Executive Dominance. The literature on executive power suggests that high

levels of centralized power lead to larger policy punctuations and more policy reversals.

This holds in American states with strong governors (Breunig and Koski 2009). And, in

cross-national analyses, authoritarian systems seem to be more prone to policy

disruptions (Baumgartner, Epp and Rey, 2015). Wlezien and Soroka (2012) provide a

possible (mis-)representational basis for such patterns. They show that systems with

strong executives tend to be less responsive to public opinion by comparison with those

in which there are more checks and balances. The latter seemingly allows greater "error

correction" (Wlezien 1996; also see Soroka and Wlezien 2010). The compromise,

bargaining, and information exchange that takes place when executives and legislatures

must cooperate in order to change policy leads to greater responsiveness. More

dominant executives, on the other hand, incorporate less outside information into their

decision-making, and so are expected to be less responsive to signals coming from the public.

To the extent this is correct, we would expect punctuations to increase with executive dominance and decrease with balance.[7] Thus, we propose the following hypothesis:

Hypothesis 3: *Systems with more dominant executives will have more budget punctuations*

Data

Dependent Variable: Efficiency in Budgeting Systems

To test these hypotheses, we first developed a dependent variable representing efficiency in public policy. Changes in budgets have been used extensively by scholars to measure policy change (e.g., Jones, Baumgartner, and True 1998, Jones et al, 2009, Jones, Sulkin and Larson 2003).

We drew our data from two sources utilizing the Classifications of Functions of Government (COFOG) system to account for government expenditures across policy areas. The first source is Eurostat's Government Expenditure by Function dataset

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[7] It is possible that there can be too much checking and balancing, which could make it hard to undertake any policy change, per Tsebelis' (2002) veto player logic. (According to Tsebelis, the larger the number of veto players, the harder to make policy change.) As such, there may exist a non-linear, possibly quadratic relationship between executive power and budget punctuations, where the latter are greater both where there is too much and too little balance.

(Eurostat 2015), which included budget expenditures for 21 EU countries in our dataset. The second is the IMF Government Finance Statistics Yearbook (IMF 2014), which included budget expenditures for 17 advanced economies in our dataset. We limited our analysis to the 1996-2011 period because those are the years for which we have data from both sources.[8]

For our analysis, we use the L-kurtosis of percent changes in central government expenditures across policy areas. L-kurtosis is a commonly used summary statistic measuring the kurtosis of a distribution, ranging from zero to one. An L-kurtosis of .123 represents a Gaussian normal distribution (see Breunig and Jones 2011). Higher scores indicate the presence of both more incremental policy changes and more extreme ones, a condition termed leptokurtosis. Lower scores indicate flat, non-peaked distributions (platykurtosis), not observed in budget data. We expect an efficient adaptive system to have a normal distribution of changes, and that a less efficient system will have a higher L-kurtosis.[9]

To produce our measures, we then estimated the L-Kurtosis of percentage changes in real expenditures across budget categories and years in each country. To generate an estimate for each country, we averaged the kurtosis estimates for each

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[8] Our sample is ultimately limited to the 24 countries with tax autonomy data in the OECD's Fiscal Decentralization Database used to construct our federalism variable, introduced below.

[9] Because L-kurtosis is an estimate, it is subject to sampling error. Moreover because it measures deviations from a Normal distribution, different distributions can have similar kurtosis values (DeCarlo 1997). These limitations should not affect the research strategy we employ in this paper.

budget category for each year of the study, and then averaged the results across the available years. This procedure yielded L-kurtosis scores for 24 countries based on budget change data pooling across 10 budgetary categories for the period 1996-2011.

To gain stability for the country budget kurtosis estimates, we calculated using each data source and pooled scores, averaging for countries with data from both sources. This allows observations for 24 countries that report the data to the OECD used by our federalism independent variable (see below) over the 1996-2011 period. That the correlation between the percent changes for Eurostat and IMF data sources is a healthy 0.99 supports pooling where data are missing, though results generally hold using either data set, exceptions to which are noted below.[10]

Table 1 shows our dependent variable and its components across the 24 countries in our dataset.   Here we can see that L-kurtosis estimate for each data set and country is greater than we would expect (0.12) were budget changes normally distributed. This implies that all systems are to some extent inefficient – that policy errors occur and accumulate, leading to large corrections. This is not surprising given what we know about the policymaking process. As can be seen in Table 1, the degree to which it is true varies tremendously across countries. The L-kurtosis scores range from below 0.30 in Finland, Slovakia, Slovenia and Hungary to over 0.60 in Italy and Belgium. We are interested in seeing whether this variation reflects institutional factors that

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[10] Some budget observations are missing from the Eurostat and IMF COFOG data. A full list of the categories for each country included in the dataset is available in the Appendix.

influence policy responsiveness to public opinion. Figure 1 presents these pooled data

as a bar chart.

