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Central Bank Independence and its Impact on Fiscal Policy Behaviour

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Abstract

This paper investigates the impact of central bank independence on fiscal policy behaviour, with a focus on political budget cycles and countercyclical fiscal policy. Multiple Fixed Effects models are estimated using panel data from 72 countries. Analyses are conducted for both de jure (legal) central bank independence and de facto (effective) independence. For some estimations, marginal effects plots using categorical analyses are included. The analysis shows a stronger positive effect of de facto independence on the fiscal balance, but neither de facto nor de jure central bank independence reduce political budget cycles. Both measures promote countercyclicality. Higher levels of rule of law increase the countercyclical effect of de jure independence, especially when de jure independence is low. Both de facto and de jure central bank independence deter fiscal deficits, but this effect is stronger and more significant for de facto independence and more present outside of the election cycle. Concluding, central bank independence has a positive impact on the fiscal balance, but not always in the way that is expected.

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1 Introduction

Across the globe, central bank independence (CBI) has become increasingly prominent (de Haan & Eijffinger, 2016). This evolution originated in the widespread inflation of the 1970s, after which Rogoff (1985) proposed CBI to mitigate the time-inconsistency problem under political actors, and create credible monetary policy commitments. Because of its credibility, CBI ensures price stability. This independence, however, also leads to conflicts of interest between the monetary and fiscal authority. Where the independent central bank is interested in price stability and long-term economic stability, the government is focused on short-term political interests like increased consumption to promote re-election (Haga, 2015). As a consequence, the fiscal authority is likely to act more expansionary than desirable for price stability and long-term economic stability (Demid, 2018). To reach its objectives, the independent central bank needs to influence fiscal behaviour to create optimal policy coordination. This optimal coordination consists of countercyclical policy that is not influenced by political budget cycles (Demid, 2018).

The question is whether the independent central bank is able to stimulate policy coordination and impact fiscal behaviour. While central bank independence is expected to reduce political budget cycles and stimulate countercyclical policy, the literature displays varying results. Maloney et al. (2003), for example, find a reduction of political budget cycles only under objective legal (de jure) independence. On the other side, Haga (2015) finds a reduction of political budget cycles under de facto (effective) CBI but not under de jure CBI. Alpanda and Honig (2009) find that de jure CBI deters political budget cycles only in old democracies, not in new ones. Alternatively, Bodea and Higashijima (2017) find that de jure CBI only reduces fiscal deficits outside of election years, thus does not reduce political budget cycles. Demid (2018) finds CBI stimulates countercyclical fiscal behaviour and increases policy coordination. But Bodea and Higashijima (2017) do not find evidence for increased countercyclicality under CBI. As the literature varies greatly in its conclusions, this paper revisits the question of fiscal behaviour under CBI with an extensive dataset on de jure CBI and an additional analysis of de facto CBI.

The question that this paper attempts to answer is: *How does central bank independence impact fiscal behaviour?* This behaviour is investigated with a specific interest in political budget cycles and countercyclical fiscal policy. To answer these questions, a Fixed Effects analysis with

panel data is conducted to uncover country specific effects of CBI on the fiscal balance. Data on elections is included to investigate the effect of CBI on political budget cycles. The analysis is split in two, one for the investigation of political budget cycles and one with a focus on countercyclical fiscal policy behaviour.

First, the background on monetary and fiscal policy coordination is illuminated and the hypotheses are formulated. Second, the data and methodology will be discussed. Third, the results from the de jure CBI analysis are introduced. Fourth, de facto CBI is included and investigated. Lastly, final conclusions are drawn.

2 Monetary and Fiscal Policy Coordination

The motivation for central bank independence (CBI) has its foundations in the time inconsistency problem articulated by Barro and Gordon (1983) and Kydland and Prescott (1977). For price stability to be attained, monetary policy commitments need to be credible. The time inconsistency problem of political actors is that they are interested in short-term goals, hence their long-term monetary policy commitments lack credibility. The solution to this is delegating monetary policy authority to a conservative central banker that does not have conflicting interests (Rogoff, 1985). Delegating monetary policy creates more credible commitments, which aids in reaching price stability and long-term economic stability (Rogoff, 1985).

The delegation of monetary policy, however, causes tension between the monetary and fiscal authority, as long-term economic growth objectives interfere with short-term political interests (Haga, 2015). For economic prosperity and stability, coordination between monetary and fiscal policy is crucial (Beetsma & Bovenberg, 1997). The goal of coordination between these authorities is to balance output and inflation and to reach macroeconomic stabilization. To support this stabilization, lower fiscal deficits and countercyclical fiscal policy are in the interest of the independent central bank. It is often the case, however, that the fiscal authority is more likely to respond procyclical and overly expansionary (Demid, 2018).

A direct channel through which the central bank can influence fiscal behaviour is through monetary policy responses (Bodea & Higashijima, 2017; Haga, 2015). When an increase in fiscal expenditure leads to higher expected inflation, the central bank increases the interest rate in

response to keep expected inflation low (Afonso et al., 2019; Demid, 2018; Haga, 2015). An increased interest rate is undesirable for the government for two reasons. First, it harms economic growth by increasing borrowing costs for investors and its own borrowing costs. Second, it harms the re-election probability of the government in election years (Haga, 2015). This mechanism will be illuminated in section 2.1.1. Because of these negative consequences, an independent central bank is able to use the interest rate tool as a threat to deter fiscal expansion (Demid, 2018; Haga, 2015). A dependent central bank is less likely to use this threat, as in that scenario both monetary and fiscal policy fall under the same authority.

After the widespread inflation in the 1970s and the time-inconsistency solution proposed by Rogoff (1985), increasingly more national central banks have become independent (Crowe & Meade, 2007). Because of the rise of CBI and the importance of coordination, the extent to which CBI influences the fiscal balance and fiscal behaviour is an interesting subject of investigation. Two patterns of fiscal behaviour form the core of coordination and expenditure smoothing and are most discussed in the literature (Beetsma & Bovenberg, 1997; Bodea & Higashijima, 2017; Demid, 2018; Haga, 2015; Maloney et al., 2003). These two patterns are the effect of CBI on the presence of political budget cycles, and the stimulation of CBI of countercyclical fiscal policy.

2.1 Fiscal Behaviour under Central Bank Independence

2.1.1 Political Budget Cycles

The first question this paper investigates is whether independent central banks are able to reduce the presence of political budget cycles. Opportunistic political budget cycles are generated by politicians manipulating the business cycle to increase their chances of re-election (Nordhaus, 1975). Increasing fiscal expenditure leading up to an election decreases unemployment and increases consumption expectation, resulting in a higher chance of re-election (Nordhaus, 1975). De Haan and Klomp (2013) find evidence for political budget cycles in developing and advanced nations and young and old democracies. In light of policy coordination and macroeconomic stability, it is in the best interest of the independent central bank to reduce these cycles and smooth fiscal behaviour (Bodea & Higashijima, 2017).

Haga (2015) formulates a theoretical model on the behaviour of independent central banks and national governments surrounding elections, in which the interest rate plays a central role. In a scenario without an independent central bank, the government experiences less costs for fiscal expenditure. These costs are measured as the effect of consumption expectations on re-election probability. High consumption expectations are beneficial for re-election, while consumption postponement is not. Without an independent central bank, the government raises fiscal expenditure before elections to boost consumption, and the expected inflation goes up as a result. To counter the negative effect of expected inflation on consumption, the government will decrease interest rate to promote consumption. Consequently, expected consumption increases and the re-election probability is high. Alternatively, in a scenario with an independent central bank, the government is not able to decrease the interest rate to counter the negative effect of inflation expectation on consumption. The independent central bank will increase rather than decrease the interest rate to maintain price stability. Consequently, consumption postponement is expected and re-election probability is low (Haga, 2015).

In a scenario with an independent central bank, the costs of fiscal expenditure before elections is higher. Thus, the presence of an independent central bank discourages expansionary fiscal policy (Haga, 2015). Governments are less likely to increase fiscal deficits leading up to elections out of fear for increased interest rate from the independent central bank, as an increased interest rate lowers their election probability due to consumption postponement. Furthermore, Alpanda and Honig (2010) argue that independent central banks are able to withstand political pressure to finance increased government expenditures leading up to an election. Thus, it is expected that the presence of central bank independence reduces political budget cycles.

Hypothesis 1: Central bank independence reduces political budget cycles

The mechanism of the effect of central bank independence (CBI) on political budget cycles has been investigated empirically, but with varying results. The cause of the variation is likely due to the varying measures of CBI used. Maloney et al. (2003), for example, find a reduction of political budget cycles under de jure CBI. This effect, however, only holds for one out of six of the

Cukierman et al. (1992) legal parameters, that of objective independence (Maloney et al., 2003). On the other side, Haga (2015) finds that under de facto CBI, political budget cycles are less present. She does not find this effect under de jure CBI. Alpanda and Honig find that legal CBI deters political budget cycles only in old democracies, not in new ones (Alpanda & Honig, 2009). Alternatively, Bodea and Higashijima (2017) find that de jure central bank independence does not reduce political budget cycles. The effect of de jure CBI, conditional on the level of rule of law, is only present in non-election years (Bodea & Higashijima, 2017).

Literature varies significantly with regards to the perspectives and parameters used in the analysis. This paper revisits the analysis of the effect CBI on political budget cycles and attempts to add to the literature by using an extensive dataset on de jure CBI with an additional analysis of de facto CBI.

2.1.2 Countercyclical Fiscal Policy

The second question this paper addresses is whether the independent central bank is able to influence fiscal authority to conduct optimal countercyclical fiscal policy. Countercyclical fiscal policy is that the fiscal balance decreases in low-growth years, and increases in high-growth years. One would expect central bank independence (CBI) to stimulate countercyclical fiscal policy because of the stabilization it generates (Buiter, 2014). Central bank monetary policy is countercyclical in nature, and in an optimal policy scenario monetary and fiscal policy would be coordinated and both countercyclical. With policy coordination, both policymakers achieve the desired economic outcome and conflict is avoided (Demid, 2018).

