Institutional Constraints and Budget Stability

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Abstract

Veto player theory (Tsebelis, 2002) predicts that the number of veto players influencing policy stabilities. While studies in OECD countries have shown supportive evidence (Tsebelis and Chang, 2004), there is few work on policy stability in nondemocracies. This project uses a new dataset from GSRE (Global State Revenues and Expenditures dataset) and performs an empirical test on veto player / institutional constraint and budget stability in new democratic countries. Results show that there is at most moderate support that institutional constraints (veto players) lead to incremental budget changes, coefficients hardly achieve significant levels. Besides, our results show little evidence on Punctual Equilibrium Theory (PET): higher institutional constraints are not directly related to budget punctuations.

Key words: budget policy, institutional frictions, punctuations [1]

[1]Replication files available on author's Github account: https://github.com/haowang666, paper generated by package 'bookdown'

1 Introduction

Budget policy is a key aspect of government activity, one that attracts lots of academic attentions in the past few years. What can explain the changes of budgetary settings? Why budgetary changes are stable in some countries but less so and more punctuated in other countries? What are the possible mechanisms that can explain the differences? These questions are not yet fulled explored. This institutional test the budget stability hypothesis with a newly-compiled dataset: GSRE (Global State Revenues and Expenditures dataset).

Government policy making involves negotiations of different branches and institutions. In democratic countries, to pass a policy modification requires the majority rule. This requirement makes the status quo at an advantageous position: any further move has to beat the status quo with a majority of votes. This institutional constraint is featured in the 'veto-player' theory (Tsebelis, 2002). Veto player theory defines 'veto players' as individuals or institutions whose agreement is required for a change of the status quo. Consequently, when the number of veto players increase, the winning set that can defeat status quo will shrink, which in turn leads to higher policy stability. Since veto player is ultimately related to the level of institutional constraints, a corollary is that institutional checks lead to more stable, incremental policy outcomes. With many checks and balances in the government, it will be harder to move policies from the status quo equilibrium.

Tsebelis and Chang (2004) apply veto player theory in the budget changes of the 19 OECD countries. In their analysis, parties with more polarized positions are modeled as potential veto players who could have blocked the policy proposals. Their results show that countries with more veto players have more stable budget policies.

On the other hand, veto player theory also implies that more veto players makes politicians harder to adjust current policies. This is particularly salient in countries with multiple veto players (e.g. the United States). During some time periods with exogenous shocks, the policy

stability can be harmful and politicians may react to the long-time stability with rapid changes of policies, which forms a policy punctuation.

This theoretical expectation leads to another potential outcome: the amount of veto powers may lead to larger policy punctuation. While stability refers to the overall changes, punctuation describes the distribution of policy changes. They may seem incompatible at this moment, but actually they are not and we will address it in the later sections.

Punctuated Equilibrium Theory (PET) (John and Bevan, 2012, Jones and Baumgartner (2014)) argues that government budget shifts over due to the over-attention and under-attention to certain policy areas. Consequently, it features with long periods of stability and short periods of radical changes. Considering the institutional constraints, we also want to test the effect of veto player on policy punctuation.

Our study contributes to the existing literature in two parts: First, with the newly released GSRE data, we extend the coverage to a much broader sample size. Till now most empirical studies on budget changes are drawn from OECD countries, although a few studies have started looking at nondemocratic cases, they are mostly cases studies (Baumgartner et al., 2017, Lam and Chan (2015)). Second, we systematically evaluate the two theories. Our results show that institutional constraints lead to more stable policy changes. However, there is little evidence that institutional constraints lead to policy punctuation.

2 Nature of Policy Changes

2.1 Punctual Equilibrium Theory

Governments change budget policy regularly. The amount of budget allocated to each specific program vary from year to year, we can differentiate the budget changes into two categories: deliberate change and automatic changes (Tsebelis and Chang, 2004). The automatic changes

are often a reflection of the environmental factors such as socio-economic development. The deliberate change requires cooperation of different political actors to break the current policy equilibrium. In this project we study the dynamics of the budget changes. In particular, we want to explore the mechanisms of the budget percentage changes.

Scholars developed multiple models addressing the nature of budget shifts. Early models assume no internal frictions and budget can shift smoothly in an incremental pattern. For instance Wildavsky (1964) proposes an incremental model of budgetary model based on the observations of the federal budget constructions of the U.S. government. His model ignores the internal institutional frictions, arguing that policy shifts features a pattern of randomness.

Incremental model predicts that budget changes (the between-year differences) will approximate a Gaussian distribution due to the randomness of decision information. Later on this model is transformed by John Padgett in a theory of policy punctuations. Through the long-term observation of the U.S. federal budgetary expenditure, Padgett finds that budget policy remain minimal changes over a long term period and have huge fluctuations in some short-periods (Padget, 1980). The entire pattern resembles some tall towns on a flat land: at most of the time there is no changes, but when there is a change, the magnitude is huge. Jones, Baumgartner and True (1998) test this hypothesis with congressional budget authority of the U.S. government, of which they find that government spending is characterized by much greater changes than is typically portrayed in the literature, even if there is great stability for most categories most of the time. This pattern of budget circles is named as 'Punctuated Equilibrium Theory'. [2]

[2]Punctuated Equilibrium is a term borrowed from evolutionary biology, it describes a pattern which proposes that once species appear in the fossil record they will become stable, showing little evolutionary change for most of their geological history.

2.2 Explain Policy Changes

Punctuated equilibrium theory describes the general pattern of budget changes. However, it is still unclear what causes the budget shifts. According to Jones and Baumgartner (2014), to explain the changes of budget we would need to incorporate both internal institutional constraints and external information flows. Efficient budget policy requires both accurate reflection of the external information and low levels of internal constraints. We can model this as the following system:

> Input (external information) ⇒ Processing (internal institutions) ⇒ Budget changes

Both the first step and the second step can influence the final budget outcomes. The information collection can be inefficient and prone to erroneous messages. In a complex environment like politics, it is harder for politicians to decipher signals from the noise. Consequently, inefficient information gathering may lead to inefficient policy decisions. On the other hand, decisions are also bounded by institutional constraints. '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 solving' (Fagan, Jones and Wlezien, 2017, p.3).

The effect of veto player structure comes into play in the second stage: the bargaining process of the internal political institutions. Jones and Baumgartner (2014) use the word 'friction' in their analysis, which captures the obstacles to policy changes by institutional arrangements. Their studies in general show that the number of veto players affects the budget changes over time.

In Tsebelis (2002) 's original settings. Veto player is defined by the ideological distances of effective political parties (named as partisan veto players) and institutional veto players (institutions/ government branches whose consent are required by constitution in enacting

policy modifications). In democratic government with a checks-and-balances design, veto players can be any government branch that can effectively oppose a policy change. Consequently, more institutional veto players and more distant political parties lead to higher policy stability.