Table 1: L-Kurtosis Across Budget Functions

Country	L-Kurtosis (IMF)	n (IMF)	L-Kurtosis (Eurostat)	n (Eurostat)	L-Kurtosis (Pooled)
Finland	0.21	140	0.19	150	0.20
Slovakia			0.26	150	0.26
Slovenia			0.26	120	0.26
Hungary			0.29	150	0.29
Greece	0.37	150	0.26	50	0.32
Portugal	0.34	140	0.36	150	0.35
Poland			0.35	90	0.35
Denmark	0.37	135	0.32	149	0.35
Norway	0.40	146	0.32	90	0.36
Netherlands	0.39	150	0.33	150	0.36
Spain	0.35	150	0.37	150	0.36
Australia	0.36	147			0.36
France			0.39	150	0.39
United States	0.42	70			0.42
Luxembourg	0.40	67	0.46	150	0.43
United Kingdom	0.37	140	0.54	140	0.46
Czech Republic			0.47	148	0.47
Austria	0.48	147	0.48	150	0.48
Switzerland	0.45	135	0.52	60	0.48
Canada	0.56	106			0.56
Sweden	0.64	112	0.49	150	0.57
Germany			0.57	148	0.57
Italy	0.65	150	0.61	150	0.63
Belgium	0.66	138	0.67	141	0.67

Sources: Eurostat Government Expenditures Database, IMF Government Finance Yearbook 2014. Number of observations refers to the number of function-years where data is available
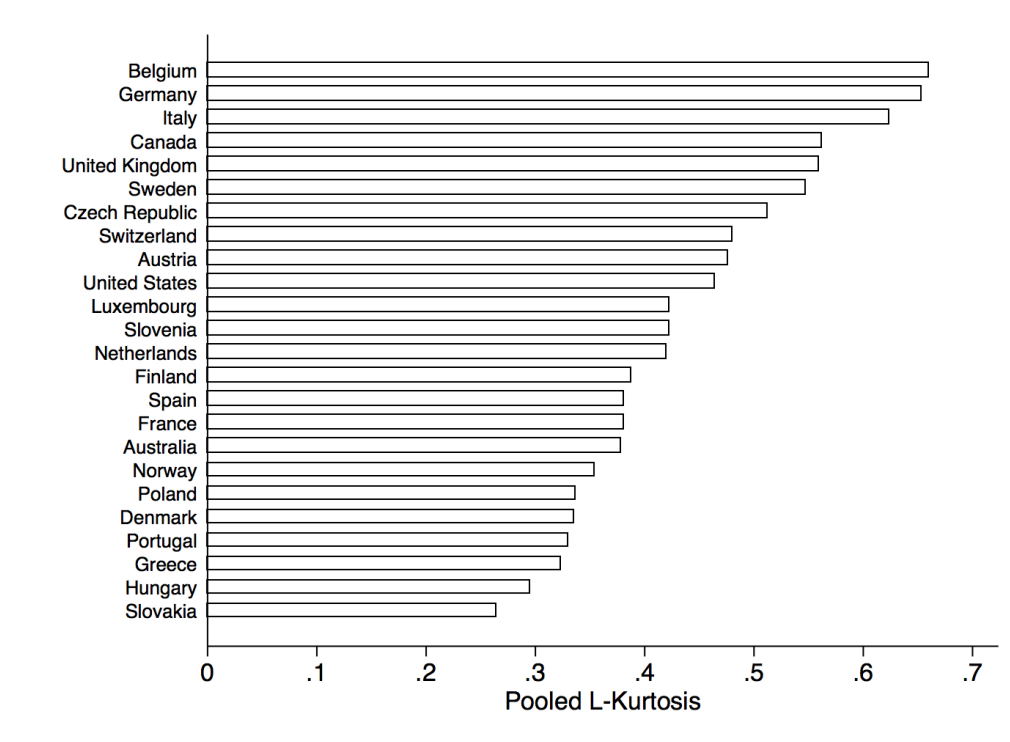
Figure 1: Pooled L-Kurtosis by Country

Figure 2 is a frequency distribution of year-to-year percentage changes of all

budget categories across all countries for the full time periods for each country for the

Eurostat data.[11] The dashed line represents a Normal distribution of changes. Each

observation is an annual percentage change for a country for a particular budget

category. Note that the graph is relatively balanced—that is, it is not heavily skewed,

but really large budget changes exist at the top end of the graph. The left side of the

distribution is bounded at -100%, but note that the shape of the distribution is not

strongly affected by this bound.[12] Second, most of the cases are concentrated in the

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[11] A similar graph for percent changes derived from IMF data is available in the
Appendix.
[12] All changes over 200% were only aggregated for Figure 2, but remained at their
original magnitude for the purposes of estimating L-Kurtosis. It is common for

low change range, implying that most budget changes are reasonably incremental, but that there are, relative to a normal distribution, few moderate changes. The dominant pattern is budget incrementalism interspersed with a disproportionate number of very large changes. The overall L-kurtosis of these data is .47, indicating a highly leptokurtic distribution of changes.

