Monetary Policy and Credit Gap: What about Central Bank Independence?

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Abstract

This study analyzes the influence of monetary policy on financial sector imbalances focusing on the role of Central Bank Independence in transmitting monetary policy to the credit markets. Based on the analysis on 41 developed and developing countries having quarterly data between 1980 and 2022, the study establishes that the expansionary monetary policy leads to an increase in the Credit-to-GDP gap. However, this relationship is reversed for countries that have high Central Bank Independence which is robust to the use of unconventional monetary policy as the monetary policy tool. The results in general indicate that the Central Bank Independence decreases and even reverses the effectiveness of monetary policy in influencing credit markets.

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Keywords: Monetary Policy; Money Supply; Interest Rates; Central Bank Independence; Credit

1. Introduction

When central banks adopted inflation targeting as their main monetary policy regime, the main road to reach their objective was to make sure that they are independent from the government. Over the last few decades, these inflation targeting central banks have become more and more independent from the political pressure which led to a reduction in inflation fluctuations in their countries. However, following the Global Financial Crisis (GFC), with their conventional and unconventional monetary policies, the central banks have become highly involved in stimulating economic growth through credit expansion. Low inflation rates, mainly in advanced economies, made it both necessary and possible for these central banks to continue these polices for an extended period of time.

According to Dincer and Eichengreen (2014), the more independent a central bank is, the more effectively it could pursue its core price stability mandate. However, this might work differently during crisis periods. As Alan Blinder (Blinder, 2021) phrases it, the Central Bank Independence (CBI) in a crisis; it's neither possible, nor desirable. Until recently, central banks have put most of their focus restoring the confidence in the financial system and reaching credit expansion, which require a higher coordination with the fiscal policy makers, like the government or at least the finance ministry. Unsustainable policies or any disagreements with the government might not help the policy makers in sustaining the flow of credit to the private sector. Therefore in this study I focus on the question if the independence of the central bank works against its ability to sustain the confidence in the financial system and reach credit expansion through its monetary policy, especially in the aftermath of Global Financial Crisis.

Conventional wisdom suggests that expansionary monetary policy leads to credit expansion which results in inflation and GDP growth via the monetary policy transmission channels (Friedman, 1970). This suggests that there is a negative relationship between policy rates and credit. The studies that analyze the influence of conventional or unconventional monetary policies on the general macroeconomy mostly confirm this conventional wisdom. Some of these studies use Vector Autoregressive models (Juselius et al., 2016; Elbourne et al., 2018; Bauer and Granziera, 2017) looking at the impulse response functions of several variables like debt to GDP, output or

prices to monetary policy shocks. Whereas others like Egert *et al.* (2006), Igan and Pinherio (2011), Guo and Stepyan (2011), and Borio and Gambacorta (2017) estimate a panel of countries to find out the relationship between interest rates – among the other macroeconomic variables – and credit or bank lending growth. These studies also find a negative relationship between interest rates and growth of credit to the private sector. Borio and Gambacorta (2017), however, documents a reversal of the influence of monetary policy on bank lending following the global financial crisis, but ties this relationship to the interest rates being too low to have an influence on bank lending. None of these studies take into account the impact of CBI on this relationship.

It has been argued that inflation targeting central banking is one of the reasons for the rising household debt and financial instability prior to the GFC (Berger and Kissmer, 2013; Sutton, 2016; Aklin et al. 2021). The studies that look specifically on the effect of central bank independence on credit are very rare (some examples are Aklin et al. (2021), Dincer and Eichengreen (2013)). However there are various studies that look into the relationship between central bank independence and financial stability (Klomp and de Haan, 2009; Fouejieu, 2017, Andries et al., 2022). The results of these studies are mixed: some studies find that CBI decreases financial instability or credit growth (Dincer and Eichengreen. 2013; Klomp and de Haan, 2009; Sethi and Acharya), while others find the opposite (Aklin et al, 2021; Fouejieu, 2017). These studies do not look explicitly on the monetary policy and its relationship with CBI on influencing financial instability or credit.

In this study, I fill the gap in the literature of the monetary policy's influence on the credit markets by introducing the role of CBI and it's components in this relationship, and also by focusing on the monetary policy's effect on credit to private sector after the global financial crisis. Since building trust in the financial system might also increase the financial imbalances, I look at the influence of monetary policy and CBI on the credit-to-GDP gap. The findings of this study contributes to the empirical literature on the relationship between monetary policy and credit markets in various significant ways. Using a sample of 41 developed and developing countries having quarterly data from 1980 until the end of 2022, I find that the effect of monetary policy on credit-to-GDP gap depends highly on central bank independence. Specifically, I find evidence that, central bank independence hinders monetary policy's influence on credit-to-GDP gap. This effect is more

pronounced after the global financial crisis indicating that expansionary monetary policy only increases the credit-to-GDP gap in countries with more dependent central banks. Another main contribution of this study is that the central bank independence decreases the effectiveness of both conventional and unconventional monetary policy, like money supply growth, in reaching to credit markets. From the components of CBI analyses, it is observed that the main drivers of reversing the influence of monetary policy on credit gap are the monetary policy independence, limitations on lending to the government, and reporting and disclosure of information by the central banks. These results have important implications regarding the inflation targeting central banking and indicate that the costs to the central banks in achieving credit expansion are much higher for independent central banks compared to central banks that coordinate more with the government.

The reminder of this paper is as follows: Section 2 discusses the methodology of my analysis and lists the data I use in this paper; Section 3 presents the results of the analysis; Section 4 reports the results of the sensitivity analyses; and finally, Section 5 concludes.

2. Methodology and Data

The effect of monetary policy (conventional and unconventional) and central bank independence together with macroeconomic and financial sector-specific indicators is estimated on credit gap for a sample of 41 developed and developing countries[1] having quarterly data starting from Q1 1980 until Q4 2022. The estimation is based on below equation for country *i*, at quarter *t*:

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t-1} + \beta_2 CBI_{i,t} + \beta_3 X'_{i,t-1} * CBI_{i,t} + \beta_4 Z_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where,

$Y_{i,t}$: Credit-to-GDP gap,
$X_{i,t-1}$: Monetary Policy,
$CBI_{i,t}$: Central Bank Independence,
$X'_{i,t-1} * CBI_{i,t}$: Interaction of Monetary Policy with Central Bank Independence,
$Z_{i,t-1}$: Macroeconomic and financial sector-specific indicators.

[1] Argentina, Austria, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, UK, US.

The dependent variable, the credit-to-GDP gap which is the difference between the aggregate credit-to-GDP ratio and it's long run trend (Drehmann and Tsatranis, 2014). This variable is one of the financial cycle measures – real private credit, credit-to-GDP ratio, real house prices – of the Bank of International Settlements, and is widely used in the literature as a measure for building up of financial imbalances[2].