Both punctuated equilibrium theory and veto player theory emphasize the importance of veto player/frictions. They share many similarities in predicting the overall budget changes. Veto player theory predicts that political structure with many veto powers leads to stability; PET on the other hand frames veto players as 'friction', arguing that institutional frictions lead to budget stability. So far few studies analyze budget volatility with both veto player theory and PET. This study attempts to evaluate both theories with GSRE dataset.

On the other hand, veto player and PET have slightly different dependent variables. Veto player emphasizes the changes of policy per se: for instance, even Tsebelis and Chang (2004) study budget changes (which is often the subject of interest in the PET studies), their dependent variable is policy changes per se, but not the overall distribution. Veto player theories make little assumptions about the policy punctuations. In terms of statistics, both veto player theory and PET agree that frictions lead to stable policy outcomes (small variance). However, PET has the second measurement of policy change distributions: frictions lead to higher punctuations.

Figure 1 addresses the difference between the two models. In this figure both the red line and blue are hypothetical budget changes of two different countries. These two lines have the same mean and variance, thus will be considered with equal amount of stability in the veto player theory. However their shapes are different due to the level of peakness: blue line are more 'punctuated' than the red line. In other words, veto player theory can be regarded as 'nested' in the PET structure: veto player predicts stability only, PET predicts both stability and punctuations.

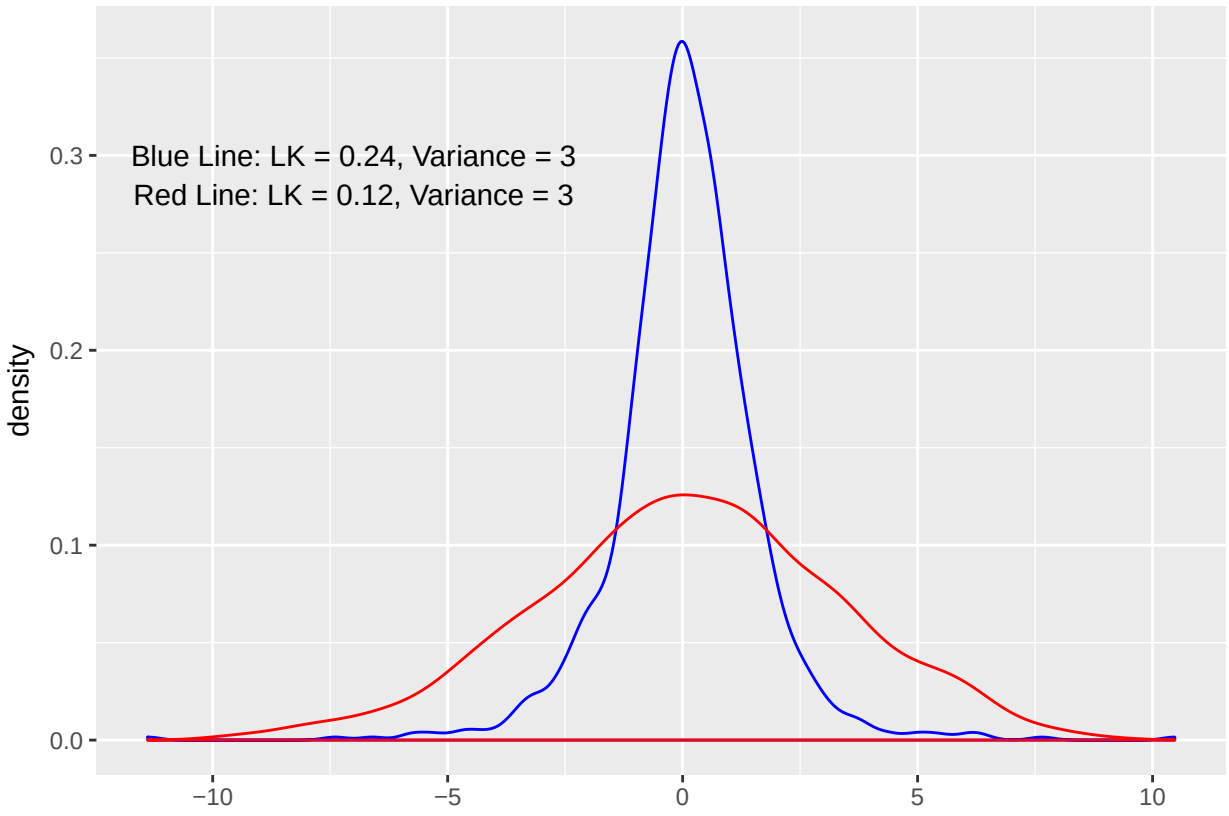

Figure 1: Same Variance Different Peakness

3 Hypotheses

Previous studies on budget changes highlight the importance of input and processing. While both steps are important for decision making, we only focus on the institutional frictions/veto powers in this manuscript.

Viewing institutional friction as a constraint on any deviations from the status quo, we argue that countries with higher levels of institutional frictions have smaller budget policy shifts. We adopt the similar framework appeared in Tsebelis and Chang (2004): countries with more veto players have smaller winning sets that can beat the status quo, consequently lead to stable policy outcomes (small incremental changes).

> institutional frictions $\Rightarrow$ stable policy shifts

On the other hand, the existing multiple veto players make it harder for reforms and policy adaptations. In the extreme condition, the current winning set $P \in \emptyset$: politicians are unable to come up with any changes of the current policy plans. A stable budget policy is not necessary a good policy: it needs to speak to the external socio-economic environment. For instance, the incumbent government should be able to spend more in social-welfare domain if there are serious welfare issues. Eventually this inability of adaptation leads to an accumulation of problems and even threaten the stability of the regime. Politicians may respond to the long-term stability with short-term rapid changes as a remedy of the chronological grid-lock, which is a policy punctuation (Epp and Baumgartner, 2016, Keefer and Stasavage (2003)).

> Institutional frictions $\Rightarrow$ unable to change policy accordingly $\Rightarrow$ long term incremental changes and short-term rapid changes $\Rightarrow$ punctual equilibrium.

Therefore we have the following two hypothesis:

1. Veto Player Hypothesis: Institutional frictions lead to budget stability (minimal difference between fiscal years)

2. PET hypothesis: Institutional frictions lead to higher budget punctuations.

4 Data and Measurements

4.1 Case Selections

Scholars study both the input and processing stages under democratic regimes (especially OECDs), arguing that free and transparent information processing as well as less institutional constraints lead to incremental budget changes (Jones and Baumgartner, 2014). While OCED countries often have more avialeble data, their long-time stable political structure leads to fundamental problems of causal inference: the independent variable (frictions) seldom varies. For instance, the amount of institutional veto players of the United States remain the same since established. This invariability of independent variable causes trouble for demonstrating the effect of treatment (frictions): since the country-level friction index does not vary across time, the major difference only exists in the cross-sectional level.

