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Review

INTERACTION OF MACRO-MANAGEMENT POLICIES TO REDUCE LENDING GROWTH

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Abstract. This paper examines whether capital flow management (CFM) and monetary policies effectively reduce lending growth in emerging market economies (EMEs) in the presence of conventional and unconventional monetary policy actions undertaken by advanced economies. We apply a dynamic panel model with fixed effects to a sample of 24 emerging market economies for 2000–2021 using quarterly data and more continuous variables than in other studies rather than limiting the variability using proxies. Capital controls and macroprudential regulation, as CFM policy tools, moderate lending growth. This effect is particularly shown in countries with tighter monetary conditions. Our main findings highlight the useful role of coordinating CFM and monetary policies. This role stands for both fixed and flexible exchange rate regimes. Lastly, we find capital flow management and monetary policies manage to control lending in normal periods, but their coordination is less effective during crises and high volatility periods.

Keywords: capital flows management, monetary policy, lending growth, interaction.

JEL Classification: F36, F37, F38, F41.

Introduction

Implementing CFM policy through capital controls and macroprudential regulation has been advised, particularly for EMEs to safeguard the financial system and ensure monetary policy effectiveness. Capital inflow surges, especially when composed of offshore borrowing and associated with appreciation in exchange rates, contribute to increases in the credit gap, justifying the use of CFM as well as, potentially, monetary policy (Nier et al., 2020). The link of CFM to boom-bust financial cycles means that the most important goal remains controlling

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lending growth (Akinci & Olmstead-Rumsey, 2018; Ahnert et al., 2021). However, the extent to which CFM policy interacts with monetary policy to deal with lending growth is far from being complete. This study argues that effective CFM and monetary policies complement each other, yielding superior results compared to when CFM policy or monetary policy is used alone and without other policies (Nier & Kang, 2016). Particularly, the interaction of both policies will be useful to reach the ultimate result of lessening lending growth and thus increasing financial stability.

A great body of empirical literature analyses the effectiveness of CFM and monetary policies with relevant results in achieving some domestic macroeconomic objectives. For example, Nier and Kang (2016) explore the interactions between macroprudential and monetary policies. They interact a monetary policy stance dummy variable expressing whether monetary policy is loose or tight with a measure for macroprudential regulation. Their results find statistically insignificant coefficients of interaction terms highlighting that the tightening or loosening of monetary policy has no impact on the macroprudential impact on lending growth. Their findings align with Aiyar et al. (2014) who focus more on capital requirements as a macroprudential policy tool. Their study is among the rare ones focusing on lowering lending growth; however, it only uses the macroprudential tool for CFM policy and also uses a dummy variable to proxy the monetary policy. Although there is expanded literature on the effects of monetary and macroprudential policies on lending growth, rare studies have systematically investigated the interaction between CFM and monetary policies in lowering domestic lending growth. As a result, the effective coordination of both policies in mitigating lending growth remains an open question.

This paper empirically examines the effectiveness of CFM and domestic monetary policies in reducing the excessive domestic lending growth in EMEs. Specifically, we focus on the interaction between both policies. The vulnerability of EMEs to global financial shocks and the raised lending booms phenomena has fueled demands for the employment of additional policies (better choice of exchange rate regime) and even to combine existing policies' tools (i.e., the interaction of CFM and monetary policies). Then this paper also explores the usefulness of the exchange rate regime that better suits the interaction of CFM and monetary policies. We also expand the analysis to assess whether the effects of both policies on lending growth are more powerful in normal or crisis periods. The main challenge faced in this study is the hard task of determining relevant indices proxying CFM's cyclical behavior. Besides, the proper effect of each policy on lending growth is hard to find because such policies respond endogenously to lending growth. We consider these concerns by employing recently developed measures of CFM that capture policy actions.

This paper boosts the research on the effectiveness of CFM in three ways. First, to capture policy changes, it is crucial to focus more on the intensity of policy tools and not only rely on dummy variables. For instance, Madeira (2022) argues that the interaction between macroprudential regulation and risk provides significant estimates when loan-to-value (LTV) ratios are used directly. However, the interaction estimates become minor when LTV measures are proxied by dummy variables. The literature on CFM actions usually uses dummy variables for this policy. In contrast, in our study, we employ recent measures built to reflect the time-varying strength of CFM actions and then ensure a better proxy for the cyclical behavior of the CFM policy.

Second, the changes in the Fed rate are usually used to proxy monetary policy shifts (a conventional measure). However, this distress to EMEs may not be reflected by only shifts in the federal funds rate, since the period following the crisis has shown the use of different monetary policy instruments and not only the funds rate (Siranova & Zelenak, 2023). The monetary policy stance is recently conducted through a combination of different instruments characterized by the growth of unconventional tools such as quantitative easing programs. Our study considers the recent evolutions surrounding the monetary policy stance using an unconventional monetary policy measure. To consider specifically the impact of monetary policy on lending growth, since some EMEs are highly dedicated to targeting inflation, which may not be determined by the change in interest rates (Nakatani, 2020), we isolate the inflation targeting purpose from the monetary policy to assess mainly the impact on lending growth and the potential interaction with CFM policy.

Third, the different findings obtained in the empirical literature are mainly due to the independent use of macroprudential and capital control tools. However, these tools also are applied with an annual data set (Bergant et al., 2020), which may affect the accuracy of the results. Therefore, our study has the merit of considering both macroprudential and capital controls under CFM policy's umbrella and applying recent quarterly data sets.

Our empirical methodology has four stages. First, we analyze the impact of CFM and monetary policies on lending growth. We regress a fixed effects panel model with quarterly lending growth. The results of CFM policy are obtained through two indexes for capital controls (Pasricha et al., 2018; Chinn & Ito, 2008) and two macroprudential policy measures (Chari et al., 2022). Similarly, the monetary policy impact is considered through two proxies, interest rate and non-interest rate. Second, we investigate whether the lending growth response to changes in CFM policy depends on monetary policy; interaction terms are included among the regressors. In the third stage, we aim to demonstrate whether the effectiveness of CFM in EMEs where their monetary policy is tightened or loosened is better to reduce lending growth, is also influenced by the exchange rate regime. The baseline equation is estimated twice for floating and fixed exchange rate regimes. This exercise can help us further explore the mechanisms and what drives our baseline results. Lastly, we examine whether our previous results remain in periods of crisis or high global volatility. Finally, we conduct a set of robustness checks on the findings of the baseline model.