Figure 2: Real Budget Changes across All Countries and Years (Eurostat Data)
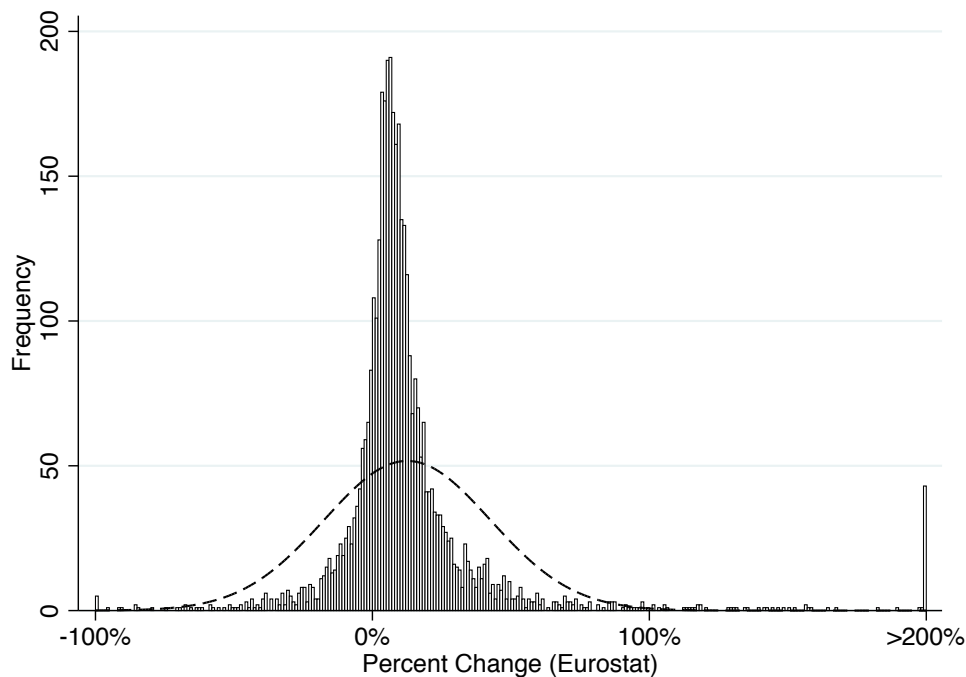
Measuring the Variables in the Analysis

We now turn to the specifics of how we operationalized the independent variables in our analysis.

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budget distributions to have very long right tails that can be difficult represent on a histogram without aggregating them at a cut-off point. For more information, see Breunig and Jones (2011).

Federalism. Wlezien and Soroka (2012) used the ratio of own-source local and state tax revenue to central government ratio to measure levels of federalism, following Rodden (2004). We improve upon this variable by incorporating levels of tax autonomy into the calculation. There is considerable variation in the degree of control that subnational governments have over their revenue systems. The OECD's Fiscal Decentralization database includes a 10-level ordinal tax autonomy variable for the twenty-four countries in our sample, separated by both state and local tax autonomy. The variable reports the percent of the subnational government's tax revenue that falls into each ordinal category, with the highest level representing complete autonomy over how taxes are collected and structured, and the lowest representing considerable control over tax policy by the central government. We constructed one measure for each country's state and local tax revenue by weighting each category by its inverse position in order. So, the highest category was weighted by 1, the second highest by .9, the third highest by .8, and so forth.

We then multiplied this number by the amount of state and local tax revenue, and divided it by the country's central government and social security revenue. The resulting variable represents the ratio of relatively autonomous subnational government spending to central government spending, with a larger ratio indicating a more federalized system. For more on our federalism variable, see Appendix Table 1. We expect a positive relationship, where more decentralized systems are less reliably representative and so have more policy punctuations.

Proportionality of Party Systems. Following Wlezien and Soroka (2010, 2012),

we measure proportionality using the average effective number of political parties

(ENPP) from Nils-Christian and Golder (2013). A country with a higher ENPP has more

political parties represented, and is therefore more likely to experience larger and more

diverse coalition governments. We again expect a positive relationship, where countries

with greater proportionality are less representationally efficient and so have more

policy punctuations.

Executive Dominance. Soroka and Wlezien (2012) relied on Lijphart's (2012)

index of executive dominance. However, Lijphart's index was only available for 19 of the

countries in our sample.[13] In order to include more countries, and also to more explicitly

(and transparently) capture executive power, we created a 3-point variable where "1"

designates a presidential system, "2" a semi-presidential system, and "3" a

parliamentary system, following Nils-Christian and Golder (2013). This admittedly is a

very coarse measure, as it ignores variation within categories, especially presidential

and semi-presidential systems. Unfortunately, there is no real alternative in the

literature. Since we rely on what clearly is an inferior measure, the results that follow

likely understate the true effect of executive power. At this point, neither the literature

nor our own investigations suggest a satisfactory alternative.[14] In any case we once

again expect a positive relationship, where systems with dominant executives are less

responsive to the public (and yet exercise more discretion), and so have more

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[13] The measure also is limited in other ways, particularly in that the coding relies
heavily on ad hoc reclassifications.
[14] Doyle and Elgie (2015) further classify semi-presidential systems as "premier-
parliamentary" and "presidential parliamentary," but using this classification to
make a substitute 4-point variable makes little difference, as noted below.

punctuations.

Table 2: Summary Statistics by Country

Variable	Obs	Mean	Std. Dev.	Min	Max
L-Kurtosis	24	0.414	0.120	0.200	0.665
Fiscal Federalism	24	0.331	0.287	0.040	1.216
ENPP	24	3.785	1.251	2.315	7.850
Executive Dominance	24	2.583	0.654	1	3

Bivariate Analyses

We first examine the bivariate relationships between budget distributions and our three independent variables. These are of particular importance in our examination, we expect there to be substantial country-to-country variation, both because of variability in measurement reliability for the budget categories reported to IMF and because of country-specific policy choices. It is worth explicitly examining this variability and how it matters.