To capture this effect, a solution is pooled time-series analysis with panel corrected standard errors (Beck and Katz, 1995). Beck and Katz (2001) considers the example of democracy, a time-invariant variable on conflict. They show that estimates obtained under fixed effect fail to show any relation between democracy and peace because it filters out all the effects of time-invariant effect. On the other hand, pooled regression is biased in failing to estimate the individual level omitted variables. Cross-national studies including different countries will always encounter the country-level heterogeneity issue. Ignoring this not only leads to a biased estimate, but also causes problems of causal inference.

Our strategy to circumvent this problem is through data selection. We construct our dataset with GSRE, excluding stable democracies and stable autocracies of which the political institutions remain the same between 1960 and 2006. This leaves us with total 93 countries.

The detailed list of countries are provided in appendix Table 7. This selection allows us to use fixed effect to estimate the individual level time-invariant effects while making sure the independent variable and dependent variables are not constant.

Studying budget changes in nondemocratic countries can quite be different from electoral democracies. First, there is no free and fair elections in authoritarian regimes. Election and regular political participation face the "dictator's dilemma" in nondemocracies (Wintrobe, 1998). Second, while serving as the information provider and monitor of the government actions in democratic regimes, media and press are not independent in autocracies. Overall these create barriers for information input and leads to inefficient information collection in authoritarian countries. On the other hand, institutional constraints are weaker in nondemocracies. Unlike democracies, the dictator has better control over the government and the legislative institutions. For instance in a democratic government with checks-and-balances institutional design, the executive branch will be constrained by the legislature, which implies a longer period of negotiation and cooperation. However political elites in nondemocracies faces less, sometimes no political constraints (Svolik, 2012). The combination of inefficient information gathering and less political constraints may lead to larger variation of budget changes.

So far only a few studies look at budgetary patterns in authoritarian countries. In the Hong Kong case, Lam and Chan (2015) propose that non-democracies are characterized by less friction than democracies because the institutional design of these regimes centralizes power at the highest level of government, meanwhile there is little check and balances of the executive branch. Lacking the incentive of electoral competition, officials are less motivated to monitor and respond to the external environment. Consequently, there is high levels of inertia of environmental changes. Errors of information may accumulate over time and threaten the regime stability. Baumgartner et al. (2017) conduct the first cross-national studies of budgetary changes in authoritarian countries (Brazil, Turkey, Malta and Russia).

Their analysis suggests that authoritarian countries have different patterns of policy shifts with the democratic regimes. However, the argument is only moderately supported by their empirical evidence due to the lack of data.

Overall, we hope to expand the current research agenda of policy shifts to nondemocracies, especially to countries with regime-transition experiences. We expect that less constraints in nondemocratic countries lead to more budget changes, and perhaps less punctuations.

4.2 Data sources

Data in this project comes from various sources. The measurement components of dependent variable come from the GSRE project (Global State Revenues and Expenditures data set). GSRE is a comprehensive budget data set based on the previous released historical documents from the International Monetary Fund (IMF). Comparing with the IMF COFOG data set (The Classification of the Functions of Government), GSRE increases coverage and accuracy of budgeting data for most authoritarian regimes and some democratic regimes. Since GSRE is built on IMF historical documents, it covers all independent states that have been or are the members of the IMF and are being coded as an authoritarian regime in the Geddes, Wright and Frantz (2014) data set. Table 9 in Appendix reports the components of dependent variable. Total we use 10 measurement components of budget policy, which cover a variety of policies including security, defence, wages, education, health, housing etc. We combine the changes of each individual category to make it an overall indicator of the volatility index. Detailed calculation is in the next section.

Data on institutional constraints come from the political constraints index (POLCON) (Henisz, 2000) and the Varieties of Democracy (Vdem) project (Coppedge et al., 2016). Henisz's measurement is a combined indicator of veto powers of different independent branches of government (Henisz and Mansfield, 2006). Specifically, veto powers are from the executive, upper and lower legislative chambers, judiciary, and sub-federal institutions. Countries lacking

any formal veto points receive a point of 0. The initial score is then modified to taken into account of the party composition of the executive and legislative branches. Alignments will decrease POLCON index and with-branch heterogeneity will increase POLCON index (see Henisz and Mansfield, 2006, p. 195). In the newest version, measure is also modified to take into account the extent of alignment across branches of government using data on the party composition of the executive and legislative branches.

Data on division of power draws from the Political Institution Index (Beck et al., 2001).

4.3 Measuring Dependent Variables

To evaluate the budget-stability hypothesis and punctual equilibrium hypothesis, we create two different dependent variables. The volatility index measures the budget volatility of a certain country at a single time point. We use L-Kurtosis score to measure the degree of punctuation (peakness).

4.3.1 Volatility Index

We measure the budget stability as the simple euclidean distance of the between-year percentage differences (same as Tsebelis and Chang, 2004). It can be written in the following equation: V_{it} is the volatility index of the ith country at a certain year t. Since government budget has various categories: p_{ijt} denotes the percentage of jth category out of total expenditure of the country i at year t. V_{it} will increase as the difference between p_{ijt} and p_{ijt-1} increases.

$$V_{it} = \sqrt{\sum_{j=1}^{j}(p_{ijt} - p_{ijt-1})^2} \tag{1}$$

For the percentage of each expenditure term p_{ijt}, $p_{ijt} \in [0, 1]$, V_{jt} has the same boundary as

$[0, 1]$. Larger score means more volatile budget policies. We construct a single dependent variable rather than use the raw percentage changes of each categories for several reasons. First, since our research interest is budget stability as a whole, a unified index of all the budget categories better serves our purpose. Some budget categories will experience dramatic shifts in certain years while other budget remain relatively stable. Our measurement will penalize the particular changes, thus lead to a conservative overall estimate. Second, many categories are missing for the single observation, for instance, in 1970, El Salvado has statistics on health, education spending, but categories security spending and defence spending are missing. Using individual components will reduce the sample size to less than 800, which loses statistical power a lot.