The findings of this study show that tighter CFM policy is correlated with a significant decrease in domestic lending. The results of both tools of CFM policy show that macroprudential regulation has more impact in reducing lending growth than capital controls (–10.8 to –41.5 basis points for capital controls indexes against –31 to –51.1 basis points for macroprudential measures). We find that tighter monetary policy (conventional and unconventional tools) in EMEs supports CFM actions in reducing lending growth. Our empirical results suggest that a one-unit increase in the conventional and unconventional monetary policy measures reduces lending growth by 32.6 and 41.6 basis points. These results are confirmed by the impulse response function plotting shocks of monetary and CFM policies on lending growth. The interaction of CFM and monetary policies considerably impacts lower lending growth by up to 54.3 basis points. Finally, our results show that the effectiveness of both policies stands for fixed and flexible exchange rate regimes; however, these policies become less effective in crisis and high volatility periods, highlighting the collapse of their coordination in reducing lending growth.

The rest of the paper is structured as follows. Section 1 reports the literature review. Data and variables are presented in Section 2. Our empirical methodology and key results are developed in Section 3, and the last Section provides conclusions.

1. Literature review

Our results are built on the recent literature debating the effectiveness of CFM and monetary policy in controlling domestic lending. Multiple studies have used country-level panel data and aim to determine the impact of CFM (in particular, capital controls and macroprudential regulation) and domestic monetary policies on domestic lending growth in EMEs. However, the studies rarely focus on the cross-impact of CFM and monetary policies. This section presents theoretical and empirical literature framing our analysis.

The theoretical literature that supports the controlling role of CFM on lending growth is founded on dynamic stochastic general equilibrium (DSGE). These models have been used to assess the usefulness of CFM tools, particularly in facing global financial shocks. According to these models, the macroprudential tool targets financial instability problems and monetary policy often reacts abruptly and cannot defend against a global financial shock alone.

Much of this literature shows that CFM and monetary policies are not substitutes but complements. Nevertheless, findings differ according to shock features (Antipa et al., 2010; Angelini et al., 2011; Zehri, 2020; Andrikopoulos et al., 2023). This literature finds inefficient the use of CFM policy to reach the same objectives as monetary policy because it seriously limits the proper functioning of the financial sector and output as well as violates the standard Tinbergen rule that for each policy goal, one needs at least that number of instruments to achieve optimality in each (Carrillo et al., 2021). On the other hand, through various policies and shocks (i.e. financial, demand or productivity), the theoretical literature finds an optimal choice from the simultaneous use of both policies.

Although there is a theoretical significance for DSGE models, their contribution to developing empirical studies on the interaction of CFM and monetary policies is relatively weak. Empirically, the impact of CFM and monetary policies and their interaction on lending growth is still unsettled (Aiyar et al., 2014; Dell'Ariccia et al., 2012). Among the rare empirical studies, Nier and Kang (2016) conducted a panel regression analysis for 36 economies. Their baseline model includes macroprudential regulation indexes and the interaction of monetary policy and macroprudential indexes as independent variables to explain two dependent variables, house price inflation and lending growth rate. Their results show that monetary and macroprudential policies effectively control lending booms; however, the interaction term coefficients are weakly significant. Furthermore, the authors emphasize that both policies reinforce each other, a result also confirmed by Forbes et al. (2017), who detect the implication of monetary policy in amplifying the effect of macroprudential regulation.

A different strand in the empirical literature supports the joint use of CFM and monetary policies. For instance, Greenwood-Nimmo and Tarassow (2016) show that CFM policy alone cannot deal with domestic macroeconomic and financial issues and its effect is ambiguous due to endogeneity concerns. However, the authors claim that it is rare to use CFM policy alone; it is usually used in combination with monetary policy. Other studies have focused on capital controls instead of macroprudential policy as CFM tools, without including their interaction with monetary policy. For example, Ben Zeev (2017) studied a panel of 33 EMEs and found an interesting role of capital inflow controls in shielding EMEs from a lending boom. These controls stabilize the output of these countries and respond effectively to credit supply shocks; however, these effects are not found for capital outflow controls. Gambacorta and Murcia (2020) analyzed the impact of capital control actions on domestic lending growth; their empirical findings show that capital controls help to smooth credit cycles, and this impact is conditional on some bank-specific characteristics.

With these ideas in mind, we aim to provide empirical support for utilizing CFM in conjunction with monetary policy in EMEs by looking at more than two decades of economic activity encompassing several business cycles with more data points both in terms of the number of countries studied and by using quarterly data over a longer time frame than many other studies (Bacchetta et al., 2023). We also use more precise quantitative measurements than the standard dummy proxies found in much of the literature and conduct several robustness checks to provide additional support for our findings. The following section details these various decisions.

2. Data and variables

In the last two decades, credits in EMEs have been speedily expanded. Multiple drivers – such as financial development, economic growth, novel forms of loans, and capital account liberalization – help explain this sharp growth of credits. However, the situation varies regarding individual cases of EMEs; in some countries, the average lending growth over the previous two decades is relatively moderate, while in others, like Russia, Brazil, Turkey, and Indonesia, the rate exceeds 10 percent per annum.

2.1. Data analysis

To examine the effect of CFM and monetary policies on domestic lending growth, we consider quarterly unbalanced panel data of 24 EMEs over 2018–2021[1]. These countries are Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Malaysia, Mexico, Morocco, Paraguay, Peru, Philippines, Poland, Russia, Singapore, South Africa, South Korea, Tunisia, Thailand, and Turkey. These EMEs are also part of the sample countries used in Pasricha et al. (2018), or Chari et al. (2022), which ensures data availability on CFM indexes for our study.

[1] We build on Ben Zeev (2017) by assuming identical quarterly values equal to the corresponding annual values in order to transform annual data of capital controls into quarterly frequency. This assumption is based on Fernández et al. (2016) who demonstrates these controls vary little over a year, have low standard deviations, and are highly acyclical in nature.

We examine the evolution of one tool of CFM (macroprudential index) with the lending growth for our sample country (Figure 1) and combine a proxy of monetary policy (Fed interest rate) with the domestic lending growth (Figure 2). This may reflect the effect of monetary policy on lending growth and allow us to compare it with the macroprudential index policy. Lastly, we link the same macroprudential policy index data with the Fed interest rate to examine the potential complementarity between both policies (Figure 3).

Figure 1 shows that, for the first dozen years or so, macroprudential policy and lending growth were somewhat delinked, but during the mid-2010s and the early 2020s, the rise of tightening macroprudential tools share a much more common pattern to lending growth until the start of COVID-19 when they are again delinked. This figure shows that policymakers have activated macroprudential tools to respond to lending development during normal times. However, this linkage is clearly broken during crises, such as the COVID-19 period.

Similarly to Figure 1, we examine the shape of the Fed interest rate with domestic lending growth. Figure 2 shows a considerable lending growth increase accompanied the Fed's decline in 2005. This increase in credit continued until the post-crisis period (in 2010), while the Fed continued to fall. From 2012, we notice that the credit goes up gradually, accompanying a progressive increase in the Fed (which ends in 2018). The bearish overall pace of the Fed since the 2008 crisis shows an easing in monetary policy, leading to significant lending growth in EMEs.