The monetary policy is captured with two indicators: monetary policy-related interest rates, for the conventional monetary policy tool, and the growth of money plus quasi-money (M2), for capturing the effect of unconventional policies applied especially following the global financial crisis. As the theory suggests (Friedman, 1970) regarding the transmission channels of the monetary policy we expect to find an inverse relationship between monetary policy rates and credit-to-GDP gap, and a positive relationship between money supply growth and credit-to-GDP gap that expansionary monetary policy (a reduction in the policy rates or an increase in money supply) increases the credit-to-GDP gap.

As for the Central Bank Independence, there are two main indexes that measure *de jure* central bank independence used commonly in the literature: GMT (Grilli *et al.*, 1991) and CWN (Cukierman *et al*., 1992). I use the recent database developed by Romelli (2022, 2024) where the characteristics of these two indexes are combined. Additionally, another proxy of CBI, the turnover rates of central bank governors, i.e. the average term of office of central bank governors in a given time period (Cukierman *et al.*, 1992 Dreher *et al.*, 2008, 2010) is used to analyze *de-facto* CBI and its effects on the credit gap. The influence of the CBI on the monetary policy's effect on credit gap is tested with the interaction terms.

The macroeconomic and financial sector specific indicators are based on the previous studies (i.e.,; Aisen and Franken (2010), Igan and Pinheiro (2011), Guo and Stepyan, 2011) which are the change in the nominal exchange rates, inflation rate, current account balance to GDP ratio, deposit growth, the ratio of foreign liabilities to foreign assets, real GDP growth, and capital account openness (Chinn and Ito, 2006 Financial Openness Index). Since during the sample period the Global

[2] I also check the robustness of the results by using the growth rate of credit-to-GDP ratio as the dependent variable.

Financial Crisis affected most of the countries included in our study, we also control for the GFC by including a dummy variable from Q3 2007 until Q4 2009 (based on Laeven and Valencia, 2020). These dependent and independent variables are taken from IMF's International Financial Statistics, the World Bank's World Development Indicators, and the Bank of International Settlements, unless otherwise stated. Table A1 in Appendix A lists the construction, sources and the frequency of the data used in the analyses.

The unbalanced sample includes quarterly observations starting from Q1 1980 until Q4 2022 for 41 developed and developing countries. For each country, there are at most 172 observations. Based on the results of the Im-Pesaran-Shin (2003) unit root test, I transform the non-stationary variables into their growth rates. Table 1 represents the summary statistics of the data used in the estimations.

Table 1. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	Unit of Account
Credit-to-GDP Gap	3327	2.041	13.756	-60.1	81	De-trended Ratio
MP related interest rates	3327	-0.003	0.388	-2.452	11.010	Percentage Change
M2 growth	3327	9.761	10.197	-33.394	123.368	Percentage Change
Central Bank Independence	3327	0.607	0.221	0.142	0.929	Index
Exchange Rate	3327	0.006	0.058	-0.355	1.35	Percentage Change
Inflation	3327	4.209	6.545	-6.128	91.793	Percentage Change
Current Account Position	3327	0.401	5.932	-20.556	30.858	Ratio (% to GDP)
Deposit Growth	3327	0.023	0.040	-0.336	0.726	Percentage Change
Foreign Liabilities to Foreign Assets	3327	1.570	1.621	0.25	22.077	Ratio
Real GDP Growth	3327	0.667	1.343	-12.397	21.025	Percentage Change
Capital Account Openness	3327	1.358	1.286	-1.927	2.311	Index
Global Financial Crisis	3327	0.097	0.296	0	1	Dummy
Credit-to-GDP Growth	3327	0.485	2.743	-35.185	39.716	Percentage Change
Turnover Rate	3277	0.156	0.107	0	0.6	Ratio

3. Results

In order to select the appropriate estimation method, I conduct Hausmann test for the estimates of equation (1) using fixed versus random effects estimators. Based on the results of the Hausmann test, I estimate equation (1) with panel fixed effects model. The estimations are conducted with robust standard errors clustered by country to control for heteroskedasticity. All estimators, except for the central bank independence and capital account openness which change rarely through time, are lagged one quarter to avoid simultaneity concerns.

Table 2 represents the estimation results of equation (1): column 1 presents the results without the inclusion of the interaction terms; in column 2 the interaction of monetary policy rate and central bank independence is included; in column 3 the interaction of money supply and central bank independence is included; finally column 4 presents the results including both interaction terms.

The central bank independence positively affect the credit-to-GDP gap, which indicates that the more independent the central bank is the higher credit-to-GDP gap. Although the coefficient is not highly significant, the result supports the link between inflation targeting regime and the decrease in the risk perception during the Great Moderation period (Sutton, 2016) which fueled the private sector indebtedness. This also confirms the findings of Aklin et al. (2021) which suggests that the independence of central banks rises the liberalization of financial markets which results in increased private debt. The monetary policy rate does not enter significant into the model in the columns without its interaction with CBI. However, money supply growth is highly significant and positive indicating that money supply has more pronounced effect on the credit-to-GDP gap compared to policy rates.

In order to see the effect of central bank independence on the transmission of monetary policy to the credit markets, I check the interaction of central bank independence with policy rates and money supply. In the estimations with the interaction term of CBI with policy rate – columns 2 and 4 –, the policy rate enters with a negative and significant coefficient, indicating that the expansionary monetary policy increases the credit gap. However, the interaction term also enters significant, but with a positive sign. This indicates that the marginal effect of the policy rate on the

credit-to-GDP gap depends on the independence of the central bank; i.e. the more independent the central bank is, the lower will be the effectiveness of expansionary monetary policy on credit gap. This effect might even be reversed for even higher CBI. The partial effect calculation suggests that for the policy rate to negatively affect the credit-to-GDP gap, the central bank independence of a country should be lower than 0.425[3]. The similar results can be observed for money supply growth as the interaction term with CBI is negative, even though not significant, which points out the decreasing effect of CBI on the overall effect of money supply on credit-to-GDP gap[4].

The other indicators mostly enter with expected effects on the credit-to-GDP gap. The significant coefficient of exchange rates indicate that the increase of domestic currency per US dollar – a depreciation of the domestic currency – increases credit-to-GDP gap. A result that is in line with Guo and Stepyan (2011), and Igan and Pinheiro (2011). The significant and negative coefficient of inflation rate is also consistent with the findings of the previous literature (Guo and Stepyan, 2011; Egert, Backe and Zumer, 2006). High inflation signals the monetary instability of a country which effects the investment decisions of the private sector. Current account position enters negative and highly significant into the estimations indicating that the worsening of the current account position increases financial imbalances of a country confirming the findings of Krugman (1999). Another indicator that enters significant is the ratio of foreign liabilities to foreign assets, which points that rising foreign liabilities relative to foreign assets increases the credit-to-GDP gap which confirms the findings of Guo and Stepyan (2011). Higher funds of banks from foreign financial institutions increases the credit availability of these institutions for the private sector. The significant real GDP growth indicates that the higher the GDP growth of a country, the lower will be credit gap of the country. A result that contradicts with Guo and Stepyan (2011), Aisen and Franken (2010), and Igan and Pinheiro (2011); however confirms Krugman (1999). Krugman (1999) also finds that credit booms rise when countries' GDP fall. Finally the Global Financial Crisis enters with a positive and significant coefficient, signifying the rise in the financial imbalances worldwide

[3] The partial effect of policy rates is (from column 2) -3.461 + 8.128*CBI; indicating that for the policy rate to have a negative effect on credit gap, the CBI should be lower than 0.425 for a given country.