4.3.2 L-Kurtosis Score

To evaluate the shape of distributions of budget shifts, we calculated the L-Kurtosis score of policy changes of each country across the available time spans. The maximum time period is 1960 to 2006, for each country this period will differ based on the data availability. Specifically, we calculate the between-year difference of budget percentages, and then using L-Kurtosis statistics to find the L-Kurtosis (LK) score. L-Kurtosis (LK) is the 4th L-moment ratio of the moment statistics. It is used to summarize the peakness of the variable distributions (for detailed calculation, check (Hosking, 1990)). An L-Kurtosis score of 0.123 approximates a Gaussian distribution (also see (Baumgartner et al., 2017, Breunig and Jones (2011))). Higher LK score means heavy tails and high peaks. Figure 1 shows an example of LK score and distributions. In this figure, the blue line has a LK score of 0.24, makes it more 'punctuated' than the red line: it features long-time incremental changes and short-term radical shifts. The red line is a normal distribution with zero mean and deviation as 3. The L-K score of the red line is 0.12, which is very close to the theoretical value 0.123.

4.4 Main Independent Variables

The main independent variable in this study is the political constraint index (POLCON). POLCON is a comprehensive index of all the veto powers in the government branches as well as the partisan compositions (Henisz, 2000). The definition of POLCON fits our idea of veto player nicely: rather than the commonly-used democracy index, POLCON focuses on the veto power on potential policy changes. POLCON has the range of [0, 1], higher score means more constraints. Countries without any formal veto powers will receive a score of 0. This often happens in the personalistic authoritarian regimes (Geddes, Wright and Frantz, 2014).

4.4.1 Other Controls

While our main interest is to evaluate the relation between POLCON and policy volatility, we include other control variables to account for the potential associations that may influence our results. Follow Tsebelis and Chang (2004), Fagan, Jones and Wlezien (2017) and Baumgartner et al. (2017), we include *Polity* score measuring the regime type. Also we include the party institutionalization index, suggested by Henisz and Mansfield (2006). A measurement of corruption is included as budget policies are often related with corruption activities in non-stable democracies (Keefer and Vlaicu, 2007). We also include logged GDP pc and GDP growth rates reflecting economic development. Finally, we include a dummy variable of Civil War status as countries currently involving in civil war tend to have much volatile budget policies than in the peace time.

5 Method and Results

GSRE data set contain lots of missing data, we did 5 multiple imputations and report results of the original dependent variable as well as the 5 imputed ones. Detailed procedure is described in Appendix missing data section. In the results tables, column 1 reports the result

without multiple imputation, column 2 to 6 report results with multiple imputation of the GSRE data.

Since our major independent variable is POLCON, which is relatively stable over time, the most efficient method is a pooled time-series analysis. However, the pooled model is rejected in the statistical test between pooled OLS and LSDV model. The second best method is random effect model, which allows estimating time-invariant effects (Bell and Jones, 2015). Again the RD model is rejected in the Hausman test. While fixed effect is picked by the data structure, it is known that fixed effect model is bad at throwing time-invariant effects away (Beck and Katz, 2001). We circumvent this issue by selecting cases with both IV and DV varying across time [3]. Countries of which the POLCON index remain 0 are dropped from the analysis. The remaining cases exhibit at least some changes of POLCON index over the time span 1960 - 2006.

While the country-level fixed effect controls for the unobserved time-invariant components of each country, it is possible that there exists a time-specific fixed effect (Beck and Katz, 2011). We test the potential time-specific fixed effect and the result confirms the existence of the time effect. Therefore we conduct both fixed effect and two-way fixed effects, results are reported in Table 1 and Table 2.

5.1 Fixed Effect and Twoway Fixed Effect

Equation (2) represents the equation for country-level fixed effect. Equation (3) represents the two-way fixed effect with both country-level and time-specific effects.

In equation (2), a_i is the country-level time-invariant factor, $POLCON$ is our main independent variable, $Party$ is the party institutionalization index, $Corruption$ is the corruption indicator from the Vdem project, $\mathbf{Z}$ is the matrix of other control variables. Equation (3) has both the

[3] again we did the tests from pooled ols to random effect based on the trimmed data, still FE model is preferred

country-level effect a_i and the time-specific effect λ_t, other components are the same.

$$V_{it} = a_i + \beta_2 POLCON_{it} + \beta_3 Party_{it} + \beta_5 Corrupt_{it} + \mathbf{Z}\beta + \epsilon_{it} \tag{2}$$

$$V_{it} = a_i + \lambda_t + \beta_2 POLCON_{it} + \beta_3 Party_{it} + \beta_5 Corrupt_{it} + \mathbf{Z}\beta + \epsilon_{it} \tag{3}$$

The results in Table 1 and Table 2 are quite unexpected. Unlike our expectation, POLCON show little effect on budget volatility. In all the columns of Table 1, POLCON is only significant in the 5th multiple imputation. Standard errors are quite large in the other 4 imputations as well as in the original data and the estimated coefficients are small. In the twoway model, non of the POLCON coefficients reach the statistical significance level. The direction of the coefficients though, are in the expected direction. Since our dependent variable is the Volatility index, a negative sign means the increase of POLCON will decrease the degree of budget volatility. In the not-so rigorous way, POLCON leads to more stable budget outcomes.

Polity score appears to be marginally significant. In Table 1, Polity scores are significant in the original data as well as three imputed data sets. Controling for the year fixed effect, Polity still remain significant in 3 of the 5 imputations. According to both Table 1 and Table 2, higher Polity score leads to more budget volatility. This is something unexpected. Scholars like Baumgartner et al. (2017), Lam and Chan (2015) argue that democratization leads to more stable budget policies. This may due to the case selection in our study: we do not include stable democracies nor stable autocracies in the dataset. Therefore countries during the transitional periods may experience more budget policy changes due to the transition. As Huntington (2008) has pointed out, transition often means a 'misfit' between political institutions and socio-economic development, which implies more volatility.

The most significant variable is the corruption index. We did not theorize the importance of

Table 1: Fixed Effect Regression Results

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
POLCON	−0.020	−0.031	−0.026	−0.003	−0.004	−0.040*
	(0.019)	(0.022)	(0.021)	(0.022)	(0.021)	(0.021)
Party	−0.046**	0.014	−0.024	0.015	0.001	0.007
	(0.023)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Corruption	−0.072***	−0.087***	−0.083***	−0.112***	−0.102***	−0.064**
	(0.027)	(0.031)	(0.030)	(0.031)	(0.030)	(0.030)
Polity	0.002***	0.003***	0.002**	0.001	0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc (log)	−0.00001	−0.007	0.001	0.006	−0.004	0.003
	(0.009)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
GDP growth	−0.0001	−0.00001	−0.001	−0.0003	−0.0003	0.0002
	(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Civil War status	−0.009	−0.002	0.012	0.008	0.014	0.011
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	3,100	3,100	3,100	3,100	3,100	3,100
R^2	0.006	0.007	0.006	0.006	0.006	0.004
Adjusted R^2	−0.028	−0.028	−0.028	−0.028	−0.028	−0.030