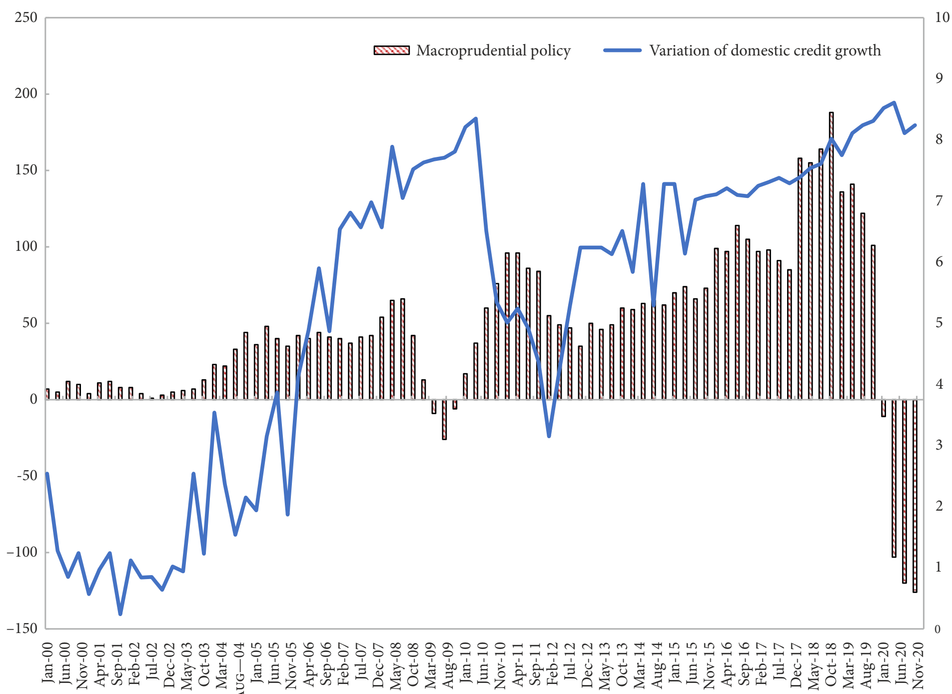

Figure 1. Macroprudential policy and variation of domestic lending growth in EMEs

Figure 3 shows the linkage between the number of macroprudential policies and the Fed interest rate. In the crisis period, there was a decline in the Fed rate (losing monetary policy) accompanied by an easing in macroprudential regulation. After the global crisis, tightened macroprudential regulations were accompanied by a tighter monetary policy, particularly between 2013 and 2018. In the advent of COVID-19, monetary policy and macroprudential regulation were eased dramatically, with macroprudential regulation easing to a greater extent than monetary policy, possibly because of the nominal zero-bound on interest rates. Figure 3 shows that the post-crisis period is the most significant for complementarity between CFM and monetary policies; in this period, there is a considerable rise in the number of macroprudential instruments accompanied by an increase in the Fed rate, as well as a corresponding decline in both in the COVID-19 period. When we examine individual country cases, we find divergent results on the complementarity of CFM and monetary policies across countries. The correlations between the number of macroprudential instruments used and the rise in Fed rate, reported in Table 1, are positive, for example, in Malaysia, China, Chile, Thailand, and Indonesia; however, we find negative correlations for the Philippines, Singapore, India, South Korea, and Turkey.