Demid (2018) finds more countercyclical coordinated fiscal and monetary policy in countries with independent central banks and disciplined fiscal authorities. In countries with undisciplined fiscal authorities or dependent central banks, fiscal policy generally reacts pro-cyclically (Demid, 2018). It is expected that CBI stimulates counter-cyclical fiscal behaviour, with more deficit deterrence in periods with high economic growth.

Hypothesis 2: Central bank independence stimulates countercyclical fiscal policy

It is difficult to say what the underlying mechanism is for how the central bank stimulates countercyclical fiscal behaviour. One possible mechanism relates to the threat of increased interest rates, which increases the borrowing costs for the fiscal authority and through that deters deficits. Bodea and Higashijima (2017) formulate the mechanism as that the independent central bank “allows fiscal policy to respond to recessions” in a countercyclical manner, not disciplining them as much in recessions. Through the presence of CBI and its interest rate threat, the central bank is expected to coerce the fiscal authority into countercyclical behaviour.

Where most literature on CBI and fiscal policy focus on political budget cycles or political monetary cycles, Demid (2018) and Bodea and Higashijima (2017) include countercyclicality in their analyses. Demid (2018) finds that CBI stimulates countercyclical fiscal behaviour and increases policy coordination. Bodea and Higashijima (2017) do not find evidence for increased countercyclicality under CBI. As the results are inconclusive, the countercyclicality of fiscal behaviour under CBI is revisited in this paper.

2.2 De Jure Central Bank Independence and Rule of Law

The main perspective this analysis adopts is on legal (de jure) central bank independence (CBI). This is primarily due to the extensive dataset provided by Garriga (2016). There is roughly twice the amount of data available for de jure CBI than for de facto CBI, covering more countries over longer time-periods (Crowe & Meade, 2008; Cukierman et al., 1992; Garriga, 2016). One caveat of de jure CBI is that previous literature found weak or no significant results for the effect of de jure CBI on inflation or the fiscal balance, but significant results for de facto CBI (Alpanda & Honig, 2010; Crowe & Meade, 2008; Haga, 2015). To increase the measure of actual practical independence with de jure data, both Bodea and Higashijima (2017) and Crowe and Meade (2008) find that the inclusion of institutional quality, primarily rule of law, increases the effect and significance of de jure CBI. The inclusion of rule of law increases the credibility of the legal agreements on which CBI is founded and brings the measurement closer to effective independence (Bodea & Higashijima, 2017; Crowe & Meade, 2008). Thus, to get de jure CBI closer to a measure of de facto CBI, an interaction with rule of law is included in the analysis. Next to rule of law, Bodea and Higashijima (2017) find evidence that the level of democracy influences

the credibility and effectiveness of de jure CBI. Furthermore, Demid (2018) finds that monetary and fiscal policy are better coordinated in countries with high institutional quality. Thus, next to rule of law, a variable accounting for the level of democracy, Polity5, is investigated in the analysis.

3 Data and Methodology

3.1 Methodology

The main focus of the analysis is on the effect of de jure central bank independence (CBI) on the fiscal balance, with a specific interest in the countercyclicality of fiscal behaviour and the reduction of political budget cycles. A total of four initial models are estimated to investigate the hypotheses. Two models regarding the political budget cycle hypothesis, including and excluding rule of law. And two models regarding the countercyclicality hypothesis, including and excluding rule of law. Separating the analysis between excluding and including rule of law allows for the investigation of the impact of rule of law on the effect of de jure CBI.

An Ordinary Least Squares (OLS) Fixed Effects analysis is used to estimate the models. A Fixed Effects model explores the relationship between the dependent and independent variable within countries, rather than pooled effects of all countries combined (Wooldridge, 2013). The Chow test shows that pooled regression for this data cannot be used. Fixed Effects removes the effect of time-invariant country characteristics so that the net effect of CBI on the fiscal balance can be explored (Wooldridge, 2013). The estimation allows for different intercepts for each country investigated, eliminating economic entity specific variation present in pooled panel data analyses (Wooldridge, 2013). Using Maddala and Wu (1999) panel unit root test for unbalanced panel data, there is no evidence of unit root in the dependent variable, which means that the data is stationary (Maddala & Wu, 1999). Another important assumption to check is that the individual countries' error terms are not be correlated (autocorrelation). Furthermore, one does not want heteroskedasticity in the Fixed Effects model, as this implies biased standard errors (Wooldridge, 2013). To correct for both heteroskedasticity and autocorrelation, panel-corrected standard errors (PCSEs) are used (Wooldridge, 2013).

To capture the slow dynamics of governments' fiscal choices, one lag of the dependent variable could be included in the model (Alpanda & Honig, 2009; Bodea & Higashijima, 2017). However, when using the Fixed Effects estimation with unbalanced data, including a lagged dependent variable introduces bias, as the lagged dependent variable will be correlated with the error term (Baltagi, 2021). Since the main reason for including a lagged value of the dependent variable is to account for autocorrelation, and the PCSEs account for this, it is decided not to include a lagged value of the dependent variable.

The economic controls included in the analysis are GDP growth, unemployment, and inflation (Bodea & Higashijima, 2017; Demid, 2018; Garriga, 2016; Haga, 2015). GDP per capita was also considered as a control variable, but due to multicollinearity with Polity5 and rule of law this was left out. To mitigate endogeneity concerns, all economic variables are lagged one year. As the Fixed Effects estimation accounts for economic entity specific variation, no further controls accounting for country specific variation, like region or income group, need to be included (Wooldridge, 2013).

3.2 Data Description and Summary Statistics

Data on the general government operating balance is collected from the IMF Fiscal Monitor database (International Monetary Fund data, 2022). Data on the primary fiscal balance is used because this excludes the interest rate payments over previous debt. By excluding the interest rate, the effect of central bank independence (CBI) is isolated to its influence on fiscal behaviour rather than its effect on the interest rate. The primary balance is calculated as revenue minus expenditure, excluding the interest rate payments (International Monetary Fund data, 2022).

Garriga (2016) provides an extensive dataset on de jure CBI. This dataset captures de jure CBI with yearly data from 182 countries between 1970 and 2012. The dataset includes Garriga's de jure CBI continuous parameter from 0 to 1, 0 implying no legal independence and 1 implying full legal independence. As this paper includes an analysis on political budget cycles surrounding elections, the dataset was narrowed down to only include democracies. The countries were selected using the Polity5 parameter, non-democratic countries with a Polity5 score below zero were dropped (INSCR, 2018). Polity5 data was collected from the Centre for Systemic Peace, and

ranges from completely autocratic countries with a score of -10 to completely democratic countries with a score of 10 (INSCR, 2018). Additionally, CBI data from regional central banks was excluded, because this research focuses on how central bank independence influences national fiscal behaviour. Narrowing down the Garriga dataset with these two steps leaves 72 countries in the analysis (Appendix, Table I). There is an extensive table depicting which countries and observations are included in which models (Appendix, Table VIII).

Data on elections is collected from the 14th release of the CLEA lower chamber election data archive (CLEA, 2022). This data includes lower chamber legislative election results from multiple levels of government. For the analysis, the data was adapted to only include national elections. The month in which the election took place was also included, so that an election cycle could be estimated. The election cycle variable was generated by recoding the election dummie to generate an election cycle of one year leading up to the election month (Alpanda & Honig, 2009). The reasoning for this is derived from Franzese (2000), in which is argued that the biggest impact of an election on the fiscal balance is in the year prior to and after an election. Since this analysis concerns the behaviour of the government leading up to an election, the election cycle is calculated one year up to the election month. A weight is given to the election data depending on the month in which the election takes place. An election in March 2012 generates a weight of $3/12 = 0.25$ for 2012 and a weight of $1-(3/12) = 0.75$ for 2011.

Polity5 and data from the World Bank Governance Indicators on rule of law is included to get closer to an estimation of effective independence under de jure CBI (Bodea & Higashijima, 2017; Crowe & Meade, 2008; Worldbank, 2020). Data on GDP growth is collected from the World Bank national accounts data (Worldbank, 2022). The distribution of the GDP growth data can be observed in Figure 1. Other control variables are inflation and unemployment, which were present in the Garriga dataset on de jure CBI (Garriga, 2016).

Table 1 shows the summary statistics of all variables included in the analyses. Inflation has a significantly high maximum, but as this observation is truthful and does not skew the estimation, the observations are left in. Table 2 depicts the correlation among the explanatory variables. For the OLS estimation to work, there cannot be multicollinearity between independent variables (Wooldridge, 2013). The correlation between election and election cycle and Polity5 and rule of

law can be expected. These explanatory variables are not included in an estimation at the same time, thus multicollinearity is not present. The panel data does not contain gaps in its missing values, thus the missing values do not skew the OLS estimation and iteration of the missing values is not necessary (Wooldridge, 2013).