[4] To check the robustness of this result, I divided the sample according to low- and high- CBI countries (using 0.425 as the threshold). The results – available upon request – indicate that the coefficient of monetary policy rate is negative and significant, and the coefficient of money supply growth is positive and significant only for countries having CBI that is lower than 0.425 (low-CBI subsample). Both monetary policies enter positive and insignificant in the high-CBI subsample.

during the GFC. This confirms the arguments of Drehmann and Tsatranis (2014) regarding the strong link between credit-to-GDP gap and financial distress.

Table 2. Fixed-Effects Estimation Results for the Whole Sample

Dependent Variable: Credit-to-GDP Gap	1	2	3	4
Central Bank Independence	8.943	9.056	11.424*	11.721*
	(6.186)	(6.168)	(6.619)	(6.572)
Monetary Policy Rate$_{t-1}$	0.393	-3.461**	0.426	-3.578**
	(0.901)	(1.514)	(0.911)	(1.507)
Money Supply$_{t-1}$	**0.130*** **	**0.130*** **	0.250**	0.259**
	(0.048)	(0.048)	(0.106)	(0.104)
CBI X Monetary Policy Rate $_{t-1}$		8.128*		8.450*
		(4.413)		(4.432)
CBI X Money Supply $_{t-1}$			-0.269	-0.288
			(0.204)	(0.198)
Exchange Rate$_{t-1}$	14.797**	15.192**	14.466**	14.853**
	(7.122)	(7.133)	(6.622)	(6.618)
Inflation $_{t-1}$	-0.173**	-0.179**	-0.144*	-0.149*
	(0.080)	(0.078)	(0.076)	(0.074)
Current Account Position $_{t-1}$	**-1.024*** **	**-1.013*** **	**-1.025*** **	**-1.015*** **
	(0.230)	(0.226)	(0.231)	(0.228)
Deposit Growth $_{t-1}$	7.805	7.749	7.394	7.307
	(4.668)	(4.692)	(4.768)	(4.804)
Foreign Liabilities to Foreign Assets $_{t-1}$	1.156**	1.156**	1.133**	1.131**
	(0.468)	(0.464)	(0.465)	(0.461)
Real GDP Growth $_{t-1}$	**-0.909*** **	**-0.948*** **	**-0.875*** **	**-0.914*** **
	(0.189)	(0.190)	(0.179)	(0.182)
Capital Account Openness	0.899	0.878	0.826	0.799
	(1.234)	(1.232)	(1.254)	(1.253)
Global Financial Crisis	**6.442*** **	**6.485*** **	**6.638*** **	**6.698*** **
	(2.060)	(2.076)	(2.025)	(2.046)
Number of Observations	3327	3327	3327	3327
R2: within	0.173	0.176	0.175	0.178
ρ^c	0.29	0.29	0.29	0.29

*Notes: The values in parenthesis represent the robust standard errors which are clustered by country. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

In order to analyze the overall effect of monetary policy on credit-to-GDP gap, I calculate the marginal effect of policy rates and money supply for different values of central bank independence. Table 3 indicates these marginal effects for low (0.2), average (0.5) and high (0.8) CBI values as well as for the sample average CBI value. The marginal effects indicate that for countries with low CBI value the policy rate is significantly negatively related to the credit gap, but for high and moderate independence levels, it is positive and insignificant. This indicates that the effectiveness of monetary policy in reaching credit expansion or contraction depends on its independence from the government. For the conventional relationship between policy rates and credit to hold, i.e. that

expansionary policy to increase credit to private sector, the central bank independence should be low. For the money supply, CBI does not change the sign of the marginal effect. For all independence levels, the marginal effect of money supply is positive. However, for countries with high CBI the effect is not significant.

Table 3. Marginal Effect of Monetary Policy for Different CBI Levels

Monetary Policy	Sample Average	CBI = 0.2	CBI = 0.5	CBI = 0.8
Monetary Policy Interest Rates	1.551	-1.888***	0.647	3.182
	(1.249)	(0.662)	(0.796)	(2.089)
Money Supply	0.084*	0.202***	0.115***	0.029
	(0.046)	(0.069)	(0.040)	(0.074)

*Notes: Based on the results of Table 2, Column 4 calculated using the sample average (0.607), low (0.2), average (0.5) and high (0.8) CBI levels. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*

According to Klomp and de Haan (2009), from the components of the central bank independence, the political independence component creates the highest risk of financial instability. Therefore, I analyze the components of the central bank independence, their direct effect as well as their role in transmitting the monetary policy to credit-to-GDP gap. Table 4 presents the estimations results of the specification in column 4 of Table 2 for each component of the CBI index[5]. Since the estimations include the interaction terms, the marginal effects are presented in Table 5. The results indicate that all components of the CBI index are positively related to credit-to-GDP gap; however only the independence of monetary policy and government lending are significant. As for the indirect effects on the effectiveness of monetary policy, Table 5 indicates that financial and monetary policy independence of the central banks significantly reduces the effect of monetary policy on credit gap. Financial independence is related to the decisions regarding the capitalization and recapitalization of the central bank capital, selection of the authority that regulates the budget of the central bank, and also the decisions on allocating the profit (Romelli, 2022). Especially, in the aftermath of the global financial crisis the last two features have become more important, since with the asset purchase programs it has become crucial how the central bank's budget would be used. It seems that that the central banks that coordinate more with the government in their budget and profit allocation succeed more in influencing the credit to private sector through their policy rates. The (monetary) policy independence suggests that the central bank is independent in

[5] For the detailed description and methodology for each CBI index component the reader can refer to the Online Appendix of Romelli (2022).

determining and implementing its monetary policy, it is the final authority in case there is a conflict between government and central bank in monetary policy implementation (Romelli, 2022). Indicated by Table 5, the more dependent the central bank is the higher will be the effectiveness of monetary policy on credit gap. Finally, the reporting independence which suggests that central bank disclosing its formal statements to the public in fixed time intervals also significantly decreases the effect of monetary policy on credit gap (Romelli, 2022). For the interaction terms with money supply, again the sign of the marginal effect does not change for different CBI values; however the significance of the marginal effect is lower for central banks that have high CBI.