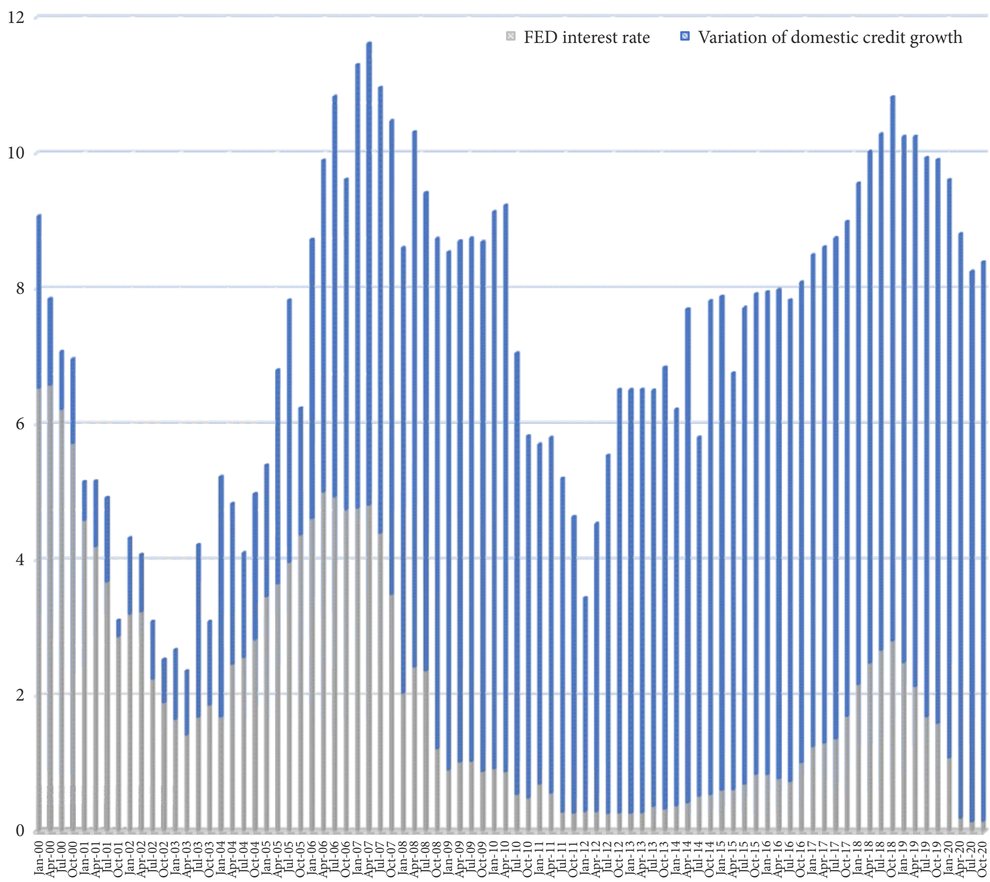

Figure 2. Domestic lending growth and fed interest rate

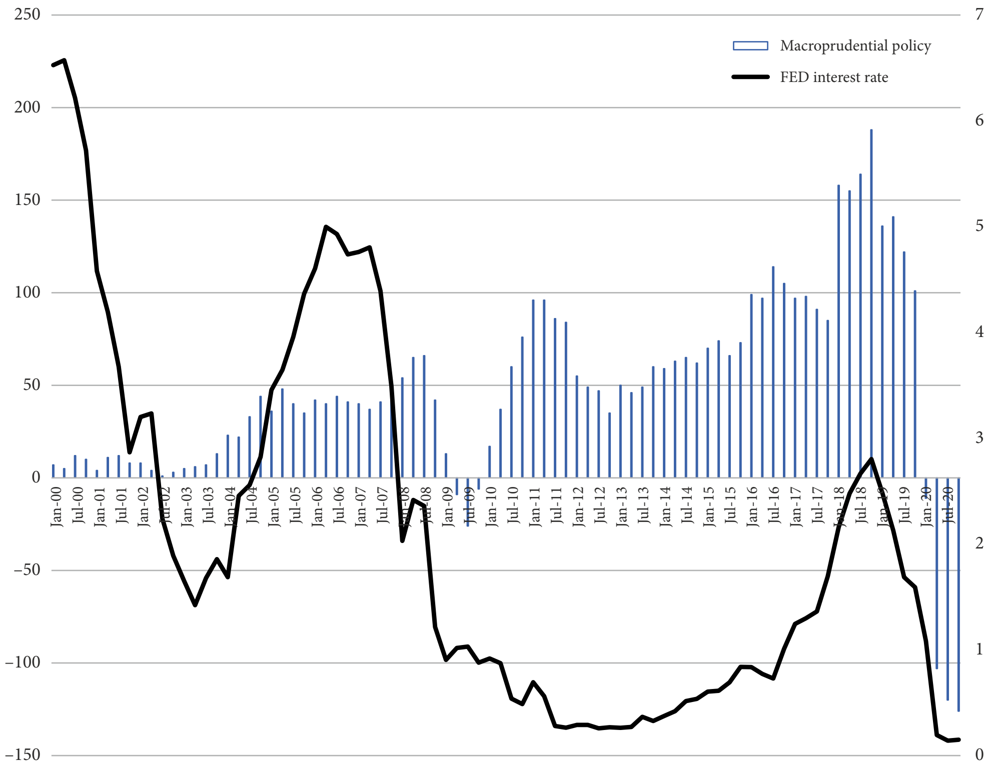

Figure 3. Macroprudential policy and Fed interest rate[2]

Table 1. Correlation between the number of macroprudential instruments and the positive changes in the Fed rate (over 2000–2020) (source: author's estimates)

Country	Coefficient of Correlation	Country	Coefficient of Correlation
Argentina	0.257	Morocco	0.341
Brazil	0.351	Peru	0.274
Chile	0.157	Philippines	–0.504
China	0.387	Poland	–0.278
Colombia	–0.149	Russia	0.387
Czech Republic	–0.427	Singapore	–0.361
Hungary	–0.105	South Africa	0.517
India	–0.097	South Korea	0.355
Indonesia	0.392	Thailand	0.283
Malaysia	0.267	Turkey	0.389
Mexico	0.403		

[2] Market Yield on U.S. Treasury Securities at 2-Year Constant Maturity, Percent, Quarterly.

2.2. Model variables

Tables 2 and 3 report, respectively, the description of our model variables and their descriptive statistics. These variables are classified into CFM policy, monetary policy, and controls. As a pre-requisite for subsequent analyses, we evaluate the integration properties of the variables under consideration.

Table 2. Description of variables

Variable	Symbol	Description	Sources	Time span
Dependent variable				
Variation of domestic lending growth	ΔCG	Quarterly growth in lending by domestic banks to private non-financial sector to GDP taken from the BIS, or if not available, quarterly growth in claims by other depository corporations on private sector (scaled by GDP, %) from IMF IFS	BIS and International Financial Statistics (IFS), IMF	2000–2020
CFM policy				
Capital controls	CC1	This index proxies the intensity of capital controls by capturing over time the number of control actions	Pasricha et al. (2018)	2000–2018
Financial openness	CC2	Chinn-Ito Index of financial openness	Chinn and Ito (2008)	2000–2016
Macroprudential policy stance	MaPP1	This index is an equally-weighted index of the CCyB (from the BIS and ESRB data), LTV ratio (from the iMaPP database, Alam et al., 2019), and FX macroprudential stance (calculated based on the iMaPP data)	Chari et al. (2022)	2000–2020
Macroprudential policy stance	MaPP2	This index includes only statistics that incorporate the intensity of the first principal component of the CCyB and LTV ratio	Chari et al. (2022)	
Monetary policy				
Federal Funds Shadow Rate	rate	United States: Federal Funds Shadow Short Rate Point Estimates (average, % p.a.)	Haver	2000–2020
Non-interest rate monetary policy	non-rate	The difference between the actual policy rate and the Taylor rule rate	Haver	2000–2020
Control variables				
Inflation	INF	Change in the CPI index	World Bank's World Development Indicators	2000–2020

End of Table 2

Variable	Symbol	Description	Sources	Time span
Real GDP growth	GDP	Real GDP growth	World Bank's World Development Indicators	2000–2020
Real effective exchange rate	REER	Real effective exchange rate	IMF, IFS	2000–2020
Current account	CA	The current account in U.S. dollars as a percentage of the HP-filtered trend nominal GDP, also in U.S. dollars	World Bank's World Development Indicators	
Employment rate	EMP			2000–2020
Inflation targeting	I	dummy variable: Inflation targeting = 1; no inflation targeting = 0	IMF's Annual Report on Exchange Arrangements and Exchange Restrictions	2000–2018
Global Financial Crisis	GFC	dummy variable: Crisis = 1; no crisis = 0	Laeven and Valencia (2020)	2000–2019
Global volatility	VIX	The Chicago Board Options Exchange's CBOE Volatility Index	Haver	2000–2020

Table 3. Summary statistics (source: author's calculations)

Variable	Mean	Std. Dev.	Min	Max
ΔCG	0.0724	0.1180	0	1.0681
CC1	0.2151	0.2548	1.00E-06	2.4250
CC2	0.0704	0.2711	–37.6254	69.4896
MaPP1	22.0740	2.9833	5.3927	33.4614
MaPP2	0.0962	0.6330	–84.9367	111.9956
rate	–0.0001	0.1653	–38.318	54.0414
non-rate	0.0102	0.3364	–120.235	28.7530
INF	5.0135	10.3768	–12.135	51.1152
GDP	1.1863	1.5226	–3.81	5.24
REER	0.0012	0.0758	–0.6233	0.4254
CA	1.3587	2.3870	0.1247	25.3279
EMP	0.4128	1.2579	0.0457	1.3429
I	0.2376	2.9824	0.0845	5.6821
GFC	0.4157	1.8546	0.0015	0.4571
VIX	0.0529	0.0312	–0.1481	0.2617

Table 4 reports the ADF and PP unit root tests for all the series, where the tests are implemented with a time trend. The results tend to suggest non-stationarity in levels of the variables but stationarity in their first differences.