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

Table 2: Two Way Fixed Effect Regression Results

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
Constraints	−0.021	−0.029	−0.018	0.001	0.002	−0.035
	(0.019)	(0.022)	(0.021)	(0.022)	(0.021)	(0.021)
Party	−0.032	0.023	−0.016	0.040	0.019	0.014
	(0.023)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Corruption	−0.069**	−0.091***	−0.088***	−0.092***	−0.096***	−0.072**
	(0.028)	(0.033)	(0.032)	(0.033)	(0.032)	(0.032)
Polity	0.002***	0.002**	0.002*	0.001	0.001	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc (log)	0.016	0.009	0.012	0.033***	0.013	0.014
	(0.011)	(0.013)	(0.012)	(0.013)	(0.012)	(0.012)
GDP growth rate	−0.001**	−0.001	−0.001**	−0.001**	−0.001*	−0.001
	(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Civil War status	0.006	0.011	0.021	0.024*	0.030**	0.024*
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	3,100	3,100	3,100	3,100	3,100	3,100
R^2	0.008	0.007	0.008	0.012	0.010	0.006
Adjusted R^2	−0.043	−0.043	−0.042	−0.038	−0.040	−0.045

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

corruption in this study, rather corruption was added as a normal control variable. However, the coefficients of corruption remain significant in all models, and the coefficients also have the largest magnitude. Apparently there is some evidence that corruption captures some variability of budget policies in the selected countries. Corruption index has a range of [0, 1]. The regression results basically infer that moving the corruption index from 0 to 1, the budget volatility index will decrease by 0.08 to 0.1, dependening on the specific dependent variable. Recall from equation (1), our Volatility Index captures the the variability of budget changes between different years and has the range [0 , 1]. Table 10 in Appendix shows that the standard deviation of the Volatility Index is about 0.15. Thus the shifts of the corruption index can actually decrease the dependent variable by almost 1 standard deviation, which is a huge impact! A full exploration based on corruption will be beyond the scope of the current project, our initial intuition is that corruption may indicate clientelistic behaviors, which tend to favor the current budget policy. Therefore curruption index is related with more stable budgetary changes.

5.2 OLS with L-Kurtosis

To evaluate the PET hypothesis, we need to change our dependent variable from the annual Volatility index to the overall punctuation measure: L-Kurtosis score. We construct the L-Kurtosis score based on the first difference changes of each budget component p_{ijt}. Specifically, for a certain country i, we first calculate the between year percentage changes of each budget component:

$$\Delta_{ijt} = p_{ijt} - p_{ijt-1} \tag{4}$$

Then we pooled all the Δ_{ijt} and obtain the signle LK score of country i though the LK function. In equation (5), $\mathbf{\Delta_i}$ is the matrix notation of Δ_{ijt}. For a specific country i, $\mathbf{\Delta_i}$ is a

$j \times t$ matrix.

$$LK_i = f_{LK}(\mathbf{p_i}) \tag{5}$$

Since the LK socre is an aggregated measurement of each country across the whole time period, we perform sinple OLS regression to test if POLCON is related to higher LK score [4].

Table 3 reports L-Kurtosis score result.

6 Robustness check

We have two major independent variables: In the horizontal level: veto players are different government divisions and political parties. In the vertical level, a strong local government with independent fiscal abilities can act as a strong veto players well.

6.0.1 Horizontal Level

We use two measurements of institutional constraints: POLCON index (Henisz, 2000) and Party Institutionalization Index (Coppedge et al., 2016).

6.0.2 Vertical Level

Regional authority index, modeled by the state government authority over taxation (Beck et al., 2001).

[4] all the independent variables in the OLS are at their means

Table 3: OLS Regression with L-Kurtosis as Dependent Variable

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
Constraints	0.020	−0.059	−0.025	−0.038	0.003	0.020
	(0.081)	(0.078)	(0.080)	(0.093)	(0.078)	(0.081)
Party Instit.	−0.004	−0.029	−0.026	−0.005	−0.038	−0.004
	(0.053)	(0.051)	(0.053)	(0.061)	(0.051)	(0.053)
Corruption	0.034	0.014	0.033	0.061	0.045	0.034
	(0.050)	(0.047)	(0.049)	(0.056)	(0.047)	(0.050)
Polity	−0.001	0.0001	−0.0004	−0.001	−0.001	−0.001
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
GDP pc (log)	−0.005	−0.011	−0.006	−0.005	−0.007	−0.005
	(0.015)	(0.014)	(0.015)	(0.017)	(0.014)	(0.015)
GDP growth rate	0.005	0.014**	0.007	0.010	0.012**	0.005
	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Civil War Status	−0.030	−0.042	−0.068	−0.040	−0.029	−0.030
	(0.061)	(0.058)	(0.060)	(0.069)	(0.058)	(0.061)
Constant	0.346***	0.435***	0.389***	0.339***	0.373***	0.346***
	(0.110)	(0.106)	(0.109)	(0.126)	(0.106)	(0.110)
Observations	93	93	93	93	93	93
R^2	0.016	0.103	0.050	0.058	0.078	0.016
Adjusted R^2	−0.065	0.030	−0.028	−0.019	0.002	−0.065

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

Table 4: Alternative Measurement: Fixed Effect Regression Results

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
Judicial Constraint	−0.008	−0.057	−0.030	−0.011	−0.018	−0.018
	(0.034)	(0.038)	(0.037)	(0.038)	(0.038)	(0.037)
Legislative Constraint	0.053*	0.015	−0.003	−0.020	0.005	−0.002
	(0.031)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
Central-Reginal Power	0.018	0.040	0.039	0.063***	0.041*	0.039
	(0.022)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Party	−0.043*	0.013	−0.032	0.016	−0.005	−0.001
	(0.026)	(0.029)	(0.028)	(0.029)	(0.028)	(0.028)
Corruption	−0.059*	−0.127***	−0.105***	−0.119***	−0.128***	−0.082**
	(0.031)	(0.035)	(0.034)	(0.035)	(0.035)	(0.034)
Polity	0.00001	0.002*	0.002**	0.001	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc (log)	−0.037***	−0.036***	−0.037***	−0.023**	−0.036***	−0.031***
	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
GDP growth	0.0001	0.0004	−0.001	−0.0003	−0.0002	0.0004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Civil War status	−0.007	−0.008	0.010	−0.001	0.007	0.011
	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)
Observations	3,031	3,031	3,031	3,031	3,031	3,031
R^2	0.011	0.015	0.013	0.011	0.015	0.009
Adjusted R^2	−0.023	−0.020	−0.021	−0.023	−0.020	−0.026