Figure 3 shows the relationship between fiscal federalism and the L-kurtosis measure of budgetary punctuations. There clearly is a strong, positive relationship between budget efficiency and federalism. The simple correlation between the two is 0.52, and highly reliable (p<0.01). This supports Hypothesis 1: systems that are more federalized tend to produce more leptokurtic budget distributions. Although the existence of a relationship between the two variables is clear, the functional form is not. As can be seen from the figure itself, there is indication of nonlinearity, where the effect of federalism declines as decentralization increases. This implies a possible ceiling on the effect of federalism on budget punctuations, which fits with theory about decentralization and thermostatic public responsiveness to policy (Soroka and Wlezien

2010). Indeed, there is reason to suppose that the responsiveness of the public – and so

the information signals it sends to policymakers – will increase at some point, that is,

when policy is mostly and clearly controlled by local authorities. That happens at very

high levels of our measure of federalism. A logarithmic fit yields a slightly better,

though not significantly greater, correlation of 0.54.

Figure 4 depicts the relationship between party proportionality and budget L-

kurtosis.   Here we find weaker support for Hypothesis 2. Although there is a positive

effect, the correlation is a modest 0.34, which is statistically significant (p=0.08) in a

one-tailed test. The effect is largely driven by Belgium, however, as can be seen in

Figure 4. When it is excluded, the correlation drops considerably (to 0.08) and is no

longer significant. There thus is only very weak support for our hypothesis regarding

party proportionality. That said, the effect is more pronounced, if still not significant

specifically for parliamentary systems, where the effects of proportionality should be

most concentrated.[15]

The relationship between executive power and punctuations is even more

problematic, as we see in Figure 5. The main issue is the difficulty in measuring the

former, as discussed above. It thus is not surprising that the relationship, while

appropriately positive, is weak.   The correlation is 0.17 and not statistically significant

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[15] The coefficient is 0.052 (s.e.=.020) including Belgium, and 0.045 (s.e.=.031)
excluding it.

(p=0.42).[1617] It appears that executive dominance neither hurts nor helps efficient responsiveness to policy inputs. This contrasts with the previous research discussed above, which indicates more punctuations in systems with strong, independent executives.

Figure 3: L-Kurtosis and Fiscal Federalism

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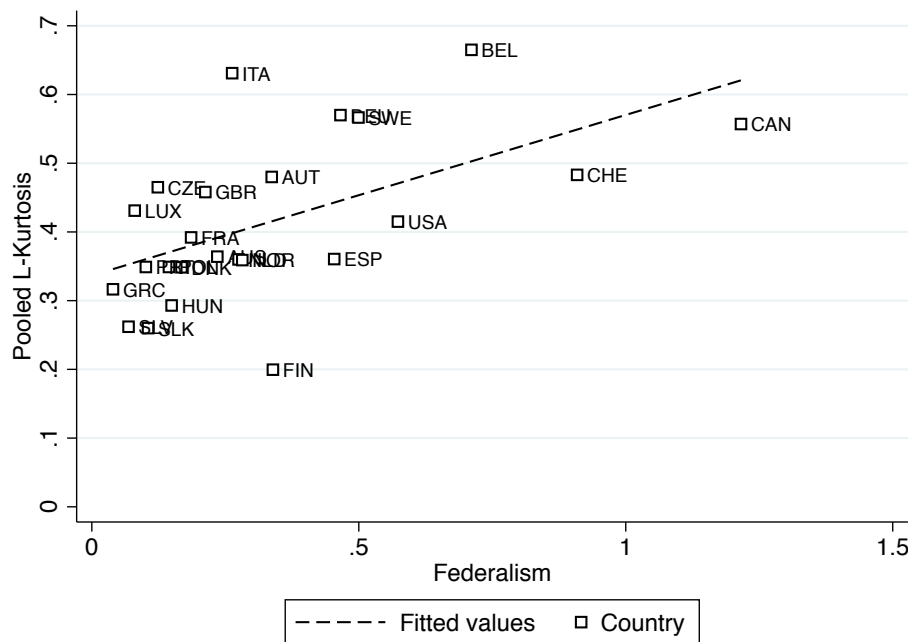
[16] We tested several different alternate formulations of executive dominance. Incorporating the tendency for government to be a coalition also does not help (p=0.53). Lumping together presidential and semi-presidential systems also makes little difference (p=0.17). The relationship is even weaker, (p=0.985) using Lijphart (2012)'s measure of executive dominance.

[17] Recall (see footnote 7) that there may be reason to expect that the relationship is non-linear, where punctuations are higher where both high and low levels of executive dominance could cause increased public punctuations. There is a suggestion of this in Figure 5, though we stop short of drawing the conclusion, as it is too demanding of the measure and the number and distribution of cases. We fit the curve with a quadratic of the form $Y = a + a_1 X + a_2 X^2$ and expect that $a_1 > 0$ and $a_2 < 0$, which yields a u-shaped curve. The correlation between the fitted quadratic and the data is 0.34—an improvement over the linear fit.