Table 4. Stationnarity tests

	ADF		PP	
Variable	Levels	First differences	Levels	First differences
ΔCG	2.1542*	3.4812**	2.0579	3.3924**
CC1	0.9276	1.8524*	0.8785	2.0578**
CC2	1.2578	3.6581*	1.6947	3.6527*
MaPP1	2.3581	4.6582*	1.9675	4.0385**
MaPP2	2.0385	3.6821*	2.367	3.6291*
rate	4.3262*	7.6284**	4.6902	8.0394*
non-rate	9.6827	13.2571**	8.6265	14.2957*
INF	1.3295	4.6257**	1.9622	3.5264*
GDP	8.6257	12.3978**	7.6029	14.9273**
REER	5.3942	15.0287*	6.3927	16.3274*
CA	3.2957	4.6558*	3.6957	7.6284*
EMP	0.2518	1.3954*	0.3694	2.0583**
I	11.8532	15.6274*	10.9574	16.8534*
GFC	5.9574	8.2545*	3.5281	9.8273*
VIX	1.2384	3.2650*	1.5482	4.628*

Note: *, ** and *** denote significance at 1 percent, 5 percent, and 10 percent, respectively.

2.2.1. CFM policy measures

This study considers two main tools commonly used in CFM policy, capital controls and macroprudential policy stance[3]. First, we estimate the variation of domestic lending growth using two proxies of capital controls, the Pasricha et al. (2018) and the Chinn and Ito (2008) indexes. The first one provides information on capital control actions. Compared to other measures, this index can proxy the intensity of capital controls by capturing the number of control actions over time. The second is the capital account openness index of Chinn and Ito (2008), widely used in the literature on capital controls. This index is normalized on a scale of 0–1, where a fully restricted capital account takes the value 0 and 1 for an entirely open.

Second, we also employed two macroprudential policy indexes, MaPP1 and MaPP2, borrowed from Chari et al. (2022). These indexes are particularly useful for dealing with reverse causality and endogeneity problems that can happen if policymakers adjust the macroprudential regulation to respond effectively to macroeconomic and financial instability (Eckert & Hohberger, 2023).

2.2.2. Monetary policy shifts

The hypothesis underpinning the analysis is that U.S. monetary policy has a spillover effect on the domestic monetary policy of EMEs, which react immediately to global financial shocks (Bussière et al., 2021; Bhattarai et al., 2021). Our identification strategy posits that

[3] The FSB-IMF-BIS (2011) have defined various tools used in advanced and EMEs to mitigate adverse effects of domestic credit development (for instance dynamic provisions, time-varying capital requirements, ceilings on credit or credit growth,…).

CFM policy reacts to international monetary policy shifts from the U.S.A. The measure of these shocks by the only quarterly changes in the Fed rates may be inappropriate because the post-crisis period has shown new tools of monetary policy qualified as unconventional. Our study follows Davis and Presno (2017) who determine the impact of "non-interest rate" monetary policy instruments through the difference between the actual rate and the Taylor rule rate[4]. Recently, a quantitative easing policy and unconventional monetary policy instruments (forward guidance, target range...) have been combined. These unconventional monetary policy programs (non-rate tools) target longer-term interest rates. In the empirical analysis, we expect that unconventional monetary policy will have a similar impact of rate policy on domestic lending growth. Empirically, we define our second proxy of domestic monetary policy by the variable "non_rate" computed through the difference between the actual policy rate and the Taylor rule rate.

2.2.3. Other country fundamentals

The empirical literature has focused on detecting credit boom periods and determining factors leading to this phenomenon in EMEs (Hume & Sentance, 2009; Arena et al., 2015). The main findings of this literature show that rapid credit expansion arises from macroeconomic weakness and potentially leads to global financial instability. Our study merges CFM tools and monetary policy data with macroeconomic factors (Zehri, 2023). We use a set of macroeconomic factors that are considered the most influenceable drivers of lending growth, the inflation rate "INF" calculated as the quarterly consumer price changes; the real gross domestic product growth rate "GDP" calculated as the quarterly change in real GDP; the current account balance "CA" measured in percentage of GDP; the real effective exchange rate "REER"; lastly, the employment growth rate "EMP".

3. Methodology and results

Our methodology has four stages through which we examine the impact of CFM and monetary policy on lending growth (Eq. (1) and Table 5), the impact of the interaction between CFM and monetary policies (Eq. (2) and Table 6), the implication of exchange rate regime choice in the effectiveness of CFM and monetary policies (Table 7), and finally a comparison of our results in normal and crisis (high volatility) periods (Eq. (3) and Table 8).

3.1. Baseline model

In the first-stage estimation, we regress the growth in lending rates on the previous quarter of CFM policy, monetary policy, and other economic fundamentals (drivers of credit growth). Building on the specifications of Alam et al. (2019), we use a fixed effects panel model with quarterly lending growth as the left-hand side variable. The baseline model is defined as follows:

[4] Hofmann and Bogdanova (2012) calculated the Taylor rule rate and assess that tight monetary policy is defined by a positive values on the difference between Taylor rule rate and the actual rate. Oppositely, the loose of monetary policy is proxied by negative values.

$$\Delta CG_{i,t} = \alpha_0 + \alpha_1 \Delta CG_{i,t-1} + \alpha_2 CFM_{i,t-1} + \alpha_3 MON_{i,t-1} + \alpha_4 X_{i,t-1} + \alpha_5 I_{i,t-1} + \varphi_i + \varepsilon_{i,t}, \quad (1)$$

where CG is the lending growth for country i in quarter t, the parameter Δ refers to the variation of CG between quarter *t* and *t*–1. The lagged dependent variable ($\Delta CG_{i,t-1}$) is added as an independent variable to consider the persistence.

CFM is a proxy for the CFM policy in country i in year t. As described above, two tools are used for CFM. First, capital controls are proxied by Pasricha et al. (2018) (CC_1) and the Chinn and Ito (2008) (CC_2) indexes. Second, the macroprudential policy stance is proxied by $MaPP_1$ et $MaPP_2$ (Chari et al., 2022).

$$\mathrm{CFM}_{i,t-1} \equiv \left[CC1_{i,t-1}; CC2_{i,t-1}; MaPP1_{i,t-1}; MaPP2_{i,t-1} \right].$$

$MON_{i,t}$ is a proxy for the domestic monetary policy. We consider two variables capturing the domestic monetary policy, through interest rate and non-interest rate tools, as follows: (i) variable "rate": which measures the domestic policy rate; and (ii) variable "non_rate": measured by the Taylor Gap as explained in the previous section. As a monetary policy tightening is generally found to reduce aggregate demand and increase the cost of borrowing, we expect negative coefficients of "rate" and "non_rate".

$$MON_{i,t-1} \equiv \left[rate_{i,t-1}; non\_rate_{i,t-1} \right],$$

To consider monetary policy variables as regressors may be insufficient to address all impacts of the monetary policy instruments because some EMEs are usually focused on the stability of prices and then targeting inflation. The only use of the interest rate variable to assess the inflation objective may not be sufficient (Nakatani, 2020). For this purpose, we added a dummy variable (noted I) for economies targeting inflation. This variable distills monetary policy from other goals and allows for more focus on lending growth objectives.