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

Table 5: Alternative Measurement: Two Way Fixed Effect Regression Results

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
Judicial Constraint	−0.013	−0.065*	−0.036	−0.023	−0.021	−0.024
	(0.033)	(0.038)	(0.037)	(0.038)	(0.037)	(0.037)
Legislative Constraint	0.069**	0.032	0.007	−0.0004	0.025	0.012
	(0.030)	(0.035)	(0.034)	(0.035)	(0.034)	(0.034)
Central-Reginal Power	0.017	0.037	0.038	0.068***	0.043*	0.036
	(0.021)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Party	−0.013	0.037	−0.016	0.047	0.018	0.015
	(0.026)	(0.030)	(0.029)	(0.030)	(0.029)	(0.029)
Corruption	−0.053	−0.127***	−0.109***	−0.100***	−0.121***	−0.088**
	(0.032)	(0.037)	(0.036)	(0.037)	(0.036)	(0.036)
Polity	−0.0005	0.001	0.002	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc (log)	0.019	0.013	0.002	0.032**	0.008	0.005
	(0.012)	(0.014)	(0.013)	(0.014)	(0.013)	(0.013)
GDP growth rate	−0.001	−0.0003	−0.001*	−0.001*	−0.001	−0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Civil War status	0.015	0.009	0.022	0.019	0.025*	0.026*
	(0.012)	(0.014)	(0.013)	(0.014)	(0.014)	(0.013)
Observations	3,031	3,031	3,031	3,031	3,031	3,031
R^2	0.008	0.011	0.010	0.015	0.014	0.007
Adjusted R^2	−0.048	−0.045	−0.046	−0.041	−0.042	−0.049

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

Table 6: Alternative Measurement: OLS Regression with L-Kurtosis as Dependent Variable

	Dependent variable:					
	Original	Imputation 1	Imputation 2	Imputation 3	Imputation 4	Imputation 5
	(1)	(2)	(3)	(4)	(5)	(6)
Judicial Constraint	0.011	−0.054	−0.045	−0.017	−0.021	0.011
	(0.063)	(0.061)	(0.062)	(0.072)	(0.061)	(0.063)
Legislative Constraint	0.035	0.002	−0.035	0.026	0.006	0.035
	(0.062)	(0.059)	(0.061)	(0.071)	(0.060)	(0.062)
Central-Reginal Power	−0.005	−0.012	−0.018	0.004	−0.018	−0.005
	(0.043)	(0.041)	(0.042)	(0.049)	(0.041)	(0.043)
Party Instit.	−0.0001	−0.028	−0.029	−0.002	−0.037	−0.0001
	(0.054)	(0.052)	(0.053)	(0.062)	(0.052)	(0.054)
Corruption	0.049	−0.009	0.001	0.062	0.036	0.049
	(0.060)	(0.058)	(0.059)	(0.069)	(0.058)	(0.060)
Polity	−0.001	−0.0001	0.002	−0.003	−0.0004	−0.001
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
GDP pc (log)	−0.003	−0.016	−0.009	−0.008	−0.007	−0.003
	(0.015)	(0.014)	(0.015)	(0.017)	(0.014)	(0.015)
GDP growth rate	0.006	0.014**	0.007	0.010	0.012**	0.006
	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Civil War Status	−0.026	−0.045	−0.081	−0.033	−0.036	−0.026
	(0.062)	(0.059)	(0.061)	(0.071)	(0.059)	(0.062)
Constant	0.307**	0.501***	0.467***	0.346**	0.392***	0.307**
	(0.139)	(0.133)	(0.136)	(0.159)	(0.133)	(0.139)
Observations	93	93	93	93	93	93
R^2	0.020	0.109	0.067	0.058	0.082	0.020
Adjusted R^2	−0.086	0.012	−0.034	−0.044	−0.017	−0.086

Note: *p<0.1; **p<0.05; ***p<0.01

DV: Volatility Index, higher value indicates more volatile policies.

7 Discussion

Constraint Index does not appear to be statistically significant in all models. Corruption needs more attention.

8 Appendix

8.1 Country Seletion Criteria

GSRE does not include OECD countries by default, we select the remaining countries based on two indicators: the political constraint index and the polity score. We drop countries of which either score does not change in the time period between 1960 and 2006. Countries like China, Vietnam, Sudan, Yemen, Saudi Arabia etc. are classified as stable authoritarian regimes and they are dropped from the total observations.

The remaining countries are listed in Table 7

Table 7: Country List

Afghanistan	Colombia	Iran	Mozambique	South Korea
Albania	Comoros	Iraq	Namibia	Spain
Algeria	Congo	Israel	Nepal	Sri Lanka
Angola	Costa Rica	Jamaica	Nicaragua	Syria
Argentina	Cote d'Ivoire	Jordan	Niger	Taiwan
Armenia	Croatia	Kenya	Pakistan	Tajikistan
Azerbaijan	Ecuador	Kyrgyzstan	Paraguay	Tanzania
Bangladesh	El Salvador	Laos	Peru	Thailand
Belarus	Estonia	Lebanon	Philippines	Trinidad and Tobago
Benin	Georgia	Lesotho	Poland	Tunisia
Bolivia	Ghana	Macedonia	Portugal	Turkey
Botswana	Greece	Madagascar	Romania	Uganda
Brazil	Guatemala	Malawi	Russia	Ukraine
Bulgaria	Guinea	Malaysia	Rwanda	Uruguay
Burkina Faso	Guinea-Bissau	Mali	Senegal	Uzbekistan
Burundi	Haiti	Mexico	Sierra Leone	Venezuela
Cambodia	Honduras	Moldova	Slovakia	Zimbabwe
Central African Republic	Hungary	Mongolia	Slovenia	
Chile	Indonesia	Morocco	South Africa	

8.2 Descriptive Statistics

Here I provide summary statistics of the variables I used in this study. Number of observations differs from the results in regression table due to the default list-wise deletion setting in regression analyses.

8.2.1 summary statistics on independent variables

Table 8: Independent Variables

Statistic	N	Mean	St. Dev.	Min	Max
Political Contraint Index	4,410	0.255	0.296	0.000	0.890
Judical Constraints	5,404	0.483	0.266	0.006	0.979
Legislative Constraints	5,376	0.409	0.288	0.024	0.959
Central-Local Power Divisions	4,839	0.325	0.340	0.000	0.991
Institutionalization of Party	5,403	0.516	0.266	0.006	0.986
Polity Score	4,985	−0.801	7.005	−10	10
Corruption Index	5,404	0.537	0.232	0.028	0.946
GDP pc	4,912	7.712	0.869	5.883	10.667
GDP Growth Rate	4,884	1.832	6.169	−61.493	86.946
Civil War	5,228	0.078	0.268	0	1

8.2.2 dependent variable components

In the following table I report the components of dependent variables. The summary statistics is from the raw GSRE dataset. The number of observations will be inconsistent with the observations used in the regression analysis due to the missing values. It is measured as the percentage expenditure of total expenditure. Two indicators are dropped out in the further analysis due to technical concerns. The variable `subpentrans` contains too few points, and the variable `pensions` must be dropped due to the convergence issue in multiple imputation.