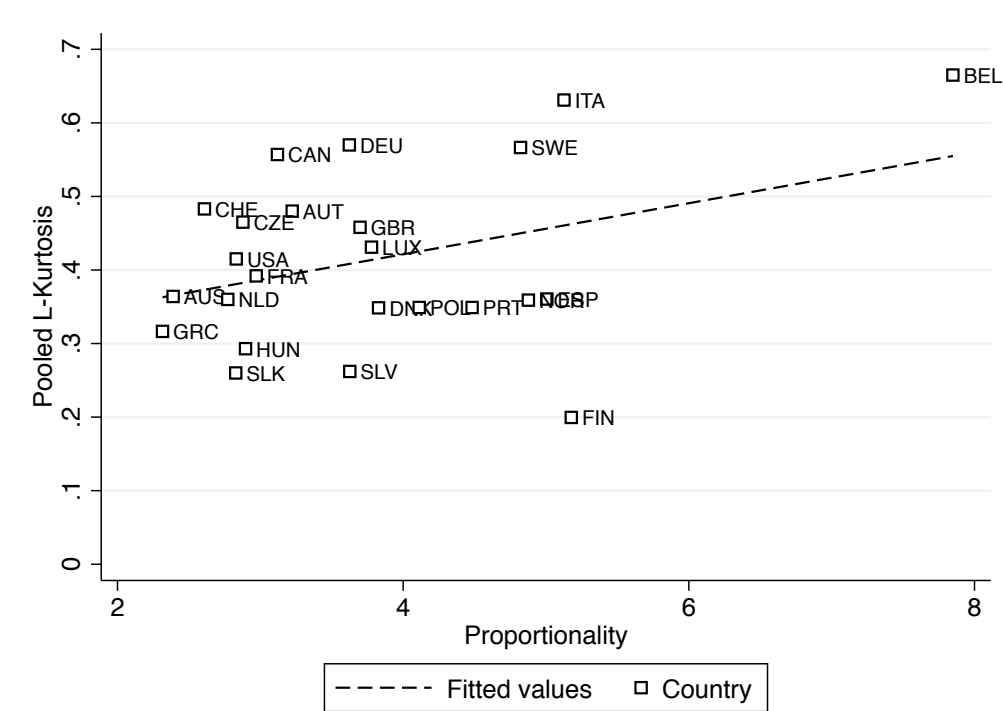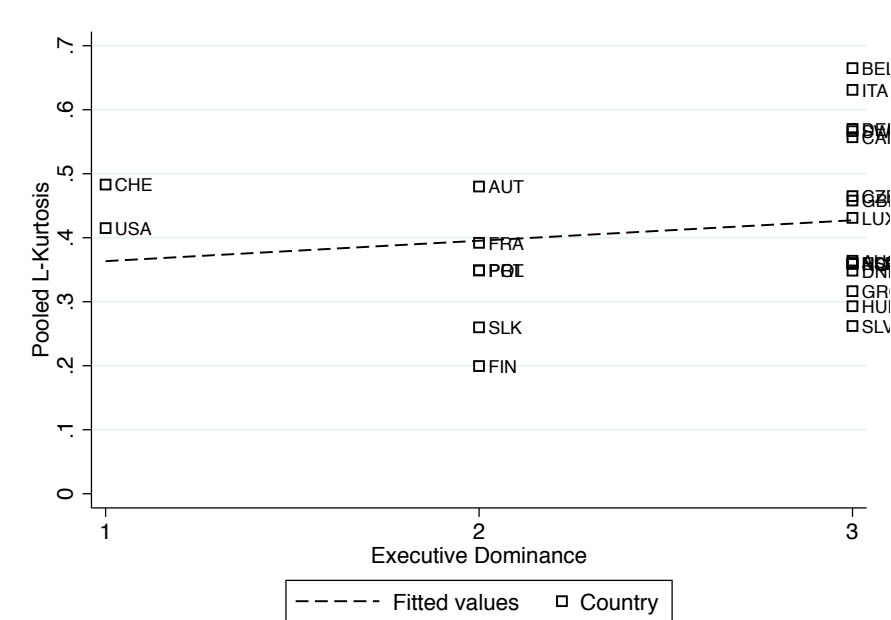**Figure 4: Budget L-Kurtosis and Proportionality**

Figure 5: Executive Dominance and Budget Punctuations.

Model Estimation and Results

Now, we turn to how these variables work together. Table 3 presents the estimates, beginning first with bivariate regressions for the relationships depicted in Figures 2-4. These results are summarized in the first three columns of the table. In Model 1, it is clear that federalism is a strong predictor of budget punctuations, explaining about 30% of the variation in budget efficiency alone. The coefficient implies that the difference between the level of federalism in Greece, which is the lower bound of our federalism variable at 0.04, and Canada, the upper bound at 1.21, accounts for an increase in L-kurtosis of 0.25, which is half of the range and equal to just more than two standard deviations. This is a sizable effect. Evidence for our other two predictors is expectedly more mixed. In Model 2, the effect of proportionality is significant at the 90% confidence level, an appropriate criterion given our hypotheses are directional. However, as discussed above, this effect is largely driven by Belgium, so we stop short of crediting it. The coefficient for executive dominance – in Model 3 of the table -- also is not significant, as we saw earlier as well.[18]

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[18] Incorporating a squared executive dominance variable makes no meaningful difference; the joint significance of the linear and squared variables is only 0.39.