$X_{i,t-1}$ is a vector of country-level variables that may affect domestic lending growth, mainly capturing the demand side for lending. The vector X includes five macro-control variables (above described) in conjunction with CFM indexes and monetary policy that can impact lending growth.

$$X_{i,t-1} \equiv \left[INF_{i,t-1}; GDP_{i,t-1}; CA_{i,t-1}; REER_{i,t-1}; EMP_{i,t-1} \right].$$

We include country fixed effects (φ_i) in our panel regressions, as several countries in our sample (notably Argentina, Singapore and Chile) have applied CFM policy tools during the analysis period and there is a time-varying effect of CFM and monetary policies.

Our starting point is a standard from-specific-to-general approach through which we regress Eq. (1), using only the capital flow management variables; in a second step, we add the monetary policy variables and finally provide the global model results, including additional controls. The results of these estimations are reported in Table 5 using the Generalized Method of Moments (GMM) difference estimator.

We perform multiple diagnostic tests to check the robustness of our empirical findings. These tests are reported in Table 5. The findings show the normal distribution of residuals (skewness/kurtosis tests). The omitted variables bias is another concern emanating from missing important explicative variables from regressors. The REST test suggests no evidence of functional form misspecification and no relevant variables omitted. Wald test statistics

Table 5. CFM policy, monetary policy, and lending growth – Baseline results

	(1)	(2)	(3)
CG_1	0.215** (0.105)	0.247* (0.172)	0.327*** (0.064)
CC1	–0.324** (0.160)	–0.415** (0.206)	–0.215* (0.109)
CC2	–0.207* (0.105)	–0.108* (0.055)	–0.209** (0.103)
MaPP1	–0.411** (0.201)	–0.312** (0.156)	–0.411* (0.209)
MaPP2	–0.452** (0.226)	–0.310* (0.158)	–0.511 (0.903)
rate		–0.429** (0.213)	–0.322** (0.160)
non-rate		–0.319* (0.162)	–0.315** (0.157)
GDP			0.007** (0.001)
INF			0.024* (0.008)
CA			–0.014* (0.003)
EMP			0.019* (0.009)
REER			–0.007 (0.015)
I			–0.014* (0.008)
skewness/kurtosis (Prob > chi2)	4.09 (0.2125)	3.57 (0.2047)	6.84 (0.1942)
Wald/LL (Pvalue)	–153.24 (0.000)	–121.27 (0.000)	–91.85 (0.000)
Hansen test	0.64 (0.000)	0.52 (0.000)	
AR(1)	(0.000)	(0.000)	
AR(2)	(0.720)	(0.651)	
REST (Prob > F)	0.2143	0.1564	0.2013
# of Economies	21	21	21
#Obs	1711	1652	1638

Note: Table 5 displays estimates for Equation (1), where the dependent variable ΔCG is the growth in lending rates for country *i* in quarter *t*. CC1 and CC2 are the proxies of capital controls; MaPP1 and MaPP2 are the proxies of the macroprudential policy; rate and non-rate are the proxies of the monetary policy. The rest of the variables compose the vector X of controls. We estimate all regressions using the difference GMM; Robust T-values are in parentheses. *, **, *** denote significance level at the 10%, 5%, and 1%, respectively. Sample size varies across regression specifications because not all variables are available for all countries or all quarters.

also prove the better fit of the model. This test is highly significant, showing that model variables conduct to statistically significant amelioration in the model's fit. The absence of autocorrelation of residuals is checked through the p-values for AR(1) and AR (2), and the statistical tests confirm the non-presence of AR (2). Globally, the diagnostic tests support a robust model specification.

The first stage regressions aim to find the effect of CFM measures, monetary policy, and control variables on credit growth. The results of Table 5 show that tighter CFM policy is correlated with a significant decrease in domestic credit, and major coefficients of capital controls (CC1 and CC2) and macroprudential policy (MaPP1 and MaPP2) are negative and statistically significant. We find that a one-standard increase in macroprudential policy lowers credit growth by about 12.4% and 38.2% for MaPP1 and MaPP2, respectively. However, capital controls have less impact; a one-standard increase in capital control indexes reduces credit growth by only 7.12% and 11.3% for CC1 and CC2, respectively[5]. Following these results, we conclude that macroprudential policy has a more powerful impact on credit growth than capital controls.

Besides, the "rate" and "non-rate" coefficients show that tight monetary policy negatively affects credit growth. These coefficients are negative and statistically significant, indicating that unexpected tightening of the monetary policy significantly decreased the credit growth rate. Our empirical results show that a one standard deviation increase in "rate" and "non-rate" variables lowers economic growth, respectively, by 13.2% and 17.4%. This result is expected since a rise in the Fed rate (tight monetary policy) makes borrowing less attractive as interest payments increase.

The inflation targeting proxy, included in the regression to isolate the inflation targeting purpose from the monetary policy, is negatively correlated to lending growth and supports the previous finding of the monetary policy. The inflation targeting policy has significant results in the fall of the inflation rate for some EMEs, leading to a rise in the real interest rate and consequently increasing the cost of lending. This process can explain the positive impact found of the inflation rate on domestic lending growth.

3.2. Interaction between CFM and monetary policies

In the second-stage regressions, we investigate whether the lending growth response to changes in CFM policy depends on monetary policy; interaction terms are included among the regressors. This interaction is defined by a combination of CFM and monetary policy proxies "$CFM_{i,t-1} \times MON_{i,t-1}$". The baseline model is augmented by the interaction term as follows:

$$\Delta CG_{i,t} = \alpha_0 + \alpha_1 \Delta CG_{i,t-1} + \alpha_2 CFM_{i,t-1} + \alpha_3 MON_{i,t-1} + \alpha_4 CFM_{i,t-1} \times MON_{i,t-1} + \alpha_5 X_{i,t-1} + \alpha_6 I_{i,t-1} + \varphi_i + \varepsilon_{i,t}. \quad (2)$$

All other variables are analogous to those in Eq. (1). The interaction term coefficients show whether the monetary policy's tightness influences the CFM policy's effect on emerging

[5] These percentages are calculated by multiplying the estimated coefficients and the standard-deviation of capital controls and macroprudential policies indexes.

markets' lending growth. This interaction term is the main of interest, and the coefficient of interest is α_4. If it is negative, statistically significant, and has a higher coefficient (compared to the standalone coefficients of CC and MaPP in Table 5) we can infer that utilizing CFM policy reduces lending growth in countries with tight monetary conditions. We can deduce a complementary between CMF and monetary policy actions.

The results of Table 6 show that the interaction between the CFM and monetary policy measures amplifies the effect of lowering lending growth. The interaction terms display negative statistically significant coefficients and are higher than the standalone coefficients of CC and MaPP in Table 5. Then, more tighten monetary policy (conventional and unconventional tools) in EMEs supports CFM actions in reducing lending growth.