Table 4. Fixed-Effects Estimation Results for the Whole Sample with components of CBI

	1	2	3	4	5	6
Dependent Variable: Credit-to-GDP Gap	Board	Policy	Objective	Lending	Finances	Report
Central Bank Independence	7.304	11.716*	7.154	8.749**	0.899	5.492
	(5.411)	(6.423)	(5.272)	(3.594)	(10.608)	(6.803)
Monetary Policy Rate$_{t-1}$	-4.902	-2.897**	-0.802***	-0.869**	-8.095**	-4.462*
	(5.450)	(1.276)	(0.227)	(0.383)	(3.441)	(2.450)
Money Supply$_{t-1}$	0.143	**0.255*** **	**0.219*** **	**0.190*** **	**0.132**	**0.223*** **
	(0.152)	(0.072)	(0.063)	(0.066)	(0.146)	(0.069)
CBI X Monetary Policy Rate $_{t-1}$	9.286	7.493**	3.940*	3.731*	15.702**	7.808*
	(9.207)	(3.554)	(2.305)	(2.172)	(7.159)	(4.612)
CBI X Money Supply $_{t-1}$	-0.030	-0.290**	-0.234*	-0.176	-0.018	-0.186
	(0.274)	(0.127)	(0.122)	(0.122)	(0.258)	(0.121)
Exchange Rate$_{t-1}$	15.409**	14.963**	14.460**	14.683**	13.769*	14.545**
	(6.566)	(6.816)	(6.541)	(6.657)	(6.896)	(6.750)
Inflation $_{t-1}$	-0.194***	-0.147*	-0.153**	-0.154*	-0.217**	-0.177**
	(0.064)	(0.074)	(0.074)	(0.084)	(0.077)	(0.080)
Current Account Position $_{t-1}$	**-1.015*** **	**-1.012*** **	**-1.007*** **	**-1.030*** **	**-0.981*** **	**-0.995*** **
	(0.227)	(0.234)	(0.234)	(0.225)	(0.235)	(0.237)
Deposit Growth $_{t-1}$	7.700	7.004	7.248	7.409	7.101	6.681
	(4.944)	(4.907)	(4.797)	(4.863)	(4.676)	(4.710)
Foreign Liabilities to Foreign Assets $_{t-1}$	1.173**	1.183**	1.123**	1.127**	1.155**	1.159**
	(0.448)	(0.446)	(0.467)	(0.476)	(0.451)	(0.460)
Real GDP Growth $_{t-1}$	**-0.918*** **	**-0.911*** **	**-0.907*** **	**-0.909*** **	**-1.000*** **	**-0.948*** **
	(0.181)	(0.186)	(0.189)	(0.187)	(0.195)	(0.191)
Capital Account Openness	1.145	0.948	0.932	0.589	1.475	1.172
	(1.172)	(1.222)	(1.298)	(1.172)	(1.204)	(1.222)
Global Financial Crisis	**6.519*** **	**6.692*** **	**6.848*** **	**6.660*** **	**6.968*** **	**6.897*** **
	(2.046)	(2.020)	(2.078)	(1.995)	(2.006)	(1.999)
Number of Observations	3327	3327	3327	3327	3327	3327
R2: within	0.174	0.176	0.176	0.182	0.170	0.171
ρ^c	0.32	0.29	0.29	0.28	0.29	0.29

*Notes: The values in parenthesis represent the robust standard errors which are clustered by country. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

Table 5. Marginal Effect of Monetary Policy for Different CBI Levels

Monetary Policy	Board	Policy	Objective	Lending	Finances	Report
Monetary Policy Interest Rates						
CBI = Sample Average	0.442	1.089	1.547	1.325	1.703	1.105
	(1.017)	(0.851)	(1.337)	(1.166)	(1.092)	(0.986)
CBI = 0.2	-3.044	-1.488**	-0.012	-0.122	-4.954**	-2.900*
	(3.657)	(0.653)	(0.464)	(0.440)	(2.021)	(1.552)
CBI = 0.5	-0.259	0.760	1.169	0.997	-0.244	-0.558
	(1.263)	(0.721)	(1.120)	(0.986)	(0.363)	(0.459)
CBI = 0.8	2.527	3.007*	2.351	2.116	4.467*	1.784
	(2.253)	(1.699)	(1.803)	(1.618)	(2.325)	(1.356)
Money Supply						
CBI = Sample Average	0.126***	0.098**	0.079*	0.090*	0.121**	0.091**
	(0.047)	(0.043)	(0.044)	(0.045)	(0.048)	(0.046)
CBI = 0.2	0.137	0.197***	0.172***	0.155***	0.129	0.186***
	(0.101)	(0.054)	(0.046)	(0.049)	(0.098)	(0.051)
CBI = 0.5	0.128***	0.110***	0.102***	0.102**	0.123***	0.130***
	(0.045)	(0.042)	(0.039)	(0.042)	(0.044)	(0.037)
CBI = 0.8	0.119	0.023	0.032	0.050	0.118	0.074
	(0.087)	(0.060)	(0.061)	(0.061)	(0.080)	(0.053)

*Notes: Based on the results of Table4 calculated using, low (0.2), average (0.5) and high (0.8) CBI levels. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*

Following the Global Financial Crisis, most of the countries in my sample started using expansionary monetary policies to maintain the public trust on the financial system and increase demand through credit expansion. In order to analyze the effectiveness of the loose monetary policy on reaching credit expansion following the crisis, I estimate the post-global financial crisis period. The results of the analyses indicated on Tables 6 and 7 (for the marginal effects) suggest that in the post-crisis period, where monetary policy is directed specifically on credit expansion, the coefficient of the policy rate is negative and the interaction term with CBI is positive and both enter significantly into the estimations. Once more this result suggests that, CBI decreases the effect of monetary policy on the credit-to-GDP gap indicating that for countries with high CBI, the low policy rates are not effective in reaching credit expansion. On the other hand, it can be seen from the interaction of money supply with CBI that the unconventional policies during this period also have counter-effect on credit-to-GDP gap for countries having average to high CBI. This interesting result indicates that the unconventional policies in the post-GFC have not been effective in reaching credit expansion and even led to credit contraction for countries having above average CBI. A result that explains why for some countries the recovery from the global financial crisis has been prolonged and costly.

The other indicators mostly confirm the previous results. Foreign liabilities to assets do not enter significant in these estimations. Additionally, it can be seen that the inflation rate enters positive and significant suggesting that even the inflation rates were falling during this period, the credit gap is also decreasing. Which can be explained by the post-crisis high risk perception in the markets that fall in inflation rates did not fuel and even reduced credit gap in this period.