Table 3: Impact of Variables on Representation Efficiency (L-Kurtosis)

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Fiscal Federalism	0.234**			0.215**	.240**
	(0.074)			(0.073)	(0.073)
ENPP		0.0347+		0.0267	0.021
		(0.019)		(0.017)	(0.017)
Executive Dominance			0.032		0.044
			(0.039)		(0.033)
Constant	0.337***	0.283**	0.331**	0.242**	.142
	(0.032)	(0.076)	(0.103)	(0.067)	(0.010)
N	24	24	24	24	24
R^2	0.31	0.13	0.03	0.39	.44
Standard errors in parentheses, + $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$					

Having documented the bivariate relationships, we now undertake how the variables work when taken together. Model 4 of Table 3 shows results of including both federalism and proportionality. There we can see that the estimated effects of both variables both are positive but slightly smaller than those from the bivariate regressions, but federalism still is a reliable predictor. The same is not true for proportionality. The results for Model 5 indicate that adding executive dominance changes things only a little. The effect of federalism remains and that for proportionality drops further still. The coefficient for executive dominance is slightly greater than we saw in Model 3, but

short of conventional standards of statistical significance.[19] In sum, only federalism

remains as a robust predictor of budget punctuations in our full model.

Exogenous Shocks

It may be that the patterns that we do see at least partly reflect exogenous

shocks rather than the nature of the representational system.   To consider this

possibility, we adjust our summary budget measure, L-kurtosis, by the GDP of countries.

This does not include all exogenous shocks, but it does account for important economic

ones.

When changes in budget categories are expressed as a percentage of GDP, there

is very little change in the structure of the distribution of changes. L-kurtosis scores

between GDP-adjusted percent changes and percent changes in real budget

expenditures correlate at (0.91). Figure 6 shows this relationship. The mean L-kurtosis of

GDP--adjusted percent changes is 0.38, significantly lower than the mean L-Kurtosis of

real currency percent changes of 0.41 (t=3.47). Adjusting for economic changes thus

produces a slightly more efficient response from governments, i.e., where the

distribution of budget changes is closer to what we would get with a normal distribution

(0.12), which is exactly as we would expect.

Substantial punctuations clearly remain after adjusting for economic changes.

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[19] We have repeated our analysis using Lijphart's index of executive dominance in
Appendix Table 2 (see footnote 17).

Moreover, the variation shows much the same structure as we have seen above. That

is, federalism continues to have a statistically significant impact on punctuations and the

other variables do not. (See Appendix Table 4 for the results.) The main difference

between these results and those from above is that the p-values on the beta coefficients

are slightly larger, which also is as we expect given the adjustment for GDP change.

Figure 6: Comparison Between L-Kurtosis of Real Changes and Changes as a Percent of GDP
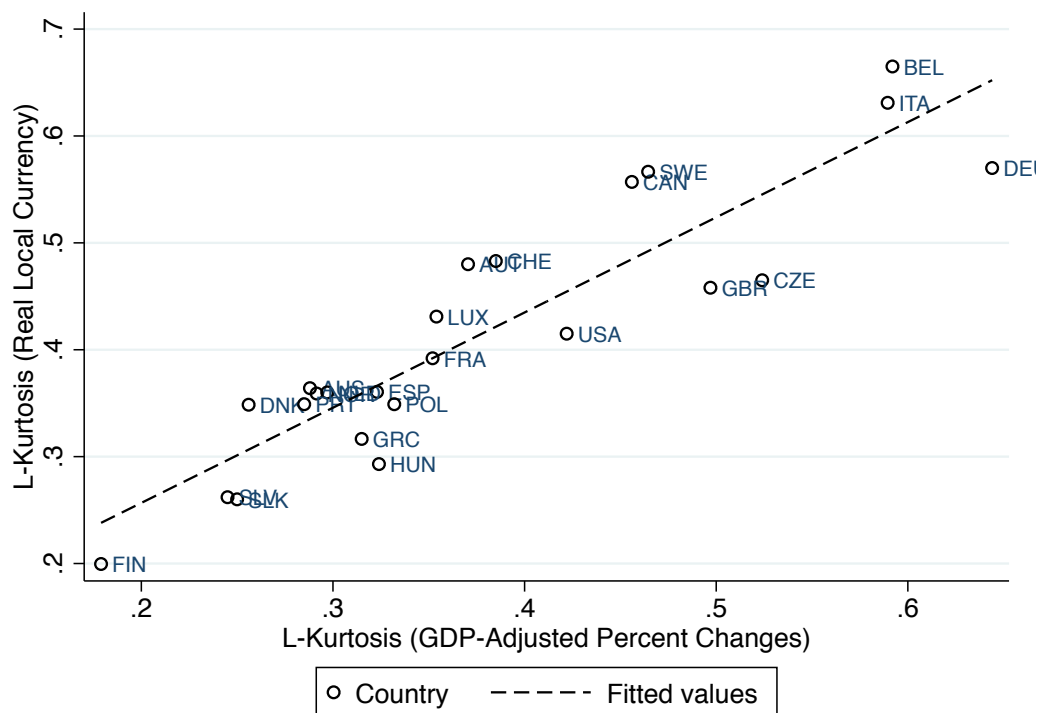
Conclusions

In this manuscript, we have examined the hypothesis that budget punctuations

are in part a consequence of inefficient representational systems. The hypothesis is

based on an adaptive systems perspective, in which political systems adjust to incoming information. Earlier work in budgetary systems concludes that larger punctuations are a consequence of inefficiency in processing information, and that efficiency can be assessed in terms of deviations from a normal distribution of budget changes. The measure usually employed in these studies is the kurtosis of annual percentage budget changes, which we used in the analysis here.