Table 9: Components of Budget Volatility Measurements

Statistic	N	Mean	St. Dev.	Min	Max
expend_security_EXP	3,034	0.166	0.123	0.000	0.712
expenddefence_EXP	2,418	0.143	0.119	0.00001	0.712
exp_public_order_EXP	1,300	0.059	0.034	0.000	0.248
wagessalaries_EXP	3,981	0.293	0.128	0.00000	0.859
pensions_EXP	1,131	0.058	0.065	0.000	0.392
total_welfare_EXP	2,927	0.238	0.127	0.00003	0.920
education_EXP	2,624	0.133	0.061	0.00002	0.388
health_EXP	2,337	0.058	0.032	0.00001	0.212
social_protection_EXP	1,451	0.055	0.073	0.000	0.599
housing_EXP	1,084	0.035	0.036	0.000	0.420
owelfarespend_EXP	1,334	0.067	0.077	0.00000	0.510

8.2.3 dependent variable statistics

Table 10: Volatility Index Table

Statistic	N	Mean	St. Dev.	Min	Max
Original	4,516	0.103	0.147	0.00000	1.110
Imputation 1	4,516	0.253	0.178	0.00001	1.318
Imputation 2	4,516	0.259	0.175	0.00001	1.085
Imputation 3	4,516	0.248	0.174	0.00001	1.810
Imputation 4	4,516	0.256	0.176	0.00001	1.121
Imputation 5	4,516	0.252	0.171	0.00001	1.064

Table 11: LK Score Table

Statistic	N	Mean	St. Dev.	Min	Max
Original	93	0.339	0.078	0.175	0.511
Imputation 1	93	0.347	0.078	0.210	0.575
Imputation 2	93	0.344	0.078	0.201	0.520
Imputation 3	93	0.337	0.091	0.111	0.617
Imputation 4	93	0.341	0.077	0.155	0.548
Imputation 5	93	0.339	0.078	0.175	0.511

8.3 Missing Cases

GSRE contains lots of missing cases. Lall (2016) systematically reanalyzed all the recent PE articles in *International Organization* and *World Politics*, and found out half of the key 'findings' disappeared. To avoid losing statistical powers and potential bias due to list-wise deletion, this article employs multiple imputation of the GSRE part data. Since GSRE part data are all measuring governmental expenditures, different categories are correlated. We use `Amelia` to perform multiple imputation with the multivariate normal distribution assumption (Honaker, King and Blackwell, 2011). Multiple imputation is unbiased when data are Missing at Random (MAR) as well as Missing Completely at Random (MCAR). Under Missing not at Random (MNAR), multiple imputation is biased since missingness depends (to some extent) on missing values. In reality data are almost always MNAR, with missingness depending in part on observed data and in part on missing data. Critically, however, multiple imputations not seriously biased under MNAR if missingness is strongly related to observed data and thus approximates MAR (see the discussion in Lall, 2016). Results reported in the paper are from the original data (without multiple imputation) and first 5 multiple imputation.

The total missing map is showing in the Figure 2.

We also calculated results without multiple imputation: points that are missing in the GSRE data set is set to be 0. Theoretically in this situation missing cases will contribute zero effects to the policy volatility index. We calculate dependent variable while filling missing cases as 0.

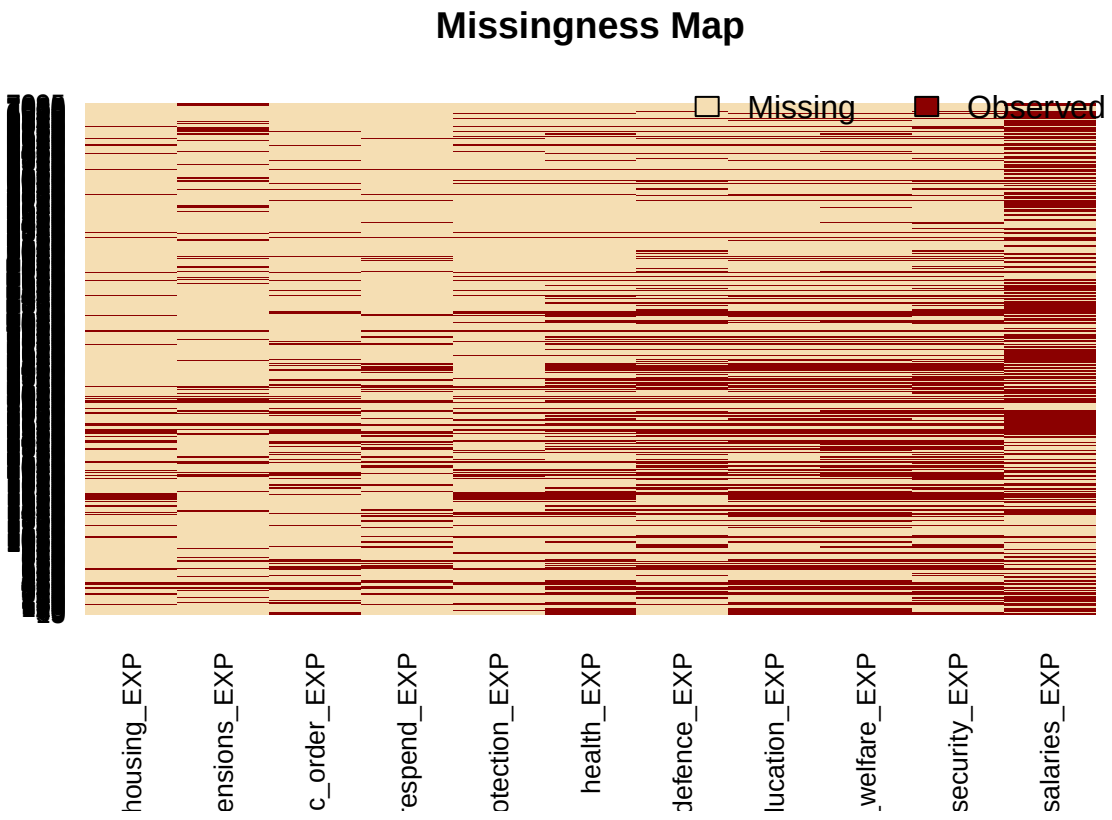

Figure 2: Missing Map

After the DV is imputed, We re-coded observations with 0 values as missing (This is because a completely missing case will yield 0 as the outcome).