Table 6. Fixed-Effects Estimation Results for the Post-GFC Period (Q1 2010- Q4 2022)

Dependent Variable: Credit-to-GDP Gap	1	2	3	4
Central Bank Independence	14.868	14.310	103.207*	101.373*
	(40.827)	(40.325)	(52.144)	(51.246)
Monetary Policy Rate$_{t-1}$	2.546	-12.597**	2.800	-11.355**
	(1.864)	(5.977)	(1.9441)	(5.555)
Money Supply$_{t-1}$	-0.634***	-0.647***	1.602	1.556
	(0.215)	(0.212)	(0.953)	(0.929)
CBI X Monetary Policy Rate $_{t-1}$		20.993**		19.618**
		(8.760)		(8.148)
CBI X Money Supply $_{t-1}$			-3.620**	-3.566**
			(1.645)	(1.614)
Exchange Rate$_{t-1}$	21.940**	22.610**	22.623**	23.239**
	(9.226)	(9.297)	(9.516)	(9.536)
Inflation $_{t-1}$	0.821*	0.829**	0.732*	0.741**
	(0.415)	(0.406)	(0.169)	(0.355)
Current Account Position $_{t-1}$	**-0.564*** **	**-0.595*** **	**-0.564*** **	**-0.565*** **
	(0.173)	(0.171)	(0.169)	(0.167)
Deposit Growth $_{t-1}$	-27.512	-26.663	-27.558	-26.763
	(20.164)	(20.305)	(18.833)	(19.029)
Foreign Liabilities to Foreign Assets $_{t-1}$	3.483	3.416	2.930	2.875
	(2.140)	(2.112)	(1.868)	(1.853)
Real GDP Growth $_{t-1}$	**-0.604*** **	**-0.600*** **	**-0.530** **	**-0.526*** **
	(0.211)	(0.203)	(0.199)	(0.191)
Capital Account Openness	1.767	1.765	1.271	1.277*
	(2.328)	(2.312)	(2.138)	(2.119)
Number of Observations	1026	1026	1026	1026
R2: within	0.160	0.169	0.196	0.203
ρ^c	0.65	0.65	0.82	0.82

*Notes: The values in parenthesis represent the robust standard errors which are clustered by country. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

Table 7. Marginal Effect of Monetary Policy for Different CBI Levels at Post-GFC Period

Monetary Policy	Sample Average	CBI = 0.2	CBI = 0.5	CBI = 0.8
Monetary Policy Interest Rates	2.299	-7.431*	-1.546	4.340**
	(1.838)	(4.046)	(2.147)	(2.190)
Money Supply	-0.926***	0.843	-0.227	-1.297***
	(0.276)	(0.616)	(0.207)	(0.418)

*Notes: Based on the results of Table 6, Column 4 calculated using the sub-sample average(0.696), low (0.2), average (0.5) and high (0.8) CBI levels. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*

Finally, I also calculate the marginal effect of policy rates based on the average CBI levels per-country in the period post-GFC. The results, presented in Table 8, suggests that almost all of the developed countries, excluding Canada, the UK, Japan, Denmark, and Singapore, have a positive and significant marginal effect of policy rate on credit-to-GDP gap. This indicates the expansionary monetary policies implemented in the post-GFC period did not lead to credit expansion and further decreased the credit to private sector. To confirm these results, I also conduct country by country estimations and to a large extend the results – available on request – confirm the below effects of policy rates on credit-to-GDP gap. Most of the divergence is observed for the developing countries which might be explained by the *de jure* measure of CBI that I am using. I address this issue in the sensitivity analyses.

Table 8. Marginal Effect Of Monetary Policy for Average CBI Per Country Post GFC

Countries	Marginal Effect	Countries	Marginal Effect	Countries	Marginal Effect
Argentina	-0.290	Finland	6.635**	The Netherlands	6.223**
	(1.910)		(2.848)		(2.717)
Austria	6.537**	France	6.537**	Norway	1.966
	(2.816)		(2.816)		(1.812)
Australia	-4.253	The UK	-3.743	New Zealand	-3.782
	(2.922)		(2.757)		(2.770)
Belgium	6.556**	Greece	6.223**	Poland	5.281**
	(2.822)		(2.717)		(2.436)
Brazil	-3.468	Hungary	3.339*	Portugal	6.223**
	(2.672)		(1.980)		(2.717)
Canada	-0.722	Indonesia	5.419**	Russia	-1.919
	(1.979)		(2.475)		(2.236)
Switzerland	5.007**	Ireland	6.243**	Saudi Arabia	-1.193
	(2.360)		(2.723)		(2.070)
Chile	3.064	India	-1.820	Sweden	4.300**
	(1.934)		(2.212)		(2.180)
China	1.985	Italy	6.223**	Singapore	-1.899
	(1.813)		(2.717)		(2.231)
Colombia	3.496*	Japan	-4.979	Thailand	-4.037
	(2.009)		(3.165)		(2.851)
Czech Republic	4.242**	Korea	0.749	Turkey	5.242**
	(2.167)		(1.806)		(2.425)
Germany	6.537**	Luxembourg	6.635**	The US	0.906
	(2.816)		(2.848)		(1.799)
Denmark	-0.683	Mexico	0.141	South Africa	-3.056
	(1.972)		(1.855)		(2.547)
Spain	6.223**	Malaysia	-0.309		
	(2.717)		(1.912)		

*Notes: Based on the results of Table 6, Column 4 calculated using the country average CBI levels post-GFC.. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%)*

4. Sensitivity Analyses

The main estimation results indicate that the negative relationship between policy rates and credit-to-GDP gap as well as the positive relationship between money supply and credit-to-GDP gap decreases with higher CBI. I do several sensitivity analyses to check the robustness of these results. To summarize, firstly I use an alternative dependent variable, the credit-to-GDP growth; afterwards I use *de facto* CBI indicator (Cukierman *et al.* 1992, Dreher *et al.* 2008, 2010); and finally I use system GMM estimator to check the robustness of the main results. The estimation result tables of this section are included in Appendix B.

The credit-to-GDP gap which is used by the Bank of International Settlements as one of the financial crisis indicators, has received also various criticisms: especially the usage of the HP-filter in estimating the long run trend which, according to critics, might suffer from measurement errors. Specifically concerns focus on the sensitivity of the gap to the starting point of the series, the consistency of real time estimates for policy purposes and the downward bias of estimates during prolonged credit boom periods (Jokipii et al. 2021). In order to mitigate these criticism, I use credit-to-GDP growth as the dependent variable and re-estimate the model. The estimation results presented in Table B1 in Appendix B indicate that although the signs confirm the main estimations, policy rate and its interaction with CBI do not enter significant into the estimations. On the other hand, both money supply and its interaction with CBI are significant and in-line with the main estimation results. The marginal effects indicated in Table B2 show that policy rates are positive for all levels of CBI, but they are significantly influencing the credit-to-GDP growth when CBI is higher. Also the marginal effect of money supply becomes negative when CBI is higher. For the other indicators, apart from the lower significance of the exchange rates, the coefficients enter with the expected signs to the estimations. Therefore it can concluded that the main estimation results are robust to using credit-to-GDP growth as the dependent variable.