TABLE 1. SUMMARY STATISTICS

	Obs.	Mean	Std. dev.	Min.	Max.
Primary Fiscal Balance	1,188	-.0095	3.5004	-12.1855	18.5427
Central Bank Independence	2,920	.4785	.2000	0.0971	0.9040
Election	2,312	.2663	.4421	0	1
Election Cycle	2,316	.2632	.3338	0	1
GDP growth	2,604	3.5714	4.5926	-32.8321	33.7358
Rule of Law	1,436	.0309	.9266	-2.0085	2.0137
Polity5	2,970	7.3926	2.7299	0	10
Inflation	2,930	47.4775	441.6893	-11.4495	14,337.92
Unemployment	2,228	8.8515	5.8880	0	38.6

Source: Author calculations

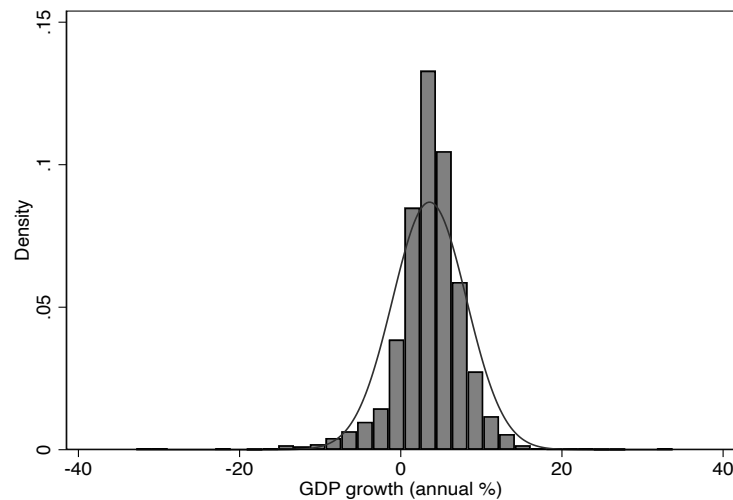


FIG. 1. DISTRIBUTION OF GDP GROWTH DATA

Notes: Min. = -32.83 Max. = 33.74 Source: Worldbank data (2022), author calculations

TABLE 2. CORRELATIONS EXPLANATORY VARIABLES

	CBI	Election	El. Cycle	GDP growth	RoL	Polity5	Inflation	Unemp.
CBI	1.000							
Election	0.0119	1.000						
Election Cycle	0.0032	0.6555	1.000					
GDP growth	-0.0208	0.0163	-0.0002	1.000				
Rule of Law (RoL)	-0.2011	0.0398	0.0508	-0.1843	1.000			
Polity5	0.0600	0.0650	0.0544	-0.1553	0.5988	1.000		
Inflation	0.0346	0.0335	-0.0016	-0.0485	-0.1011	-0.0777	1.000	
Unemployment	0.1293	-0.0010	0.0061	-0.0760	-0.0760	-0.0064	0.0255	1.000

Source: Author calculations

3.3 Political Budget Cycles Estimation

The first two estimated models regard the political budget cycle hypothesis. To investigate this, the election cycle variable and an interaction term with central bank independence (CBI) is included. For a political budget cycle to be present one would expect a negative coefficient for the election cycle, as this implies a lower fiscal balance in election years. It is expected that the interaction term between CBI and the election cycle is positive; for higher levels of CBI, the effect of election on the fiscal balance becomes less negative or is eliminated.

The first model estimation does not include rule of law and its impact on de jure CBI. This estimation is split in two, one including Polity5 as a control and one excluding it. It is expected that in a country with higher levels of democracy an upcoming election has an bigger impact on the fiscal balance, as competition for re-election is bigger (Haga, 2015). Polity5 can be included to control for this effect that would otherwise be captured by the election cycle variable. The first model will be estimated twice, with and without the additional control, to see whether Polity5 changes the estimation.

$$(1a) \quad FB_{i,t} = \beta_0 + \beta_1 CBI_{i,t} + \beta_2 ELcycle_{i,t} + \beta_3 CBI_{i,t} * ELcycle_{i,t} + \beta_4 [Controls] + \sum_{j=4}^N \beta_{j+1} X_{i,t} + u_{i,t}$$

$$(1b) \quad FB_{i,t} = \beta_0 + \beta_1 CBI_{i,t} + \beta_2 ELcycle_{i,t} + \beta_3 CBI_{i,t} * ELcycle_{i,t} + \beta_4 Polity5_{i,t} + \beta_5 [Controls] + \sum_{j=5}^N \beta_{j+1} X_{i,t} + u_{i,t}$$

To investigate whether the inclusion of rule of law impacts the effect of de jure CBI on political budget cycles, a second model is estimated including a three-way interaction with rule of law. Under high levels of rule of law, it is expected that de jure CBI has a bigger impact on political budget cycles than when the level of rule of law is low. For the three-way interaction, the original election dummie is included rather than the generated election cycle, because this facilitates the interpretation of the three-way interaction effect.

$$(2) \quad FB_{i,t} = \beta_0 + \beta_1 CBI_{i,t} + \beta_2 Election_{i,t} + \beta_3 RoL_{i,t} + \beta_4 CBI_{i,t} * Election_{i,t} + \beta_5 CBI_{i,t} * RoL_{i,t} + \beta_6 RoL_{i,t} * Election_{i,t} + \beta_7 CBI_{i,t} * Election_{i,t} * RoL_{i,t} + \beta_8 [Controls] + \sum_{j=8}^N \beta_{j+1} X_{i,t} + u_{i,t}$$

In mathematical specifications 1a, 1b, and 2, the dependent variable $FB_{i,t}$ is the primary fiscal balance. De jure central bank independence is $CBI_{i,t}$. $ELcycle_{i,t}$ stands for the election cycle variable, and $Polity5_{i,t}$ is the Polity5 variable depicting the level of democracy. $Election_{i,t}$ is the election dummie variable, and $RoL_{i,t}$ stands for the rule of law parameter. Under controls lie the lag of GDP growth, the lag of inflation and the lag of unemployment. The summation captures the time-demeaned data of the Fixed Effects model, and the error term captures the error between entities. The within entity error term is eliminated by the Fixed Effects estimation.

3.4 Countercyclical Fiscal Policy Estimation

Two models are estimated to investigate the effect of central bank independence (CBI) on countercyclical fiscal behaviour. For countercyclical fiscal policy one would expect GDP growth to have a positive effect on the fiscal balance, as this implies reduced expenditure in high-growth years and higher expenditure in low-growth years. An interaction effect is included for GDP growth and CBI. If CBI stimulates countercyclical fiscal policy, the interaction term is positive, implying a more positive effect of GDP growth on the fiscal balance under high CBI.

$$(3) \quad FB_{i,t} = \beta_0 + \beta_1 CBI_{i,t} + \beta_2 GDPgrowth_{i,t-1} + \beta_3 CBI_{i,t} * GDPgrowth_{i,t-1} + \beta_4 [Controls] + \sum_{j=4}^N \beta_{j+1} X_{i,t} + u_{i,t}$$

The second model regarding countercyclical fiscal policy includes a three-way interaction with rule of law. Under higher levels of rule of law, one would expect a bigger and more significant

impact of CBI on the counter-cyclical policy of fiscal policy. In both model 3 and model 4, the controls are the lag of inflation and the lag of unemployment. The summation captures the time-demeaned data of the Fixed Effects model, and the error term captures the error between entities. The within entity error term is eliminated by the Fixed Effects estimations.

$$(4) \quad FB_{i,t} = \beta_0 + \beta_1 CBI_{i,t} + \beta_2 GDPgrowth_{i,t-1} + \beta_3 RoL_{i,t} + \beta_4 CBI_{i,t} * GDPgrowth_{i,t-1} + \beta_5 CBI_{i,t} * RoL_{i,t} + \beta_6 RoL_{i,t} * GDPgrowth_{i,t-1} + \beta_7 CBI_{i,t} * GDPgrowth_{i,t-1} * RoL_{i,t} + \beta_8 [Controls] + \sum_{j=8}^N \beta_{j+1} X_{i,t} + u_{i,t}$$

4 De Jure Central Bank Independence

4.1 Political Budget Cycles under de jure CBI

In the first estimation of model 1a and 1b depicted in Table 3, both de jure central bank independence (CBI) and the election cycle do not show a significant effect on the fiscal balance. Although insignificant, CBI does have the expected positive impact, where higher CBI implies a higher fiscal balance and deterrence of fiscal deficits. The interaction coefficient of the election cycle and CBI is negative, which indicates that de jure CBI does not reduce political budget cycles. The positive, although insignificant, de jure CBI coefficient does imply that outside of the election cycle the effect of CBI is positive. In the election cycle the effect becomes more negative, illustrated by the negative interaction term. This indicates that de jure CBI has a positive impact on the fiscal balance, but only outside of election years. This result is in line with the findings of Bodea and Higashijima (2017), who find that de jure CBI only has an effect on the fiscal balance outside of election years (Bodea & Higashijima, 2017). It implies that the legally independent central bank is not able to influence governments' fiscal decisions and deter fiscal deficits as effectively during election years as outside of them.

The interaction effect is only significant when Polity5 is not included in the specification. An increased Polity5 score has a significant negative effect on the fiscal balance. This follows expectations, as higher levels of democracy increases election competition among political parties and thereby increases public spending (Brender & Drazen, 2005; Haga, 2015). It could be

that Polity5 captures the negative effect of democracy and its accompanying election competition on the fiscal balance, taking away the effect of the election cycle variable in the estimation.

TABLE 3. POLITICAL BUDGET CYCLE ESTIMATION RESULTS

Dependent variable: Primary Fiscal Balance			
	Model 1a	Model 1b	Model 2
Central Bank Independence (CBI)	1.442 (0.71)	1.808 (0.88)	1.719 (1.03)
Election Cycle	0.808 (1.43)	0.791 (1.41)	
CBI * Election Cycle	-1.858* (-2.01)	-1.803 (-1.98)	
Election (dummie)			0.391 (0.72)
CBI * Election (dummie)			-1.090 (-1.46)
Rule of Law			-2.266 (-1.46)
CBI * Rule of Law			0.470 (0.22)
Election * Rule of Law			0.331 (0.80)
CBI * Election * Rule of Law			-0.505 (-0.75)
Polity5		-0.405*** (-3.84)	
GDP growth (lag)	0.200*** (5.80)	0.198*** (5.71)	0.178*** (6.20)
Inflation (lag)	0.0112 (1.07)	0.00684 (0.67)	0.0295* (2.49)
Unemployment (lag)	0.0524 (0.97)	0.0501 (0.96)	0.165** (3.16)
Constant	-2.067 (-1.83)	1.123 (0.84)	-2.531* (-2.11)
Observations	1012	1012	832
adj. R-squared	0.057	0.071	0.076
Rho	0.416	0.472	0.708

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001 Source: Author calculations

In Table 3 the results from the three-way interaction with rule of law are depicted under model 2. The only coefficients that are significant in this model are the controls. Hence, the interpretation of this model remains speculative and does not generate significant conclusions. One adaptation was made to the estimation to attempt to improve the significance of the results. Model 2b was estimated using the election cycle variable rather than the election dummie (Table II, Appendix). This specification, however, did not change anything about the significance or shape of the results of model 2. Another possible alteration of model 2 is to include Polity5 in the three-way interaction instead of rule of law. This follows the hypothesis by Bodea and Higashijima (2017) that de jure CBI is supported by the level of democracy in a country. However, including Polity5 rather than rule of law in the three-way interaction model with elections did not improve the significance of the coefficients or their explanatory powers (Model 2c. Table III, Appendix). That rule of law or Polity5 do not improve the effect of de jure CBI on political budget cycles is an interesting finding, as it is at odds with conclusions by Bodea and Higashijima (2017) and Crowe and Meade (2008). This might be because the sample of countries in this analysis was narrowed down using the Polity5 score, excluding all countries with a negative score. Consequently, the countries present in the sample likely already show higher levels of rule of law. This effect is heightened by the fact that only the more democratic countries have data available on their election cycle. Hence, the inclusion of rule of law in this estimation does not change the significance. Bodea and Higashijima (2017) and Crowe and Meade (2008), on the other hand, use more diverse samples to prove the effect of rule of law and Polity5 on the significance of de jure CBI.