We joined the line of literature analyzing policy punctuations with the literature on thermostatic theories of policymaking (Wlezien 1995). We theorize that governments that do not receive clear signals from the public or are unable to act on them will be more prone to accumulate representational errors and thus punctuated patterns of policy change. Drawing from previous research (Wlezien and Soroka 2012), we theorized that countries with certain representational institutions would have less opinion-policy, and as a result should be more likely to accumulate those errors.

For our dependent variable, we estimated the average L-Kurtosis across ten budget categories of 24 countries from 1996-2011. For our independent variables, we used measures shown by previous research to be associated with representational efficiency: federalism, party system proportionality, and executive dominance. For federalism, we developed a new variable to estimate cross-national variation that builds on previous measures. We hypothesized, in line with earlier research, that all three variables would be positively associated with punctuations -- that is, higher L-Kurtosis estimates.

We found the following. Federalism clearly and unambiguously affects the

extent of budget punctuations at the national level. Party proportionality has the

expected positive impact but the effect is not highly robust. Executive dominance has

the expected positive coefficient, but is not statistically significant. This conflicts with

previous research, though is not entirely surprising given data limitations.[20] The

measure is very coarse and the small number of cases further complicates finding

statistical significance for it or the other variables. The latter also rules out an analysis

of whether and how they interact with each other. Consider that proportionality is of

special interest in parliamentary systems, which are characterized by a high level of

executive dominance. It remains a subject for future research. Future research could

also explore the effect of these representative systems on different categories of public

spending. For example, scholars have found that government tends to be more

responsive on salient issues (Soroka and Wlezien 2010), and so it may be that less

salient budget categories may be more prone to budget punctuations.

In the meantime, it appears that representational efficiency has real impact on

budgetary stability and change. Indeed, it appears that information matters most of all.

This inference reflects the fact that the one clear effect we identified relates to

federalism, particularly the degree of decentralization, and the previous research

showing that its influence on representation inefficiency is indirect, through the quality

of the opinion signals the public sends to policymakers. That is, decentralization

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[20] Recall that US states with high levels of executive power produce more punctuated budgets (Breunig and Koski 2009) and that authoritarian regimes do as well (Baumgartner, Epp and Rey 2015).

dampens thermostatic public responsiveness to policy. By contrast, party

proportionality and executive dominance are not about inputs per se, but about their

translation into policy outputs. To the extent the patterns we observed here ultimately

are rooted in representational inefficiency, therefore, they highlight the importance of

information for effective, efficient representation.

Online Appendix

Appendix Table 1: Fiscal Federalism

Country	Fiscal Federalism
Greece	**0.040**
Slovenia	**0.069**
Luxembourg	**0.080**
Portugal	**0.101**
Slovakia	**0.105**
Czech Republic	**0.124**
Poland	**0.144**
Hungary	**0.149**
Denmark	**0.168**
France	**0.186**
UK	**0.213**
Australia	**0.235**
Italy	**0.263**
Netherlands	**0.275**
Norway	**0.282**
Austria	**0.337**
Finland	**0.339**
Spain	**0.454**
Germany	**0.466**
Sweden	**0.499**
United States	**0.573**
Belgium	**0.711**
Switzerland	**0.909**
Canada	**1.216**

Source: OECD Fiscal Decentralization Database.
[1] No state tax autonomy information available

Appendix Table 2: Models Repeated Using Lijphart (2012) Executive Dominance

Independent Variables	Model 1	Model 2
Executive Dominance (Lijphart 2012)	-0.000340	0.0111
	(0.0179)	(0.0160)
Federalism		0.195*
		(0.0833)
ENPP		0.0295
		(0.0190)
Constant	0.438***	0.211+
	(0.0639)	(0.109)
N	19	19
R^2	0.000	0.357

Standard errors in parentheses, + p<.1 * p<.05 ** p<.01 *** p<.001

Appendix Table 3: Regressions Repeated Without Belgium

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Federalism	0.197*			0.199*	0.224**
	(0.0740)			(0.0753)	(0.0764)
ENPP		0.00989		0.0128	0.00760
		(0.0260)		(0.0229)	(0.0229)
Executive Dominance			0.0212		0.0433
			(0.0361)		(0.0330)
Constant	0.341***	0.367**	0.349**	0.294**	0.194
	(0.0309)	(0.0965)	(0.0954)	(0.0896)	(0.116)
N	23	23	23	23	23
R^2	0.252	0.007	0.016	0.263	0.325