The density plot of raw volatility index without imputation is shown in the following Figure 3.

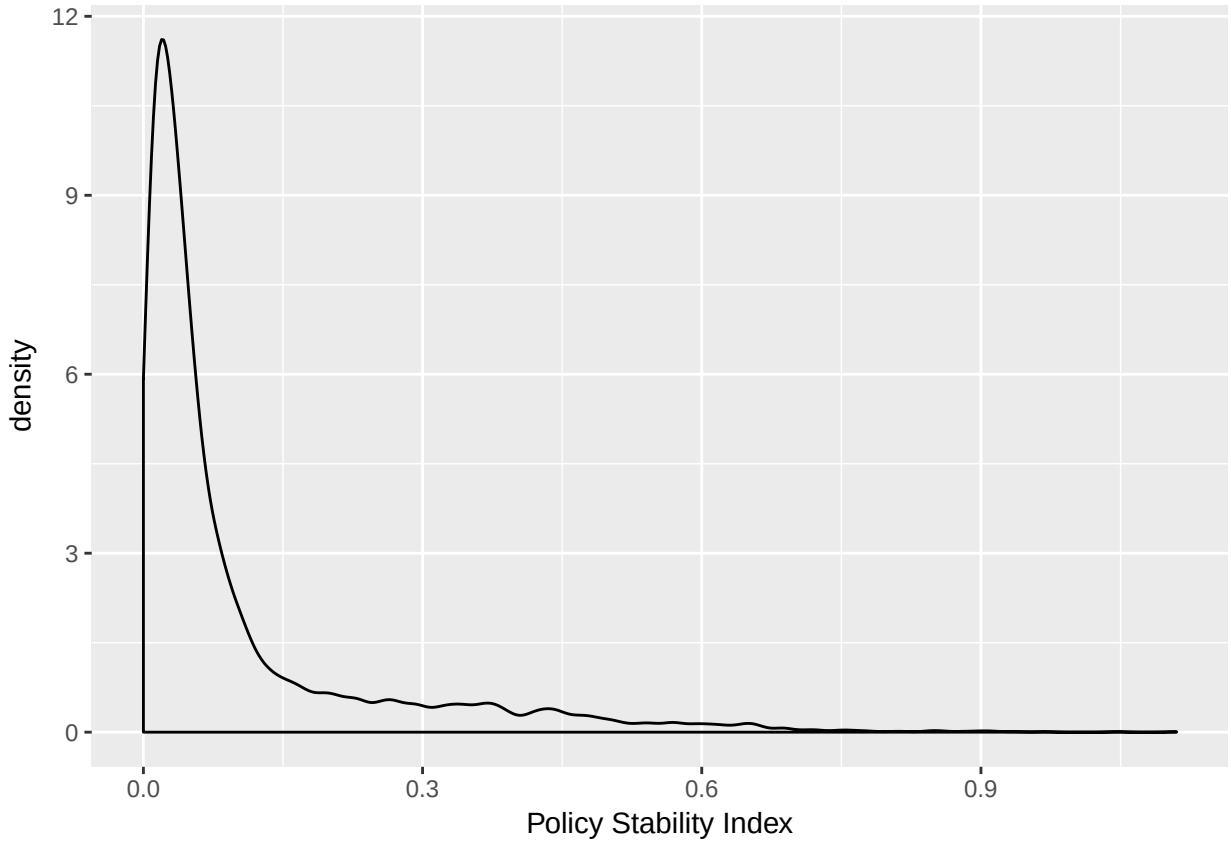

Figure 3: Policy Stability Index Density

The relationship between the raw DV and the imputed DV is shown in the Figure 4. Due to the page limits only the relationships between the original dependent variable and the first two imputed dependent variables are displayed here.

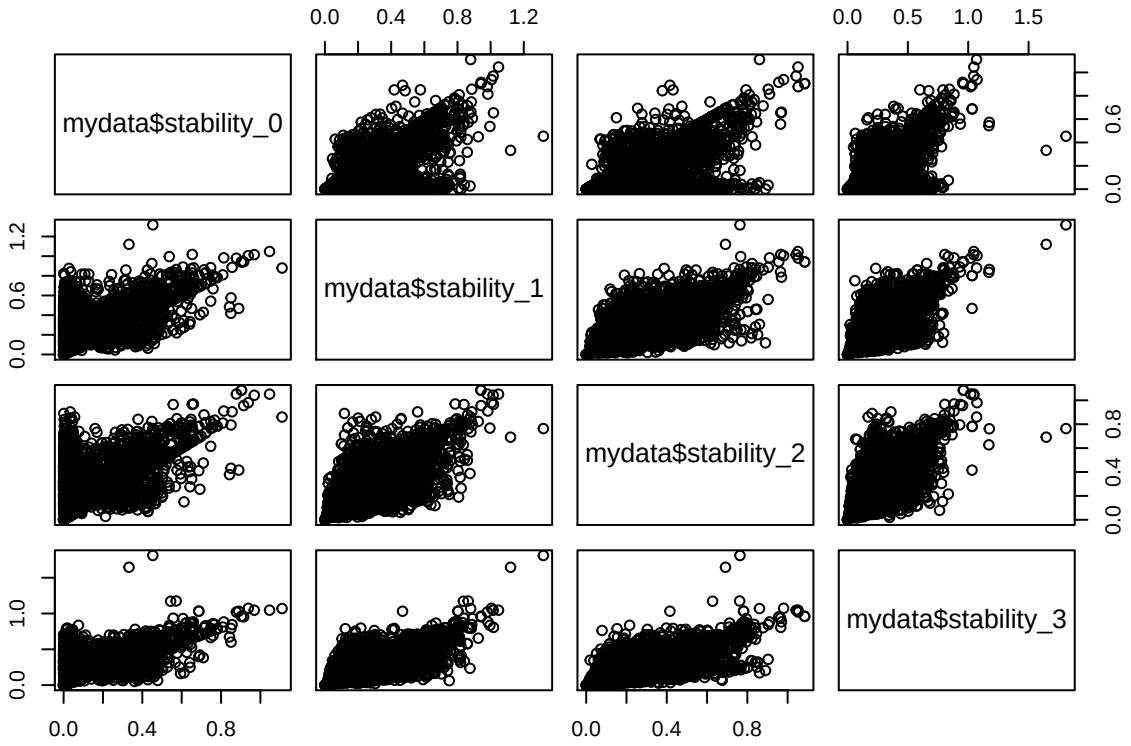

Figure 4: Dependent Variables Comparison

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