One critical caveat to the conclusion on political budget cycles is that it appears that these cycles are not present in the sample, as seen from the insignificant and positive effect of the election coefficient on the fiscal balance. One possible explanation for this might be the use of the one-year election cycle rather than a bigger cycle length (Franzese, 2000). Another explanation might be that the sample covers a too wide variety of countries for the effect to be visible. Brender and Drazen (2005) find, for example, that political budget cycles are more likely to occur in young democracies or developing nations. Future research could examine the dataset used in this paper and split the analysis in groups for developing and developed nations, or old and young

democracies. This might uncover the political budget cycle mechanism more clearly, and then CBI could be included in the analysis. For now, this extension falls beyond the scope of this paper.

4.2 Countercyclical Fiscal Policy under de jure CBI

TABLE 4. COUNTERCYCLICAL FISCAL POLICY ESTIMATION RESULTS

Dependent variable: Primary Fiscal Balance		
	Model 3	Model 4
Central Bank Independence (CBI)	1.049 (0.67)	1.631 (1.06)
GDP growth	0.327*** (3.55)	0.319*** (3.65)
CBI * GDP growth	-0.167 (-1.28)	-0.171 (-1.48)
Rule of Law		-2.316 (-1.57)
CBI * Rule of Law		0.955 (0.51)
Rule of Law * GDP growth		0.135 (1.32)
CBI * Rule of Law * GDP growth		-0.0501 (-0.31)
Inflation (lag)	0.00404 (1.54)	0.0076 (1.16)
Unemployment (lag)	-0.0368 (-0.58)	0.0355 (0.54)
Constant	-1.217 (-1.29)	-1.726 (-1.44)
Observations	1122	927
adj. R-squared	0.072	0.099
Rho	0.416	0.638

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001. Source: Author calculations

The results from model 3 are depicted in Table 4. The results show a significant positive effect of GDP growth on the fiscal balance. This indicates countercyclical fiscal policy behavior; when GDP growth is high, expenditure is lower and the fiscal balance is higher. The interaction term with de jure central bank independence (CBI) is not significant and, against expectations, negative

rather than positive. To investigate this interaction effect in more detail, an additional marginal effects estimation is conducted using three categories on the level of de jure CBI. As the marginal effects for the political budget cycle hypothesis are difficult to interpret, its inclusion falls beyond the scope of this paper. In the low CBI group, all countries with a CBI score between 0 and 0.4 are grouped, accounting for around 40% of observations (Appendix Table V). In the medium CBI group this is the countries with a score between 0.4 and 0.6, which is roughly 32% of observations. And in the high CBI group these are the countries with scores above 0.6, the highest levels of de jure CBI, accounting for 28% of the observations (Appendix Table V). Conducting this additional estimation generates the marginal effects plots depicted in Figure 2. To observe the confidence intervals for the marginal effects of the three CBI groups, an additional figure is included in the Appendix (Figure A).

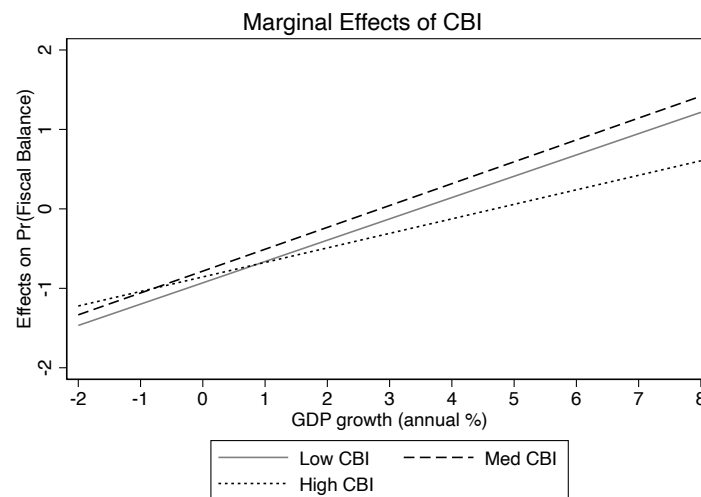


FIG. 2. MARGINAL EFFECTS: COUNTERCYCLICALITY UNDER DE JURE CBI

Source: Author calculations

Where the estimation results of model 3 in Table 4 do not show a significant sign of de jure CBI stimulating countercyclical fiscal policy, this effect is observable in the additional marginal effects analysis with three CBI categories. The marginal effects plots in Figure 2 show a clear countercyclical tendency of the effect of de jure CBI on the fiscal balance, with a more negative effect in periods of low GDP growth and a positive effect in periods of high GDP growth.

When estimating the three-way interaction including rule of law depicted as model 4 in Table 4, it appears that only the GDP growth coefficient is significant. One of the alterations that was

made to model 4 in an attempt to improve the results was to include Polity5 rather than rule of law. However, this had no impact on the significance of the coefficients (Model 4b. Table IV, Appendix). Another attempt to uncover the effect of rule of law on de jure CBI is conducting a marginal effects analysis with categories for both de jure CBI and rule of law. The groups of de jure CBI have previously been introduced. The group for low levels of rule of law includes all the negative observations, ranging from -2.5 to 0, and accounts for roughly 57% of observations. The rule of law group for high levels includes all positive observations, 0 to 2.5, accounting for the other 43% (Appendix Table VI). Figure 3 depicts the marginal effects of the three groups of de jure CBI with low and high rule of law (RoL) for each group.

In all three groups depicted in Figure 3, increased rule of law indicates a more countercyclical effect of de jure CBI on the fiscal balance with significantly smaller confidence intervals. Especially when de jure CBI is relatively low, higher rule of law increases its countercyclicality. This implies that strong rule of law is needed for lower levels of de jure CBI to be effective in influencing governments' behaviour, confirming the expected relationship of rule of law increasing the effectiveness of de jure CBI (Bodea & Higashijima, 2017; Crowe & Meade, 2008).

This conclusion differs from what was found in the political budget cycle estimation, where rule of law had no significant effect. This might be because this sample also includes countries with relatively lower Polity5 scores for which no election data is available. Furthermore, the interaction effect with rule of law in the countercyclical estimation (Table 3) is insignificant. It is the marginal effects in which the impact becomes clear. The marginal effects might uncover the effect of rule of law that was not noticeable in the initial estimation and the estimation for political budget cycles.

The results from the marginal effects analyses confirm the hypothesis that CBI stimulates countercyclical fiscal policy for optimal policy coordination (Demid, 2018). This implies that legally independent central banks succeed in stimulating governments' fiscal behaviour into countercyclicality, with higher deficit deterrence in periods of high GDP growth and lower deterrence in periods of low GDP growth.