It has been argued by many academics[6] that *de jure* central bank independence might not reflect the actual influence of the government on the central bank. According to Walsh (2005), especially in developing countries there might be large difference between the legal institutional arrangements

[6] Forder (1996), Mangano (1998), Dreher *et al*. (2008)

and their practical application. Therefore I use the turnover rate of the central bank governors (Cukierman *et al.* 1992, Sturm and de Haan, 2002; Dreher *et al.* 2008, 2010) as a measure of *de facto* CBI to check the robustness of the results. Turnover rate is the average term of office of the central bank governors in a given period of time. It is calculated per decade as the ratio of the number of governors to number of years in that given period (Cukierman *et al*. 1992). Since more frequent changes in central bank governors indicates higher control of government over central banks, the higher the turnover rate, the lower the central bank independence. Even though the turnover rate ranges from 0 to 1, according to Cukierman *et al.* (1992), the threshold is around 0.25 indicating that if turnover rate is lower than 0.25, the central bank has higher independence. In my sample, the highest turnover rate is 0.6. Therefore I calculate the thresholds based on this maximum turnover rate.

The results, presented in Table B3, mainly confirm the main results. Turnover rate enters with a negative sign. Although not significant, once again it indicates that higher central bank independence, i.e. the lower turnover rate, increases the credit gap. Policy rate and it's interaction with the turnover rate enter insignificant, but once more it is observed that the effect of the policy rate depends on the turnover rate. Indicated by the marginal effect calculation in Table B4, the sign of the policy rate is negative only for the central banks with an average or higher turnover rate which indicates lower central bank independence. The money supply, on the other hand, is more effective for central banks with a lower turnover rate (see Table B4) although the interaction term is not significant in Table B3. Therefore it can be concluded that, for the policy rates, monetary policy's effect on credit-to-GDP gap decreases and even gets reversed when *de facto* central bank independence increases. However, the effect of money supply on the credit-to-GDP gap gets stronger with higher *de facto* CBI. This result can explain why most of developed countries reached the desired credit expansion with quantitative easing following the Global Financial Crisis.

Another concern is the potential endogeneity of the estimators that are used in the model. Although the fixed-effects estimator corrects for the unobserved heterogeneity in the model, it fails to address the potential reverse causality running from credit gap to monetary policy or other economic fundamentals. Therefore I conduct a system GMM (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) estimation to address the endogeneity concerns in the absence of

strictly exogenous instruments. I apply the forward orthogonal deviation instead of first-differencing in the differenced equation which preserves the sample size as well as removes the fixed-effects. Hansen test of over-identifying restrictions is used to test the exogeneity of the instruments. In order to limit the number of instruments to climb to the number of groups, for each regressor, I create only the first lags of the variables in the levels and differences equations as instruments. Additionally, I collapse the instrument set, so that for each variable and lag distance one instrument is created. Lastly, since in the presence of serial correlation in first differences some lags might turn out to be invalid instruments, Arellano-Bond serial correlation tests of the residuals in differences are calculated.

The results, presented in Table B5 and marginal effects in Table B6, confirm the main results that the CBI decreasing the influence of the policy rates on credit-to-GDP gap. The other results are also confirming the main estimation results; the only exception is the reversed sign of money supply and its interaction with CBI which suggests that higher CBI increases the effectiveness of money supply growth on credit gap. However, if the analysis is conducted only for the post-GFC sub-sample – available upon request – the money supply enters positive and significant, and its interaction with CBI is negative and significant. This indicates once more that the quantitative easing and other tools that led to an increase in money supply in the post-GFC period have lower and reversed influence on the credit gap for countries with average-to-high CBI, which confirms the main results.

5. Conclusion

This study analyzes the effect of monetary policy on financial imbalances by controlling for the effect of Central Bank Independence on the transmission of monetary policy to the credit-to-GDP gap. Using quarterly data from 1980 until the end of 2022 for 41 developed and developing countries the results of the analyses contribute significantly to the literature on monetary policy, central bank independence and credit to private sector.

The findings indicate that monetary policy's effect on the credit-to-GDP gap is highly dependent on the central bank independence. For countries with a low central bank independence a fall in the

policy rates or monetary expansion increases credit-to-GDP gap. However, for countries with high central bank independence, the expansionary monetary policy is not effective on reaching credit expansion. Especially following the Global Financial Crisis, the influence of central bank independence is much larger: the expansionary monetary policy – either through policy rates or money supply – results in a reduction in credit-to-GDP gap in countries with a high central bank independence. This robust finding supports the main hypothesis of this study that central banks need to coordinate more with the government in countries with high CBI to reach the domestic credit expansion following a financial crisis. In general, central bank independence works as a firewall between monetary policy and credit-to-GDP gap, making it difficult for the monetary policy transmission mechanism to operate in order to stimulate the credit growth.

These crucial results contribute to the empirical literature regarding the monetary policy, the central bank independence and its relevance on accessibility of bank credit in several important ways. Specifically, the evidence suggests that central bank independence hinders monetary policy's influence on bank credit to the private sector. Therefore the main policy implication of this study is that maintaining public trust on financial system is much costlier for an independent central bank compared to a central bank that coordinates more with the government. Another contribution of this study is that the central bank independence has much more pronounced effect on reversing the effect of conventional monetary policies compared to unconventional policies, like money supply growth in reaching credit expansion. However, during GFC both policy tools have reversed monetary policies' effectiveness in reaching credit markets. This underlines the need for central banks having more coordination, especially following financial crises, with the governments to restore confidence in the financial system. However, this higher coordination might also bring difficulties later on to the inflation targeting central banks in rebuilding their credibility and reaching their inflation targets. Lastly, according to the results, if central banks give more control over the monetary policy implementation, the lending decisions, and reporting and disclosure to the government they will succeed more in controlling the financial imbalances through their monetary policy.

As a result, the findings of this study shed light on the debate if an independent central bank can do it all; i.e. support the financial system without losing its independence and compromising its main policy objective, which for most central banks is the price stability.