Table 6. CFM and monetary policies complementarity

	(1)	(2)	(3)	(4)
CC1 × rate	−0.531*** (0.108)	−0.338* (0.172)	−0.427** (0.212)	−0.152 (0.787)
CC1 × non_rate	−0.332*** (0.110)	−0.341** (0.170)	−0.330* (0.168)	−0.329* (0.167)
CC2 × rate	−0.339** (0.165)	−0.222* (0.121)	−0.331* (0.168)	−0.353 (0.711)
CC2 × non_rate	−0.424* (0.215)	−0.311* (0.159)	−0.419 (0.834)	−0.323* (0.163)
MaPP1 × rate	−0.441* (0.225)	−0.149 (0.315)	−0.344** (0.171)	0.101 (0.453)
MaPP1 × non_rate	−0.446** (0.223)	−0.140 (0.003)	−0.533* (0.271)	−0.439* (0.223)
MaPP2 × rate	−0.539* (0.275)	−0.438* (0.222)	−0.542** (0.270)	−0.439* (0.224)
MaPP2 × non_rate	−0.543* (0.274)	−0.441* (0.222)	−0.432* (0.219)	−0.107 (0.341)
#Obs	1627			

Note: The Table reports estimates for equation (2), where the dependent variable ΔCG is the growth in lending rates for country i in quarter t. CC1 and CC2 are the proxies of capital controls; MaPP1 and MaPP2 are the proxies of the macroprudential policy; rate and non-rate are the proxies of the monetary policy. The rest of the variables compose the vector X of controls (their results are not reported in this Table). We estimate all regressions using four different estimators: Column (1) difference GMM; Column (2) system GMM, column (3) fixed effects MLE and column (4) random effects MLE. Robust T-values are in parentheses. *, **, *** denote significance level at the 10%, 5%, and 1%, respectively. Sample size varies across regression specifications because not all variables are available for all countries or all quarters.

This complementarity between CFM and monetary policies is also shown in the timing of activation of each policy. Usually, EMEs activate these policies following shifts and buoyant economic data in the U.S. Particularly, The U.S. monetary policy will push EMEs to react immediately to these international shifts (Bhattarai et al., 2021), and the stylized facts showed that EMEs tend to introduce CFM policy during periods of monetary tightening.

We compare the coefficients' significance of the interaction terms in Eq. (2). Table A summarizes this comparison and shows that the interactions of CC1 (capital control index of Pasricha et al. (2018)) with "rate" and "non-rate" monetary policy proxies are the most significant in lowering lending growth. CC2 (capital control index of Chinn and Ito (2008)) interaction with monetary policy measures is moderately significant (5% level for interaction with "rate" and 10% with "non-rate"). Considering the interaction of macroprudential indexes, Table 7 shows that the second index of Chari et al. (2022) (MaPP2) presents the lowest significant results for both interactions with monetary policy indexes; however, the first index MaPP1 displays a 5% level of significance when interacts to "non-rate".

Table 7. Interaction of CFM and monetary policies (source: author's estimates)

Tightening stance	Interaction terms			
	CC1*rate	CC2*rate	Ma¨PP1*rate	MaPP2*rate
Lending growth				
Tightening stance	Interaction terms			
	CC1*non-rate	CC2*non-rate	Ma¨PP1*non-rate	MaPP2*non-rate
Lending growth				

Note: Table 7 summarizes the results of the difference GMM of Table 6 (Column 1). It presents the dynamic panel regression analysis results with lending growth rate as a dependent variable. Quarterly data from 21 emerging market economies are used. Yellow, orange, and green display 1%, 5%, and 10% significance levels, respectively.

3.3. Exchange rate regime impact

The vulnerability of EMEs to the U.S. policy rates forces policymakers to use further policy tools in coordination with CFM and domestic monetary policies. The choice of an adequate exchange rate regime may support prior policies facing lending growth. In the third-stage regressions we aim to provide evidence that the effectiveness of CFM and monetary policies in EMEs to reduce lending growth also depends on the exchange rate regime. We do so by dividing the observations into two subgroups, according to that the considered economy has a peg or floating exchange rate. Then, we estimate the baseline model for two panels, countries with floating and fixed currency. This exercise can help us further explore the mechanisms and what drives our baseline results. For example, would floating/pegged exchange rate regime in a country with tighten/loosen monetary policy reduces their credit if CFM policy is activated in that country? We employ the Ilzetzki et al. (2019) de facto exchange rate regime classification. The results of Table 8 show that the interaction of CFM with monetary policy effectively controls domestic lending growth for peg and floating exchange rate regimes. This finding confirms those of Davis and Presno (2017) who show that capital controls will effectively raise the monetary policy autonomy, which is not surprising since the free flow of capital cannot exist with both a fixed exchange rate and monetary policy autonomy according to the well-known "Impossible Trinity" (Aizenman et al., 2013). The results of Davis and Presno (2017) are confirmed for economies with fixed exchange rate regimes where the rise in autonomy is obtained mechanically through the dilemma purpose and economies with flexible exchange rates.

Table 8. CFM and monetary policies complementarity – Exchange rate regimes

	Flexible Exchange Rate Regime		Fixed Exchange Rate Regime	
	(1)	(2)	(3)	(4)
CC1 × rate	–0.331** (0.165)	–0.329* (0.168)	–0.337** (0.165)	–0.227* (0.115)
CC1 × non_rate	–0.337*** (0.107)	–0.235* (0.120)	–0.426** (0.213)	–0.413* (0.211)
CC2 × rate	–0.339* (0.173)	–0.127 (0.213)	–0.321* (0.163)	0.043 (0.211)
CC2 × non_rate	–0.328** (0.164)	–0.321** (0.160)	–0.319** (0.158)	0.183 (0.119)
MaPP1 × rate	–0.331 (0.209)	–0.425** (0.212)	–0.518** (0.255)	–0.431 (0.103)
MaPP1 × non_rate	–0.526** (0.261)	–0.429** (0.212)	–0.317** (0.155)	–0.419* (0.213)
MaPP2 × rate	–0.429** (0.214)	–0.418** (0.209)	–0.321** (0.160)	–0.519* (0.260)
MaPP2 × non_rate	–0.323** (0.160)	–0.421*** (0.210)	–0.424** (0.212)	–0.517* (0.260)
#Obs	1627	1694	1397	1648

Note: The Table reports estimates for Eq. (3), where the dependent variable ΔCG is the growth in lending rates for country *i* in quarter *t*. CC1 and CC2 are the proxies of capital controls; MaPP1 and MaPP2 are the proxies of the macroprudential policy; rate and non-rate are the proxies of the monetary policy. The rest of the variables compose the vector X of controls (their results are not reported in this Table). We estimate all regressions using two different estimators: Column (1) and (3) using difference GMM; Column (2) and (4) using fixed effects MLE. Robust T-values are in parentheses. *, **, *** denote significance level at the 10%, 5%, and 1%, respectively. Sample size varies across regression specifications because not all variables are available for all countries or all quarters.