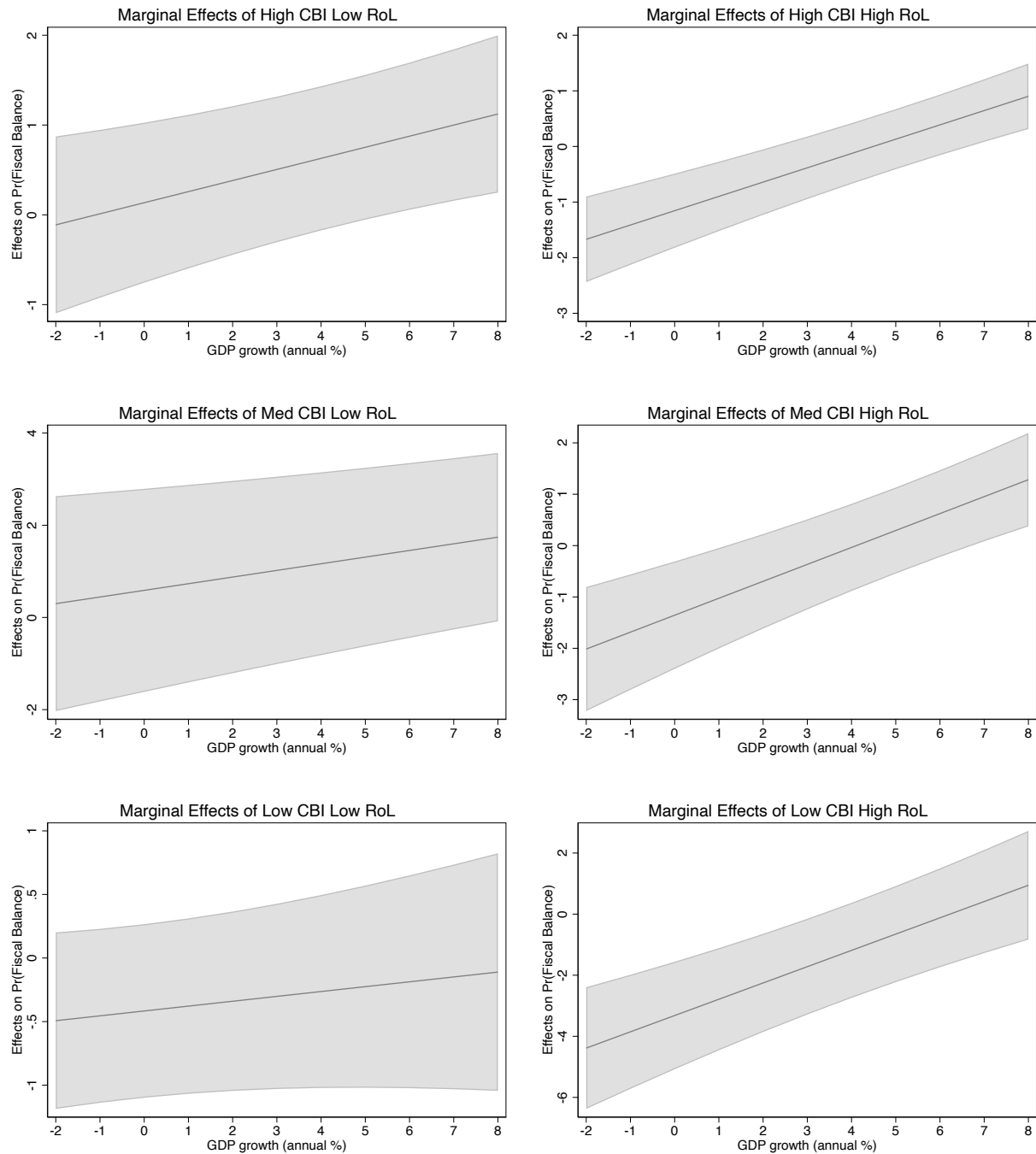


FIG. 3. MARGINAL EFFECTS: COUNTERCYCLICALITY UNDER DE JURE CBI, INCLUDING RULE OF LAW

Notes: Gray area depicts the 90% confidence interval. Source: Author calculations

5 De Facto Central Bank Independence

There are only a few significant conclusions that can be drawn from the models that are estimated with de jure central bank independence (CBI). One of the possible explanations for the ambiguous results is the ambiguity of de jure CBI. Haga (2015), for example, investigates political budget cycles and finds no relationship for legal CBI, but a significant relationship with de facto CBI. She argues that this might be because legal independence does not reflect accurately how monetary policy is conducted in reality (Haga, 2015). Alpanda and Honig (2010) underline this by stating that a measure of de jure CBI may be problematic because the law can be vastly different from actual practice (Alpanda & Honig, 2010). Crowe and Meade (2008) find a much stronger empirical relationship for de facto CBI than for de jure CBI with levels of inflation. They conclude that the de jure measure of CBI fails to capture the actual, effective level of CBI, and therefore shows a weaker empirical link than de facto CBI (Crowe & Meade, 2008). To summarize, two countries can have the same legal CBI measurement, but score very differently in its effective independence due to differences in institutions and rule of law. This paper has attempted to capture this difference by including three-way interactions rule of law or the level of democracy, but this has proven to generate mostly insignificant interaction effects. Thus, an additional analysis using a measure of de facto CBI is conducted. It was chosen to use data on de jure CBI rather than de facto due to its data availability. This means that the analysis with de facto CBI contains around half of the observations present in the de jure analysis.

The data for de facto CBI is derived from methods used by Alpanda and Honig (2010). They use data from two sources, Crowe and Meade (2007) and Cukierman et al. (1992), in which the turnover rate of central bank governors is the measure for de facto CBI. The dataset consists of the original specification by Cukierman et al (1992), supplemented by Crowe and Meade (2008) to cover the time-period from 1980-2004 (Crowe & Meade, 2008). The de facto CBI measurement concerns the turnover rate of central bank governors. Intuitively, the higher the turnover rate of governors, the lower the independence of the central bank (Vuletin & Zhu, 2011). One problem with this measurement, however, is that dependent central banks could also have low turnover of governors simply because these governors act in favor of the political power and therefore are not forced to resign. There has been empirical evidence, however, that the turnover rate can be

used as a proxy for de facto independence (Vuletin & Zhu, 2011). Furthermore, it is the most used measurement in the literature to capture de facto CBI (Alpanda & Honig, 2010; Crowe & Meade, 2008; de Haan & Eijffinger, 2016; Haga, 2015).

TABLE 5. SUMMARY STATISTICS DE FACTO CBI

	Obs.	Mean	Std. dev.	Min.	Max.
Turnover (de facto CBI)	1,353	.2295639	.1787478	0	1

Source: Author calculations

The turnover de facto CBI parameter ranges from 0 to 1, in which 0 stands for no independence and high turnover, and 1 for high independence and a low turnover rate (Crowe & Meade, 2008). This data has the same shape as the data used on de jure CBI, thus the interpretation of the estimations for de facto and de jure CBI is the same. When the measure of de facto CBI is used, the need for the inclusion of rule of law and the three-way interaction model 2 and 4 drops. As the reason for inclusion was to come closer to a de facto estimation with de jure CBI data. Hence, only model 1 and 3 are re-evaluated using the de facto CBI turnover data from (Crowe & Meade, 2008). One obstacle in conducting the analysis with this data is that there are only two values for de facto CBI per country. One value running from 1980 to 1994 and one from 1995 to 2004. This means the data is semi-time-invariant, which might pose problems for the Fixed Effects estimation. This limitation is discussed in the conclusion.

TABLE 6. CORRELATION INCLUDING DE FACTO CBI

	Turnover	Election Cycle	Polity5	GDP growth	Inflation	Unemp.
Turnover (de facto CBI)	1.000					
Election Cycle	0.0255	1.000				
Polity5	-0.1334	0.0286	1.000			
GDP growth	0.0068	-0.0183	-0.1745	1.000		
Inflation	0.2237	0.0258	-0.0574	-0.1867	1.000	
Unemployment	-0.0498	-0.0318	0.0070	-0.0299	-0.0316	1.000

Source: Author calculations

5.1 Political Budget Cycles under de facto CBI

TABLE 7. POLITICAL BUDGET CYCLE ESTIMATION RESULTS: DE JURE VS DE FACTO CBI

Dependent variable: Primary Fiscal Balance				
	1a. de jure	1b. de jure	1a. de facto	1b. de facto
Central Bank Independence (CBI)	1.442 (0.71)	1.808 (0.88)	5.497* (2.31)	5.188* (2.24)
Election Cycle	0.808 (1.43)	0.791 (1.41)	0.675 (1.49)	0.656 (1.47)
CBI * Election Cycle	-1.858* (-2.01)	-1.803 (-1.98)	-4.340* (-2.15)	-4.157* (-2.12)
GDP growth (lag)	0.200*** (5.80)	0.198*** (5.71)	0.222** (3.11)	0.218** (2.95)
Inflation (lag)	0.0112 (1.07)	0.00684 (0.67)	0.00778 (0.42)	0.0058 (0.31)
Unemployment (lag)	0.0524 (0.97)	0.0501 (0.96)	-0.109 (-1.26)	-0.109 (-1.26)
Polity5		-0.405*** (-3.84)		-0.142 (-0.70)
Constant	-2.067 (-1.83)	1.123 (0.84)	-0.844 (-1.36)	-0.431 (-0.21)
Observations	1012	1012	496	496
adj. R-squared	0.057	0.071	0.086	0.086
Rho	0.416	0.472	0.482	0.481

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001. Source: Author calculations

Table 7 depicts the results of model 1a and 1b with both measures of central bank independence (CBI). One clear and important change when including de facto CBI rather than de jure CBI in the estimation is that de facto CBI has a significant and positive impact on the fiscal balance where de jure CBI does not. This result confirms the general hypothesis that CBI deters fiscal deficits and influences fiscal behavior. It is a critical observation that this effect is significant for de facto CBI and not for de jure. It, however, is not a new observation. Crowe and Meade (2008) find similar conclusions on the effect of CBI on inflation. They conclude that the de jure measure of CBI fails to capture the actual, effective level of CBI, and therefore shows a weaker empirical link than de facto CBI.

Another difference of the de facto analysis compared to the de jure analysis is that the Polity5 variable is not significant and does not take away the significance of the interaction term. This likely relates to the fact that Polity5 increases the significance of the effect of de jure CBI, which is not the case for de facto CBI (Bodea & Higashijima, 2017).

The interaction term with election cycles is significant and still negative, implying that both de facto and de jure CBI do not decrease political budget cycles in this sample. This finding at odds with conclusions drawn by previous literature. Haga (2015) finds that political budget cycles are reduced with de facto CBI, where it is not with de jure CBI. Including de facto CBI in this paper, however, does not produce significant results regarding political budget cycles. This could be because the election cycle effect in the model is still insignificant, confirming the suspicion that this dataset likely does not contain political budget cycles.

To summarize, de facto CBI has a more significant and positive impact on the fiscal balance than de jure CBI, but this effect is still stronger outside of the election cycle than in it. Implying that both de facto CBI and de jure CBI do not reduce political budget cycles. This means that CBI in both forms fails to deter fiscal deficits as effectively inside election years as outside them. It appears that the short-term political interest to increase deficits during elections is stronger than the interest-rate threat produced by the independent central bank.

5.2 Countercyclical Fiscal Policy under de facto CBI

At first glance of Table 8, the inclusion of de facto central bank independence (CBI) seems to have no significant impact on the countercyclical fiscal policy specification. The two changes worth mentioning regard the insignificant effect of GDP growth and the interaction term that has turned slightly positive.

TABLE 8. COUNTERCYCLICALITY ESTIMATION RESULTS: DE JURE VS DE FACTO CBI

Dependent variable: Primary Fiscal Balance		
	De jure	De facto
Central Bank Independence (CBI)	1.049 (0.67)	1.143 (0.31)
GDP growth	0.327*** (3.55)	0.161 (1.88)
CBI * GDP growth	-0.167 (-1.28)	0.127 (0.51)
Inflation (lag)	0.00404 (1.54)	0.00099 (0.62)
Unemployment (lag)	-0.0368 (-0.58)	-0.139 (-1.48)
Constant	-1.217 (-1.29)	0.523 (0.72)
Observations	1122	551
adj. R-squared	0.072	0.062
Rho	0.416	0.465

Notes: t statistics in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: Author calculations

To investigate the interaction effect further, a marginal effects analysis including categories for de facto CBI is conducted. Just as for de jure CBI, de facto CBI is categorized in three groups. De facto CBI, however, is more unevenly distributed than de jure CBI, with significantly more observations in the lower range. This is in line with expectations, as high levels of de jure CBI might still imply low levels of de facto CBI in practice (Alpanda & Honig, 2010). Thus, rather than following the same groups as de jure CBI, de facto CBI groups are generated with new cut-off points. For the low de facto CBI group, the score ranges from 0 to 0.2, accounting for nearly 70% of the de facto observations (Appendix Table VII). The medium group scores lie between 0.3 and 0.5, accounting for around 25% of observations. The final group with the highest scores, between 0.6 and 1, account for 5% of the de facto observations (Appendix Table VII). An important caveat to the interpretation is that there are only 70 observations for high de facto CBI, compared to the 342 and 941 observations in the low and medium group (Appendix Table VII). The confidence intervals for the marginal effects of the three de facto CBI groups can be observed in Figure B in the Appendix.