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Appendix

A. Data Descriptions and Statistics

Table A1. Data Descriptions

Explanatory Variables	Construction and Sources	Frequency
Credit-to-GDP Gap	The difference between private sector credit to GDP ratio and its long-run trend (HP-filter with a parameter of 400,000) (BIS[a])	Quarterly
Credit-to-GDP Ratio	Private sector credit to GDP Ratio (BIS[a])	Quarterly
Current Account Position	Net current account divided by GDP expressed in US dollars. (IMF, IFS[b])	Quarterly
Exchange Rate	National currency per US dollars, period average (IMF IFS[b]) For the US, before 1999 German Mark and afterwards Euro is used.	Quarterly
Real GDP Growth	The percentage change in the GDP in constant prices local currency. (OECD and IMF, IFS[b])	Quarterly
Monetary Policy Rates	The monetary policy-related interest rate expressed as percentage change (IMF IFS[b] and BIS[a])	Quarterly
Inflation	The percentage change in the Consumer Price Index, corresponding period previous year (IMF IFS[b])	Quarterly
Money Supply Growth	Money plus Quasimoney (M2) expressed as percentage change same period previous year (IMF IFS[b])	Quarterly
Capital Account Openness Index	The Chinn-Ito Index measuring country's degree of financial openness (Chinn and Ito, 2006[c])	Annual
Deposit Growth	Demand plus Time, Savings, Foreign currency deposits (IMF, IFS[b]) expressed as a percentage change	Quarterly
Foreign Liabilities to Foreign Assets Ratio	Banking Institutions Foreign Liabilities to Foreign Assets (IMF, IFS[b])	Quarterly
Global Financial Crisis	The dummy that's takes value 1 during the Global Financial Crisis (from Q3 2007 until Q4 2009) (Laeven and Valencia, 2020)	Quarterly
Central Bank Independence	Central Bank Independence Index developed by Romelli (2022[d]) which incorporates the characteristics of both GMT and CWN indexes.	Annual
CBIE Board	The independence of the governor and central bank board developed by Romelli (2022[d])	Annual
CBIE Policy	The independence of the central bank in determining and implementing the monetary policy and conflict resolution developed by Romelli (2022[d])	Annual
CBIE Objectives	The independence of central bank in setting and clearly defining its objectives developed by Romelli (2022[d])	Annual
CBIE Lending	The independence of the central bank in deciding the quantity and conditions under which it lends money to the government developed by Romelli (2022[d])	Annual
CBIE Finances	The financial strength of the central bank and the independence of using its own resources developed by Romelli (2022[d])	Annual
Turnover Rate	The yearly average term of office of the central bankers. Calculated as number of times the central bank governor changes over ten-year periods, based on Cukierman et al. (1992), data from Dreher et al. (2008)[e]	Decennially

[a] Bank of International Settlements
[b] International Monetary Fund, International Financial Statistics
[c] Extracted from: https://web.pdx.edu/~ito/Chinn-Ito_website.htm
[d] Extracted from: https://dromelli.github.io/cbidata/index.html
[e] Extracted from: https://kof.ethz.ch/en/data/data-on-central-bank-governors.html

Table A2. Correlation Coefficients

	Cred-to-GDP Gap	MP rates	M2 Growth	CBI	Exch. Rate	Infl.	CA Pos.
Cred.-to-GDP Gap	1.000						
MP rates	-0.017	1.000					
M2 growth	0.054	0.012	1.000				
CBI	0.151	-0.062	-0.152	1.000			
Exchange Rate	0.060	0.024	0.148	-0.066	1.000		
Inflation	-0.007	0.016	0.664	-0.123	0.188	1.000	
CA Pos.	-0.214	0.007	-0.115	-0.045	-0.033	-0.148	1.000
Deposit Growth	0.034	0.009	0.540	-0.115	0.107	0.345	-0.042
For. Liab. to Ass.	0.127	-0.005	0.216	-0.128	0.043	0.167	-0.205
Real GDP Growth	-0.110	0.054	0.093	0.059	-0.145	-0.045	0.061
Cap. Acc. Op.	0.050	-0.013	-0.421	0.262	-0.132	-0.332	0.179
GFC	0.184	-0.056	0.033	0.126	-0.056	-0.041	-0.034
TOR	-0.049	0.048	0.261	0.051	0.072	0.167	-0.122
Credit-to-GDP Gr.	0.338	0.038	0.011	0.012	0.072	-0.108	-0.151

	Deposit Growth	For. Liab. to Ass.	Real GDP G	Cap. Acc. Op.	GFC	TOR	Cred/GDP Gr
Deposit Growth	1.000						
For. Liab. to Ass.	0.120	1.000					
Real GDP Growth	0.091	0.022	1.000				
Cap. Acc. Op.	-0.241	-0.189	-0.113	1.000			
GFC	-0.011	-0.014	-0.150	0.044	1.000		
TOR	0.157	-0.018	1.112	-0.367	-0.031	1.000	
Credit-to-GDP Gr.	-0.014	0.067	-0.077	-0.013	0.090	0.042	1.000

B. Estimation Results of Sensitivity Analyses

Table B1. Fixed-Effects Estimation Results for the Whole Sample with Alternative Dependent Variable (Credit-to-GDP Growth)

Dependent Variable: Credit-to-GDP Growth	1	2	3	4
Central Bank Independence	-0.982	-0.971	-0.497	-0.470
	(0.648)	(0.654)	(0.540)	(0.547)
Monetary Policy Rate$_{t-1}$	0.344	0.025	0.351	-0.001
	(0.230)	(0.400)	(0.234)	(0.392)
Money Supply$_{t-1}$	0.017	0.017	0.043	0.043***
	(0.010)	(0.010)	(0.015)	(0.015)
CBI X Monetary Policy Rate $_{t-1}$		0.672		0.744
		(0.572)		(0.573)
CBI X Money Supply $_{t-1}$			-0.057*	-0.059*
			(0.033)	(0.033)
Exchange Rate$_{t-1}$	2.868	2.900	2.787	2.820
	(4.103)	(4.101)	(4.012)	(1.009)
Inflation $_{t-1}$	**-0.106*** **	**-0.106*** **	**-0.104*** **	**-0.104*** **
	(0.033)	(0.033)	(0.032)	(0.032)
Current Account Position $_{t-1}$	**-0.133*** **	**-0.133*** **	**-0.135*** **	**-0.134*** **
	(0.033)	(0.033)	(0.033)	(0.033)
Deposit Growth $_{t-1}$	-0.415	-0.422	-0.434	-0.442
	(1.371)	(1.372)	(1.403)	(1.405)
Foreign Liabilities to Foreign Assets $_{t-1}$	0.179**	0.180**	0.167**	0.168**
	(0.082)	(0.082)	(0.083)	(0.083)
Real GDP Growth $_{t-1}$	-0.170**	-0.173**	-0.165**	-0.168**
	(0.070)	(0.071)	(0.069)	(0.068)
Capital Account Openness	-0.073	-0.075	-0.088	-0.090
	(0.177)	(0.176)	(0.184)	(0.183)
Global Financial Crisis	**0.723*** **	**0.728*** **	**0.762*** **	**0.767*** **
	(0.226)	(0.227)	(0.232)	(0.233)
Number of Observations	3443	3443	3443	3443
R2: within	0.108	0.109	0.110	0.110
ρ^c	0.08	0.08	0.09	0.09

*Notes: The values in parenthesis represent the robust standard errors which are clustered by country. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