Standard errors in parentheses, + p<.1 * p<.05 ** p<.01 *** p<.001

Appendix Figure 1: L-Kurtosis Across All Countries (IMF Data)
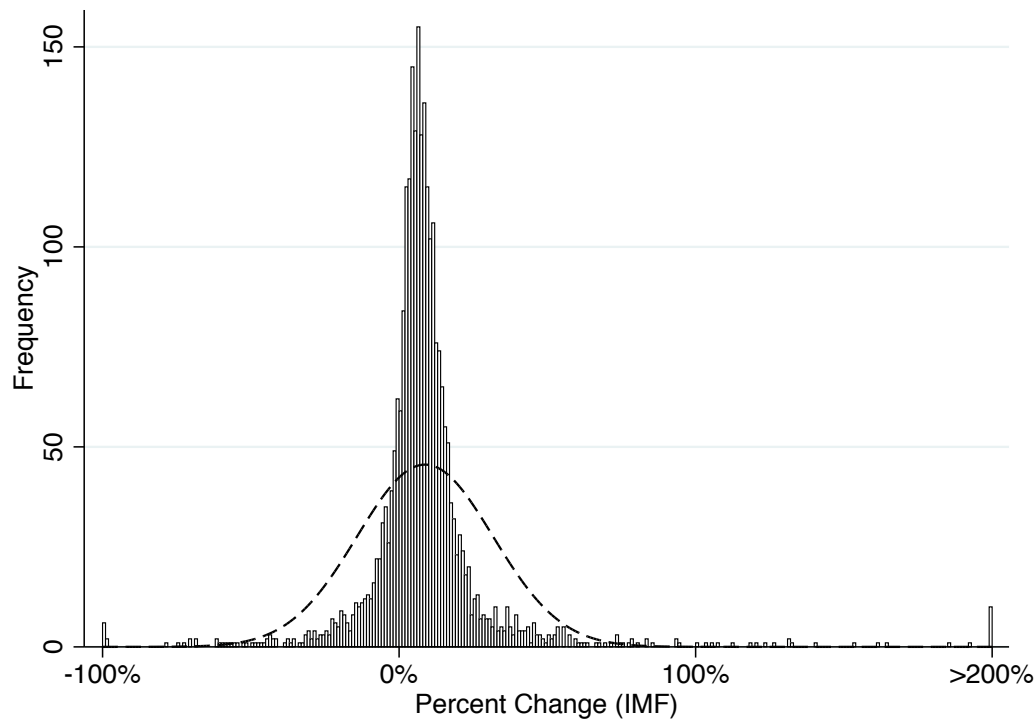
Appendix Table 4: Regression Models Repeated Using GDP-Adjusted L-Kurtosis

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Federalism	0.167+			0.153+	0.180*
	(0.0837)			(0.0845)	(0.0859)
ENPP		0.026		0.020	0.014
		(0.0201)		(0.0194)	(0.0198)
Executive Dominance			0.0389		0.0489
			(0.0391)		(0.0382)
Constant	0.321***	0.277**	0.276*	0.248**	0.138
	(0.0363)	(0.0799)	(0.104)	(0.0778)	(0.115)
N	24	24	24	24	24
R^2	0.154	0.072	0.043	0.197	0.258

Standard errors in parentheses, + $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$

Appendix Table 5: Available IMF Budget Function-Years Used to Calculated L-Kurtosis Variable

Country	Defense	Economic Affairs	Education	Environment	General	Health	Housing	Public Order	Recreation	Social Protection
Australia	15	15	15	12	15	15	15	15	15	15
Austria	15	15	15	15	15	15	15	15	15	15
Belgium	15	15	15	15	15	15	3	15	15	15
Canada	11	11	11	7	11	11	11	11	11	11
Switzerland	14	15	14	8	14	14	14	14	14	14
Denmark	15	15	15	15	15	15	15	15	0	15
Spain	15	15	15	15	15	15	15	15	15	15
Finland	14	14	14	14	14	14	14	14	14	14
United Kingdom	14	14	14	14	14	14	14	14	14	14
Greece	15	15	15	15	15	15	15	15	15	15
Italy	15	15	15	15	15	15	15	15	15	15
Luxembourg	7	7	7	4	7	7	7	7	7	7
Netherlands	15	15	15	15	15	15	15	15	15	15
Norway	15	15	15	11	15	15	15	15	15	15
Portugal	14	14	14	14	14	14	14	14	14	14
Sweden	14	3	14	14	14	7	4	14	14	14
United States	8	8	8	0	8	8	8	6	8	8

IMF Government Finance Statistics Yearbook 2014

Appendix Table 6: Available Eurostat Budget Function-Years Used to Calculated L-Kurtosis Variable

Country	Defense	Economic Affairs	Education	Environment	General	Health	Housing	Public Order	Recreation	Social Protection
Austria	15	15	15	15	15	15	15	15	15	15
Belgium	15	15	15	15	15	15	6	15	15	15
Switzerland	6	6	6	6	6	6	6	6	6	6
Czech Republic	15	15	15	13	15	15	15	15	15	15
Germany	15	13	15	15	15	15	15	15	15	15
Denmark	15	15	15	15	15	14	15	15	15	15
Spain	15	15	15	15	15	15	15	15	15	15
Finland	15	15	15	15	15	15	15	15	15	15
France	15	15	15	15	15	15	15	15	15	15
United Kingdom	14	14	14	14	14	14	14	14	14	14
Greece	5	5	5	5	5	5	5	5	5	5
Hungary	15	15	15	15	15	15	15	15	15	15
Italy	15	15	15	15	15	15	15	15	15	15
Luxembourg	15	15	15	15	15	15	15	15	15	15
Netherlands	15	15	15	15	15	15	15	15	15	15
Norway	9	9	9	9	9	9	9	9	9	9
Poland	9	9	9	9	9	9	9	9	9	9
Portugal	15	15	15	15	15	15	15	15	15	15
Slovakia	15	15	15	15	15	15	15	15	15	15
Slovenia	12	12	12	12	12	12	12	12	12	12
Sweden	15	15	15	15	15	15	15	15	15	15

Source: Eurostat Functions of Government Database. Note: 3 countries (United Kingdom, Cyprus, Germany) reported 'Central Government' expenditures but not 'Defense'. We classified these under the 'defense' category.

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