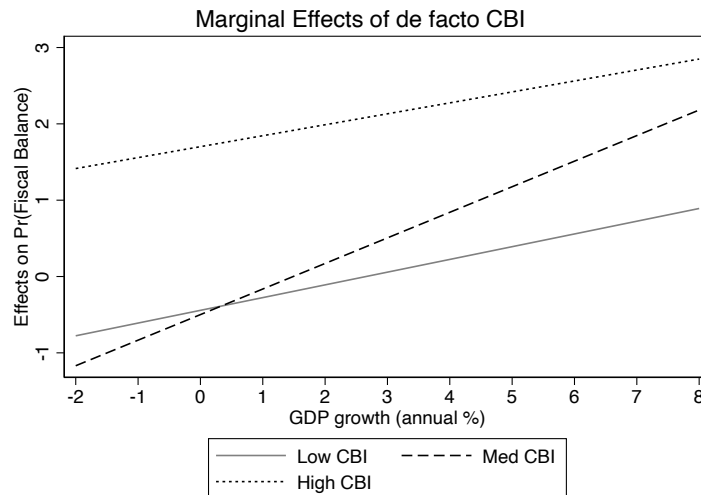


FIG. 4. MARGINAL EFFECTS: COUNTERCYCLICALITY UNDER DE FACTO CBI

Source: Author calculations

In Figure 4, all groups of de facto CBI show countercyclicality. The steepest slope is observed for medium de facto CBI. The low and high de facto CBI groups have the same slope, but the group for high de facto CBI is significantly more positive. The biggest observable difference of the marginal effects for de facto CBI compared to de jure CBI is that the estimation for high de facto CBI is significantly more positive. Even for negative levels of GDP growth, high de facto CBI has a positive effect on the fiscal balance. This implies that high levels of de facto CBI have a significantly more positive impact on the fiscal balance than de jure CBI, confirming the suspicion that de facto CBI has more effect on the fiscal balance than de jure CBI (Alpanda & Honig, 2010; Crowe & Meade, 2007; Haga, 2015). To conclude, both measures of CBI promote countercyclicality and deter fiscal deficits, but this effect is stronger and more significant for de facto independence. This is likely because de facto CBI paints a more realistic picture of independence, which increases its impact on fiscal behaviour.

6 Conclusion

The focus of this research was to shed light on the relationship between central bank independence (CBI) and fiscal behaviour and to investigate whether the independent central bank is able to stimulate policy coordination. For this question, the effect of CBI on political budget cycles and countercyclical fiscal policy was investigated.

The first conclusion that can be drawn is that *de facto* CBI has a more significant positive impact on the fiscal balance than *de jure* CBI. In the estimations for political budget cycles, the effect of *de facto* CBI is significantly positive. This is not the case for the countercyclical estimation, but the marginal effects plots show a significant positive impact of high *de facto* CBI. These results are in line with conclusions drawn by Crowe and Meade (2008) and Haga (2015) and confirm that CBI might be very different in practice than what is written in the law (Alpanda & Honig, 2010).

Regardless of this positive effect, the second conclusion is that both *de facto* and *de jure* CBI do not reduce political budget cycles in this sample. CBI in both forms fails to deter fiscal deficits as effectively inside election years as outside them, implying that short-term political interests to increase deficits during elections are stronger than the interest-rate threat of the independent central bank. Regardless of not reducing political budget cycles, both measures of CBI do have a positive impact on the fiscal balance outside of the election cycle, which is in line with the conclusion by Bodea and Higashijima (2017).

The results on the political budget cycle do not change when rule of law and the level of democracy are included for *de jure* CBI, which opposes the findings of Bodea and Higashijima (2017) and Crowe and Meade (2008). Inclusion of rule of law or democracy might not improve the effect of *de jure* CBI because the sample is already narrowed down to exclude non-democracies, thereby eliminating the effect. Rule of law, however, does increase the countercyclicality of the effect of *de jure* CBI on fiscal behaviour. This difference might be in the samples used for the models, with the countercyclicality models including more countries with a lower Polity5 score (Appendix, Table VIII).

One critical caveat to the conclusion on political budget cycles is that it appears that these cycles are not present in the sample. As political budget cycles are more likely to be found in young and developing democracies, future research might split the analysis of the effect of CBI on political

budget cycles for developed and developing nations, or young and old democracies (Brender & Drazen, 2005).

The third conclusion is that both de facto and de jure CBI stimulate countercyclical fiscal policy. The paper confirms the hypothesis that CBI stimulates countercyclical fiscal policy for optimal policy coordination (Demid, 2018). The effect increases for higher levels of rule of law, especially when the level of CBI is low. This implies that strong rule of law is needed for lower levels of de jure CBI to be effective in influencing governments' behaviour.

One of the limitations of this research is that it uses a Fixed Effects estimation to generate the results. Perhaps the use of the Fixed Effects estimation is not the right way to model the relationship. Bodea and Higashijima (2017) argue that the Fixed Effects estimation might not be optimal for this kind of data due to the time-invariant nature of central bank independence. This is a possible problem present in both the de facto and de jure CBI data used in this analysis. Most literature on CBI and its effect on the fiscal balance use the GMM estimation that considers simultaneous equation models to estimate the results (Bodea & Higashijima, 2017; Demid, 2018; Haga, 2015; Maloney et al., 2003). This estimation is used as it allows for more time-invariance in the main independent variable and allows a lag of the independent variable to be included in the estimation (Crowe & Meade, 2008; Haga, 2015). The choice for a Fixed Effects estimation therefore could have contributed to the ambiguity of the results. Future research can reevaluate the models introduced in this paper using different estimation methods.

Concluding, some puzzles on CBI and its impact on fiscal policy behaviour have been uncovered. CBI has a positive impact on the fiscal balance, but not always in the way that is expected. Both de facto and de jure CBI promote countercyclical fiscal behaviour, but neither reduce political budget cycles. Outside of the election cycle, however, both measures improve the fiscal balance and deter fiscal deficits.

REFERENCES

- Afonso, A., Alves, J., & Balhote, R. (2019). Interactions between monetary and fiscal policies. *Journal of Applied Economics*, 22(1), 132–151. <https://doi.org/10.1080/15140326.2019.1583309>
- Alpanda, S., & Honig, A. (2009). The Impact of Central Bank Independence on Political Monetary Cycles in Advanced and Developing Nations. *Journal of Money, Credit and Banking*, 41(7), 1365–1389. <https://doi.org/10.1111/j.1538-4616.2009.00260.x>
- Alpanda, S., & Honig, A. (2010). Political monetary cycles and a de facto ranking of central bank independence. *Journal of International Money and Finance*, 29(6), 1003–1023. <https://doi.org/10.1016/j.jimonfin.2010.02.001>
- Baltagi, B. H. (2021). *Econometric Analysis of Panel Data* (6th ed.). Springer. <https://link.springer.com/book/10.1007/978-3-030-53953-5>
- Barro, R. J., & Gordon, D. B. (1983). Rules, discretion and reputation in a model of monetary policy. *Journal of Monetary Economics*, 12(1), 101–121. [https://doi.org/10.1016/0304-3932\(83\)90051-X](https://doi.org/10.1016/0304-3932(83)90051-X)
- Beetsma, R. M. W. J., & Bovenberg, A. L. (1997). Central bank independence and public debt policy. *Journal of Economic Dynamics and Control*, 21(4), 873–894. [https://doi.org/10.1016/S0165-1889\(97\)00003-1](https://doi.org/10.1016/S0165-1889(97)00003-1)
- Bodea, C., & Higashijima, M. (2015, October 26). Central banks and fiscal policy: Why independent central banks can lead to lower fiscal deficits. LSE Blogs. <https://blogs.lse.ac.uk/euoppblog/2015/10/26/central-banks-and-fiscal-policy-why-independent-central-banks-can-lead-to-lower-fiscal-deficits/>
- Bodea, C., & Higashijima, M. (2017). Central Bank Independence and Fiscal Policy: Can the Central Bank Restrain Deficit Spending? *British Journal of Political Science*, 47(1), 47–70. <https://doi.org/10.1017/S0007123415000058>
- Brender, A., & Drazen, A. (2005). Political budget cycles in new versus established democracies. *Journal of Monetary Economics*, 52(7), 1271–1295. <https://doi.org/10.1016/j.jmoneco.2005.04.004>
- Buiter, W. H. (2014). Central Banks: Powerful, Political and Unaccountable? (SSRN Scholarly Paper No. 2526351). Social Science Research Network. <https://papers.ssrn.com/abstract=2526351>
- CLEA. (2022). CLEA | The Constituency-Level Elections Archive. <https://electiondataarchive.org/>
- Crowe, C., & Meade, E. E. (2007). The Evolution of Central Bank Governance around the World. *Journal of Economic Perspectives*, 21(4), 69–90. <https://doi.org/10.1257/jep.21.4.69>
- Crowe, C., & Meade, E. E. (2008). Central Bank Independence and Transparency: Evolution and Effectiveness. *IMF Working Papers*, 08(119), 30.