Table B2. Marginal Effect of Monetary Policy for Different CBI Levels

Monetary Policy	Sample Average	CBI = 0.2	CBI = 0.5	CBI = 0.8
Monetary Policy Interest Rates	0.450***	0.148	0.371**	0.594***
	(0.157)	(0.291)	(0.173)	(0.186)
Money Supply	0.007	0.031***	0.014	-0.004
	(0.013)	(0.011)	(0.011)	(0.018)

*Notes: Based on the results of Table B1, Column 4 calculated using the sample average (0.607), low (0.2), average (0.5) and high (0.8) CBI levels. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*

Table B3. Fixed Effects Estimation Results with *De-Facto* Central Bank Independence Indicator

Dependent Variable: Credit-to-GDP Gap	1	2	3	4
Turnover Rate	-1.170	-1.389	-2.818	-2.926
	(14.974)	(14.970)	(17.421)	(17.427)
Monetary Policy Rate$_{t-1}$	0.445	2.354	0.459	2.349
	(0.918)	(1.934)	(0.924)	(1.933)
Money Supply$_{t-1}$	0.121**	0.119**	0.096	0.096
	(0.046)	(0.046)	(0.096)	(0.096)
TOR X Monetary Policy Rate $_{t-1}$		-8.467		-8.391
		(5.554)		(5.416)
TOR X Money Supply $_{t-1}$			0.141	0.132
			(0.542)	(0.540)
Exchange Rate$_{t-1}$	13.764**	13.704**	13.689*	13.635*
	(6.705)	(6.652)	(6.804)	(6.747)
Inflation $_{t-1}$	-0.214**	-0.210**	-0.220**	-0.216**
	(0.079)	(0.080)	(0.083)	(0.084)
Current Account Position $_{t-1}$	**-1.013*** **	**-1.015*** **	**-1.014*** **	**-1.016*** **
	(0.242)	(0.242)	(0.242)	(0.242)
Deposit Growth $_{t-1}$	7.022	7.350	6.919	7.251
	(4.577)	(4.554)	(4.523)	(4.503)
Foreign Liabilities to Foreign Assets $_{t-1}$	1.160**	1.159**	1.180**	1.177**
	(0.451)	(0.450)	(0.452)	(0.450)
Real GDP Growth $_{t-1}$	**-1.064*** **	**-1.069*** **	**-1.067*** **	**-1.072*** **
	(0.209)	(0.210)	(0.208)	(0.209)
Capital Account Openness	1.447	1.473	1.451	1.476
	(1.083)	(1.089)	(1.082)	(1.088)
Global Financial Crisis	**6.589*** **	**6.621*** **	**6.623*** **	**6.653*** **
	(1.994)	(1.998)	(3.082)	(2.047)
Number of Observations	3343	3343	3343	3343
R2: within	0.168	0.169	0.169	0.170
ρ^c	0.31	0.31	0.31	0.31

*Notes: The values in parenthesis represent the robust standard errors which are clustered by country. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

Table B4 . Marginal Effect of Monetary Policy for Different Values of the Turnover Rate

Monetary Policy	Sample Average	TOR= 0.48	TOR = 0.3	TOR = 0.12
Monetary Policy Interest Rates	1.040	-1.679	-0.170	1.342
	(1.254)	(1.280)	(0.917)	(1.395)
Money Supply	0.116**	0.159	0.135	0.112**
	(0.048)	(0.182)	(0.092)	(0.051)

*Notes: Based on the results of Table B3 , Column 4 calculated using the sample average(0.156)), low (0.12), average (0.3) and high (0.6) levels of Turnover rate. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*

Table B5. System GMM Estimation Results for the Whole Sample

Dependent Variable: Credit-to-GDP Gap	1	2	3	4
Central Bank Independence	-70.184**	-69.666**	-69.745**	-69.580**
	(35.123)	(34.682)	(33.723)	(33.571)
Monetary Policy Rate$_{t-1}$	-0.599	**-2.664*** **	-1.023*	-1.767**
	(0.745)	(0.900)	(0.541)	(0.902)
Money Supply$_{t-1}$	-0.103	-0.101	-0.770	-0.768
	(0.147)	(0.146)	(0.636)	(0.636)
CBI X Monetary Policy Rate $_{t-1}$		4.363		1.580
		(2.390)		(2.172)
CBI X Money Supply $_{t-1}$			1.640	1.633
			(1.104)	(1.102)
Exchange Rate$_{t-1}$	7.733	8.036	13.032*	13.113*
	(6.616)	(6.548)	(7.257)	(7.260)
Inflation $_{t-1}$	-0.879*	-0.877*	-0.885**	-0.885**
	(0.481)	(0.477)	(0.432)	(0.430)
Current Account Position $_{t-1}$	**-1.910*** **	**-1.901*** **	**-1.886*** **	**-1.881*** **
	(0.447)	(0.477)	(0.412)	(0.412)
Deposit Growth $_{t-1}$	-7.499	-7.395	-1.353	-1.340
	(9.391)	(9.306)	(7.295)	(7.277)
Foreign Liabilities to Foreign Assets $_{t-1}$	-0.552	-0.530	0.012	0.017
	(1.615)	(1.592)	(1.130)	(1.125)
Real GDP Growth $_{t-1}$	**-2.157*** **	**-2.162*** **	**-2.029*** **	**-2.032*** **
	(0.557)	(0.556)	(0.518)	(0.517)
Capital Account Openness	-0.549	-0.493	1.688	1.691
	(3.716)	(3.682)	(3.584)	(3.577)
Global Financial Crisis	7.783**	7.780**	5.326**	5.341**
	(3.131)	(3.119)	(2.600)	(2.602)
Number of Observations	3327	3327	3327	3327
Number of Instruments	24	26	26	28
Hansen Test P-Value	0.137	0.110	0.206	0.128
AR (1)	-2.95***	-2.95***	-3.05***	-3.04***
AR (2)	-1.39	-1.42	-1.33	-1.34

*Notes: Forward orthogonal deviation transformation is used to eliminate fixed effects. The values in parenthesis represent the robust standard errors which are clustered by episode. The significance levels of the variables are indicated by * (10%), ** (5%) and *** (1%). Counter intuitively-signed coefficients are represented in italics. (1%) significant coefficients having anticipated signs are represented in bold.*

Table B6. Marginal Effect of Monetary Policy for Different CBI Levels

Monetary Policy	Sample Average	CBI = 0.2	CBI = 0.5	CBI = 0.8
Monetary Policy Interest Rates	-0.808	-1.451***	-0.976**	-0.503
	(0.645)	(0.547)	(0.483)	(1.008)
Money Supply	0.225	-0.440	0.050	0.540*
	(0.152)	(0.424)	(0.159)	(0.299)

*Notes: Based on the results of Table B5, Column 4 calculated using the sample average (0.607), low (0.2), average (0.5) and high (0.8) CBI levels. The values in parenthesis represent the standard errors. The significance levels of the marginal effects is indicated by * (10%), ** (5%) and *** (1%).*