3.4. Crisis and high volatility periods

This section examines whether the complementarity CFM/monetary policies stand in crisis periods. We introduce the dummy variable of Laeven and Valencia (2020), in the baseline model, to proxy crisis periods (CRISIS). The new regressions are specified as follows:

$$\begin{aligned}\Delta CG_{i,t} &= \alpha_0 + \alpha_1 \Delta CG_{i,t-1} + \alpha_2 CFM_{i,t-1} + \alpha_3 MON_{i,t-1} + \\ &\alpha_4 CFM_{i,t-1} \times CRISIS_{i,t} + \alpha_4 MON_{i,t-1} \times CRISIS_{i,t} + \\ &\alpha_4 CFM_{i,t-1} \times MON_{i,t-1} \times CRISIS_{i,t} + \alpha_5 X_{i,t-1} + \alpha_6 I_{i,t} + \varphi_i + \varepsilon_{i,t}.\end{aligned} \tag{3}$$

The main results of Table 9 show that, in crisis periods, interaction term coefficients are weaker and statistically significant for the macroprudential proxies and are statistically insignificant for capital control ones. The effectiveness between CFM and monetary policies, previously found, becomes less in periods of crisis and highlights the collapse of complementarity between CFM and monetary policies. Macroprudential authorities and central banks in several EMEs tried to manage the damage of the 2008 crisis through tighter macroprudential regulation and an adequate monetary policy, however, with disparate success in curbing lending growth. The interplay of these policies during the crisis has created a boom effect

Table 9. CFM and monetary policies complementarity – crisis periods

	(1)	(2)	(3)	(4)
CC1 × rate × CRISIS	–0.321 (0.310)	–0.115 (0.209)	–0.117 (0.078)	–0.219 (0.815)
CC1 × non_rate × CRISIS	–0.207* (0.110)	–0.215 (0.456)	0.316 (0.804)	0.113 (0.516)
CC2 × rate × CRISIS	–0.219* (0.112)	–0.207 (0.213)	–0.211 (0.342)	–0.113 (0.411)
CC2 × non_rate × CRISIS	–0.459 (0.852)	–0.240 (0.309)	–0.137 (0.588)	–0.327 (0.745)
MaPP1 × rate × CRISIS	–0.204* (0.108)	–0.110* (0.109)	–0.214* (0.112)	–0.206* (0.109)
MaPP1 × non_rate × CRISIS	–0.106* (0.003)	–0.001 (0.313)	–0.002 (0.003)	–0.003** (0.001)
MaPP2 × rate × CRISIS	–0.109* (0.059)	–0.112* (0.060)	–0.116 (0.304)	–0.113* (0.057)
MaPP2 × non_rate × CRISIS	–0.005** (0.002)	–0.054 (0.572)	–0.002* (0.001)	–0.003 (0.971)
#Obs	1627	1694	1397	1648

Note: The Table reports estimates for Eq. (2), where the dependent variable ΔCG is the growth in lending rates for country *i* in quarter *t*. We estimate Eq. (2) using CRISIS dummy variable; CC1 and CC2 are the proxies of capital controls; MaPP1 and MaPP2 are the proxies of the macroprudential policy; rate and non-rate are the proxies of the monetary policy. The rest of the variables compose the vector X of controls (their results are not reported in this Table). We estimate all regressions using four different estimators: Column (1) difference GMM; Column (2) system GMM, column (3) fixed effects MLE and column (4) random effects MLE. Robust T-values are in parentheses. *, **, *** denote significance level at the 10%, 5%, and 1%, respectively. Sample size varies across regression specifications because not all variables are available for all countries or all quarters.

on credit, in some EMEs such as Turkey, Brazil, Mexico, and Thailand. This finding is different from Kim et al. (2019) who suggest that policy discords when there are vulnerabilities in the macroeconomic sphere with strong lending growth may be fixed with monetary and CFM policy instruments. However, the facts show that the period following the 2008 global crisis was marked by policymakers' reservations about using monetary policy tools far from primordial objectives, stabilizing prices and output. Instead, there is a preference for using monetary policy as a last resort to face lending growth and keeping CFM policy as the first line of defense (Akinci & Olmstead-Rumsey, 2018).

We perform different robustness checks on the empirical literature results. First, we examine if our findings for the effect of CFM and monetary policies on lending growth change when we consider the credit gap as a dependent variable. Next, we distill the monetary policy shifts to build another monetary policy measure. Third, we use the Fernández et al. (2016) index as an alternative proxy for capital controls. Fourth, we re-classify exchange rate regimes based on the IMF's AREAER classification. Finally, we use a proxy of high global volatility, the VIX, instead of the Laeven and Valencia (2020) dummy variable crisis. Our results of CFM interaction with monetary policy to curb domestic lending growth are also robust to these alternative settings[6].

[6] We do not report the robustness analysis results for the sake of space. They are available from the authors upon request.

Conclusions

The starting point of this study is that CFM and monetary policies in EMEs can be coordinated to target the reduction of lending growth. This paper examines whether the interaction of both policies provides a more powerful impact on lending. Globally, we find that cooperative policies' effectiveness is improved relative to an economy in which each policy acts independently of the other. The effectiveness of these policies becomes less in periods of crisis and highlights the collapse of their coordination in reducing lending growth. This study finds that the results obtained stand indifferently for countries with fixed and flexible exchange rate regimes.

This policy coordination reinforces the leading function of central banks to design policy frameworks, particularly to face credit supply shocks. Central banks have high incitement to ensure that CFM and monetary policies are pursued coordinately. However, precautions are required to safeguard that each policy focuses on its primary objective (financial stability for CFM policy and price or output stability for monetary policy). Given these dual aims and the feedback that each exerts on the other, however, this means that the coordinated policy will work towards a second-best solution for all matters since each will be somewhat constrained in pursuing a perfectly optimal policy by ignoring their mutual interdependency.

The study holds up even after conducting a series of robustness checks and contributes to the literature by examining policies over a longer time frame and with a more encompassing set of variables. However, we consider that this is just a step in the development of this literature since we have focused exclusively on emerging economies and have not considered the impact these policies might have on more advanced economies. With the advent of greater trade restrictions for political reasons, these capital flow management tools, once considered verboten, may become available to advanced economies, which suffer more greatly from being unable to overcome the Impossibility Trinity since their currencies almost always float and they have capital markets that are more integrated into the world economy while attempting to pursue independent monetary policies. This is, perhaps, one reason why such countries have experienced asset price bubbles that have almost inevitably caused serious economic damage to themselves and the world economy.

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Data availability

Data available on request due to privacy/ethical restrictions.

Competing interests

The authors declare that they have no competing interests.

Disclosure statement

No potential conflict of interest was reported by the authors.

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