- Cukierman, A. (2022). Data on Central Banks. Alex Cukierman. <https://www.alexcuk.sites.tau.ac.il/data-on-central-banks>
- Cukierman, A., Webb, S. B., & Neyapti, B. (1992). Measuring the Independence of Central Banks and Its Effect on Policy Outcomes. *The World Bank Economic Review*, 6(3), 353–398.
- de Haan, J., & Eijffinger, S. C. W. (2016). The Politics of Central Bank Independence (SSRN Scholarly Paper No. 2888836). Social Science Research Network. <https://doi.org/10.2139/ssrn.2888836>
- de Haan, J., & Klomp, J. (2013). Conditional political budget cycles: A review of recent evidence. *Public Choice*, 157(3), 387–410. <https://doi.org/10.1007/s11127-013-0106-6>
- Demid, E. (2018). Fiscal and Monetary Policy: Coordination or Conflict? *International Economic Journal*, 32(4), 547–571. <https://doi.org/10.1080/10168737.2018.1534133>
- Franzese, R. J. (2000). Electoral and Partisan Manipulation of Public Debt in Developed Democracies, 1956–90. In R. R. Strauch & J. von Hagen (Eds.), *Institutions, Politics and Fiscal Policy* (Vol. 2, pp. 61–83). Springer US. https://doi.org/10.1007/978-1-4615-4555-2_3
- Garriga, A. C. (2016). Central Bank Independence in the World: A New Data Set. *International Interactions*, 42(5), 849–868. <https://doi.org/10.1080/03050629.2016.1188813>
- Haga, M. (2015). On Central Bank Independence and Political Cycles. *Journal of Applied Economics*, 18(2), 267–295. [https://doi.org/10.1016/S1514-0326\(15\)30012-X](https://doi.org/10.1016/S1514-0326(15)30012-X)
- INSCR. (2018). Polity5 Annual Time-Series, 1946-2018. INSCR Data Page. <https://www.systemicpeace.org/inscrdata.html>
- International Monetary Fund data. (2022, April 21). IMF Data Fiscal Monitor. IMF Data: Access to Marcoeconomic & Financial Data. <https://data.imf.org/?sk=4BE0C9CB-272A-4667-8892-34B582B21BA6>
- Kandil, M. (2009). Determinants of Institutional Quality and Their Impact on Economic Growth in the MENA Region. *International Journal of Development Issues*, 8, 134–167. <https://doi.org/10.1108/14468950910997693>
- Keefer, P., & Stasavage, D. (2003). The Limits of Delegation: Veto Players, Central Bank Independence, and the Credibility of Monetary Policy. *American Political Science Review*, 97(3), 407–423. <https://doi.org/10.1017/S0003055403000777>
- Kydland, F. E., & Prescott, E. C. (1977). Rules Rather than Discretion: The Inconsistency of Optimal Plans. *Journal of Political Economy*, 85(3), 473–491. <https://doi.org/10.1086/260580>
- Larch, M. (2012). Fiscal Performance and Income Inequality: Are Unequal Societies More Deficit-Prone? *Kyklos*, 65(1), 53–80. <https://doi.org/10.1111/j.1467-6435.2011.00527.x>

- Laurens, B., & de la Piedra, E. (1998). Coordination of Monetary and Fiscal Policies (SSRN Scholarly Paper No. 882258). <https://papers.ssrn.com/abstract=882258>
- Maddala, G. S., & Wu, S. (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. *Oxford Bulletin of Economics and Statistics*, 61(S1), 631–652. <https://doi.org/10.1111/1468-0084.0610s1631>
- Maloney, J., Pickering, A. C., & Hadri, K. (2003). Political Business Cycles and Central Bank Independence. *The Economic Journal*, 113(486), C167–C181. <https://doi.org/10.1111/1468-0297.00115>
- Nordhaus, W. D. (1975). The Political Business Cycle. *The Review of Economic Studies*, 42(2), 169–190. <https://doi.org/10.2307/2296528>
- Rogoff, K. (1985). The Optimal Degree of Commitment to an Intermediate Monetary Target*. *The Quarterly Journal of Economics*, 100(4), 1169–1189. <https://doi.org/10.2307/1885679>
- Vuletin, G., & Zhu, L. (2011). Replacing a “Disobedient” Central Bank Governor with a “Docile” One: A Novel Measure of Central Bank Independence and Its Effect on Inflation. *Journal of Money, Credit and Banking*, 43(6), 1185–1215. <https://doi.org/10.1111/j.1538-4616.2011.00422.x>
- Wooldridge, J. M. (2013). Chapter 14: Advanced Panel Data Methods. In *Introductory Econometrics—A Modern Approach* (5th ed., pp. 484–511). South-Western.
- Worldbank. (2020). WGI 2020 Documentation. Worldwide Governance Indicators. <http://info.worldbank.org/governance/wgi/Home/Documents>
- Worldbank. (2022). GDP per capita growth (annual %) | Data. <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG>

7 Appendix

7.1 List of Countries

TABLE I. THE 72 COUNTRIES PRESENT IN THE FULL SAMPLE

Argentina	Finland	Malaysia	Russia
Australia	France	Mexico	Slovak Republic
Austria	Ghana	Moldova	Slovenia
Bangladesh	Greece	Mongolia	South Africa
Belgium	Haiti	Mozambique	South Korea
Bolivia	Honduras	Nepal	Spain
Brazil	Hungary	Netherlands	Sri Lanka
Cambodia	India	New Zealand	Sweden
Canada	Indonesia	Nicaragua	Switzerland
Chile	Ireland	Nigeria	Thailand
Colombia	Israel	Norway	Turkey
Croatia	Italy	Pakistan	Ukraine
Cyprus	Japan	Papua New Guinea	United Kingdom
Czech Republic	Kenya	Peru	United States
Denmark	Latvia	Philippines	Uruguay
Dominican Republic	Lithuania	Poland	Venezuela
Ecuador	Luxembourg	Portugal	Zambia
Estonia	Madagascar	Romania	Zimbabwe

Notes: Table notes Source: Author calculations

7.2 Model 2 Experiments

TABLE II. RESULTS MODEL 2B – ELECTION CYCLE EXPERIMENT

Dependent variable: Primary Fiscal Balance	
	Model 2b.
Central Bank Independence (CBI)	1.705 (0.99)
Rule of law (RoL)	-2.339 (-1.43)
CBI * Rule of Law	0.589 (0.26)
Election Cycle	0.310 (0.48)
Election Cycle * CBI	-1.009 (-1.07)
Election Cycle * Rule of Law	0.505 (0.87)
Election cycle * CBI * Rule of Law	-0.909 (-0.95)
GDP growth (lag)	0.178*** (6.16)
Inflation (lag)	0.0299* (2.55)
Unemployment (lag)	0.168** (3.22)
Constant	-2.537* (-2.04)
Observations	832
adj. R-squared	0.075
Rho	0.709

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001. Source: Author calculations

TABLE III. RESULTS MODEL 2C - POLITY5 EXPERIMENT

Dependent variable: Primary Fiscal Balance	
	Model 2c.
Central Bank Independence (CBI)	-1.395 (-0.21)
Polity5	-0.573 (-1.31)
CBI * Polity5	0.363 (0.45)
Election (dummie)	-0.314 (-0.18)
Election * CBI	1.105 (0.37)
Election * Polity5	0.0999 (0.52)
Election * CBI * Polity5	-0.291 (-0.82)
GDP growth (lag)	0.199*** (5.71)
Inflation (lag)	0.00668 (0.65)
Unemployment (lag)	0.0467 (0.87)
Constant	2.657 (0.71)
Observations	1012
adj. R-squared	0.070
Rho	0.474

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001. Source: Author calculations

7.3 Model 4 Experiments

TABLE IV. RESULTS MODEL 4B - POLITY5 EXPERIMENT

Dependent variable: Primary Fiscal Balance	
	Model 4b.
Central Bank Independence (CBI)	-2.838 (-0.60)
Polity5	-0.549 (-1.69)
CBI * Polity5	0.495 (0.86)
GDP growth (lag)	0.327 (0.93)
CBI * GDP growth (lag)	-0.4998 (-0.75)
Polity5 * GDP growth (lag)	0.00525 (0.12)
CBI * Polity5 * GDP growth(lag)	0.0370 (0.45)
Inflation (lag)	0.00344 (1.26)
Unemployment (lag)	-0.0530 (-0.81)
Constant	3.224 (1.11)
Observations	1122
adj. R-squared	0.082
Rho	0.451

Notes: t statistics in parentheses: * p<0.05, **p<0.01, *** p<0.001. Source: Author calculations

7.4 Category Specifications

TABLE V. TABULATION DE JURE CBI CATEGORIES

CBI group	Freq.	Percent	Cum.
Low	1,171	40.10	40.10
Med	920	31.51	71.61
High	829	28.39	100
Total	2,920	100.00	

TABLE VI. TABULATION RULE OF LAW CATEGORIES

RoL group	Freq.	Percent	Cum.
Low	819	57.03	57.03
High	617	42.97	100.00
Total	1,436	100.00	

TABLE VII. TABULATION DE FACTO CBI CATEGORIES

fCBI group	Freq.	Percent	Cum.
Low	941	69.55	69.55
Med	342	25.28	94.83
High	70	5.17	100.00
Total	1,353	100.00	

7.5 Additional Marginal Effects Plots

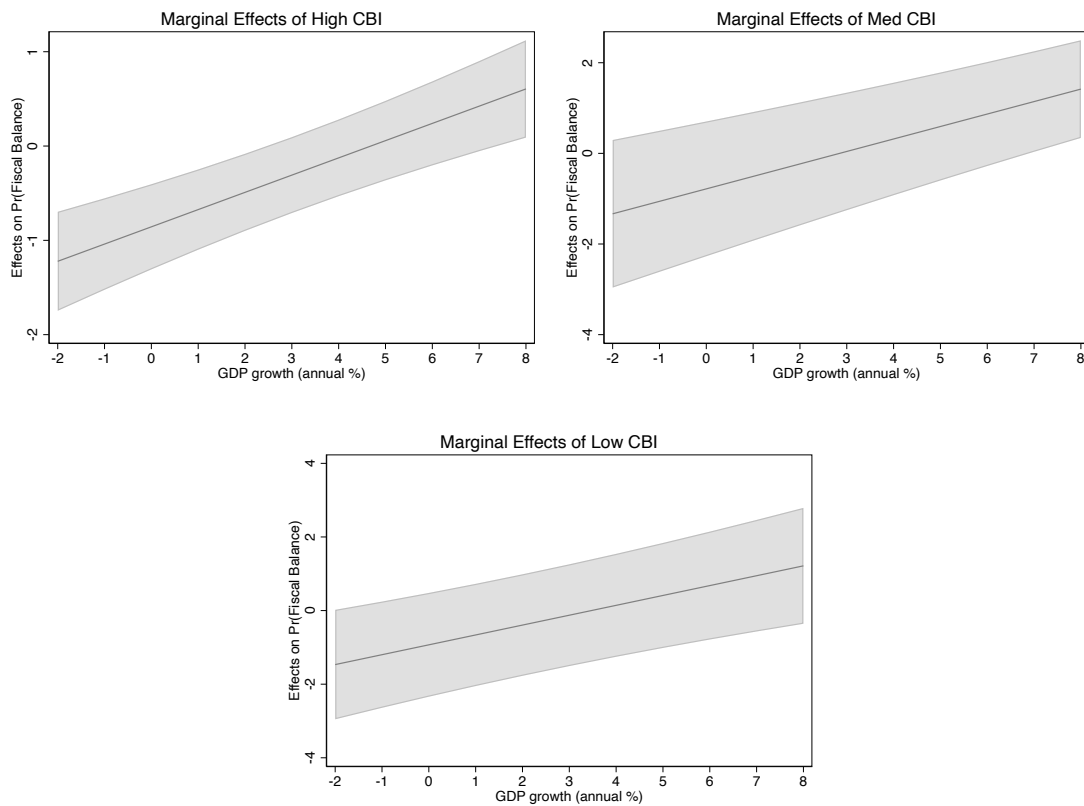


FIG. A. MARGINAL EFFECTS: COUNTERCYCLICALITY UNDER DE JURE CBI

Notes: Gray area is the 90% confidence interval Source: Author calculations

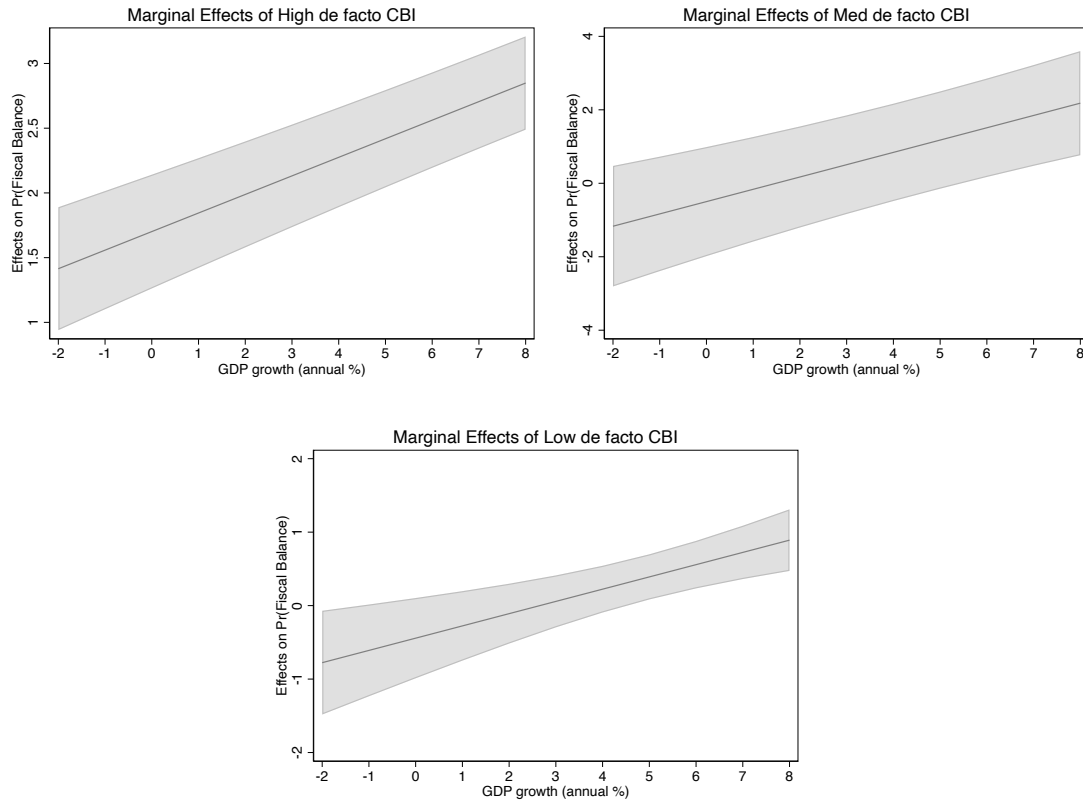


FIG. B. MARGINAL EFFECTS: COUNTERCYCLICALITY UNDER DE FACTO CBI

Notes: Gray area depicts the 90% confidence interval. *Source:* Author calculations

7.6 List of Countries per Specification

TABLE VIII. ALL COUNTRIES AND OBSERVATIONS PRESENT IN THE MODELS

Country	Full sample	Model 1a & 1b (de jure)	Model 1a & 1b (de facto)	Model 2 (de jure)
Argentina	40	20	12	17
Australia	43	23	15	17
Austria	28	8	8	2
Bangladesh	41	16	10	12
Belgium	28	8	8	2
Bolivia	31	23	10	17
Brazil	28	17	9	17
Cambodia	17	11		11
Canada	43	23	15	17
Chile	43	23	15	17
Colombia	43	16	8	16
Croatia	14	13	5	13
Cyprus	38	6	10	6
Czech Republic	20	18		17
Denmark	43	23		17
Dominican Republic	23	16	8	16
Ecuador	21	18	10	17
Estonia	18	14		14
Finland	28	8	8	2
France	28	8	8	2
Ghana	43	16	8	16
Greece	26	10	10	4
Haiti	27			
Honduras	42	23	15	17
Hungary	24	18	10	17
India	43	21	13	17
Indonesia	14	13	5	13
Ireland	28	8		2
Israel	43	13	5	13
Italy	28	8	8	2
Japan	43	23	15	17
Kenya	16	15	7	15
Latvia	21	15		15
Lithuania	22	13	5	13
Luxembourg	28	3	3	2

Madagascar	19			
Malaysia	43	23	15	17
Mexico	25	23	15	17
Moldova	22	18		17
Mongolia	22	21	10	17
Mozambique	19	15	7	15
Nepal	23	2		2
Netherlands	28	3		2
New Zealand	43	23	15	17
Nicaragua	23	12	5	12
Nigeria	35	11	3	11
Norway	43	23	15	17
Pakistan	41	11	6	8
Papua New Guinea	13			
Peru	34	11	4	11
Philippines	43	23	15	17
Poland	24	18	10	17
Portugal	23	8	8	2
Romania	23	21		17
Russia	21			
Slovak Republic	16	14		13
Slovenia	16	10		10
South Africa	43	13	5	13
South Korea	43	18	10	17
Spain	22	8	8	2
Sri Lanka	43	23	10	17
Sweden	43	23	15	17
Switzerland	43	22	14	17
Thailand	43	10	5	10
Turkey	43	13	5	13
Ukraine	22	16	8	16
United Kingdom	43	23	15	17
United States	43	12	4	12
Uruguay	43	14	6	14
Venezuela	39			
Zambia	43	13		13
Zimbabwe	33	3		3
<hr/>				
Total observations:	2254	1012	496	832
Countries included:	72	67	53	66

Country	Full sample	Model 3 (de jure)	Model 3 (de facto)	Model 4 (de jure)
Argentina	40	20	12	17
Australia	43	23	15	17
Austria	28	8	8	2
Bangladesh	41	19	10	15
Belgium	28	8	8	2
Bolivia	31	23	10	17
Brazil	28	17	9	17
Cambodia	17	15		15
Canada	43	23	15	17
Chile	43	23	15	17
Colombia	43	23	15	17
Croatia	14	13	5	13
Cyprus	38	6	10	6
Czech Republic	20	18		17
Denmark	43	23		17
Dominican Republic	23	16	8	16
Ecuador	21	18	10	17
Estonia	18	15		15
Finland	28	8	8	2
France	28	8	8	2
Ghana	43	16	8	16
Greece	26	10	10	4
Haiti	27	10	2	10
Honduras	42	23	15	17
Hungary	24	18	10	17
India	43	21	13	17
Indonesia	14	13	5	13
Ireland	28	8		2
Israel	43	13	5	13
Italy	28	8	8	2
Japan	43	23	15	17
Kenya	16	15	7	15
Latvia	21	15		15
Lithuania	22	13	5	13
Luxembourg	28	3	3	2
Madagascar	19	18	10	17
Malaysia	43	23	15	17
Mexico	25	23	15	17
Moldova	22	18		17

Mongolia	22	21	10	17
Mozambique	19	18	10	17
Nepal	23	9	2	9
Netherlands	28	3		2
New Zealand	43	23	15	17
Nicaragua	23	13	5	13
Nigeria	35	13	5	13
Norway	43	23	15	17
Pakistan	41	12	6	9
Papua New Guinea	13	12	4	12
Peru	34	13	5	13
Philippines	43	23	15	17
Poland	24	18	10	17
Portugal	23	8	8	2
Romania	23	21		17
Russia	21	15	7	15
Slovak Republic	16	14		13
Slovenia	16	11		11
South Africa	43	13	5	13
South Korea	43	18	10	17
Spain	22	8	8	2
Sri Lanka	43	23	10	17
Sweden	43	23	15	17
Switzerland	43	22	14	17
Thailand	43	11	5	11
Turkey	43	13	5	13
Ukraine	22	18	10	17
United Kingdom	43	23	15	17
United States	43	12	4	12
Uruguay	43	14	6	14
Venezuela	39	19	15	13
Zambia	43	13		13
Zimbabwe	33	4		4

Total observations:	2254	1122	551	927
Countries included:	72	72	59	72
