TÜRKİYE CUMHURİYET MERKEZ BANKASI

WORKING PAPER NO: 17/12

Are Macroprudential Policies Effective Tools to Reduce Credit Growth in Emerging Markets?

May 2017

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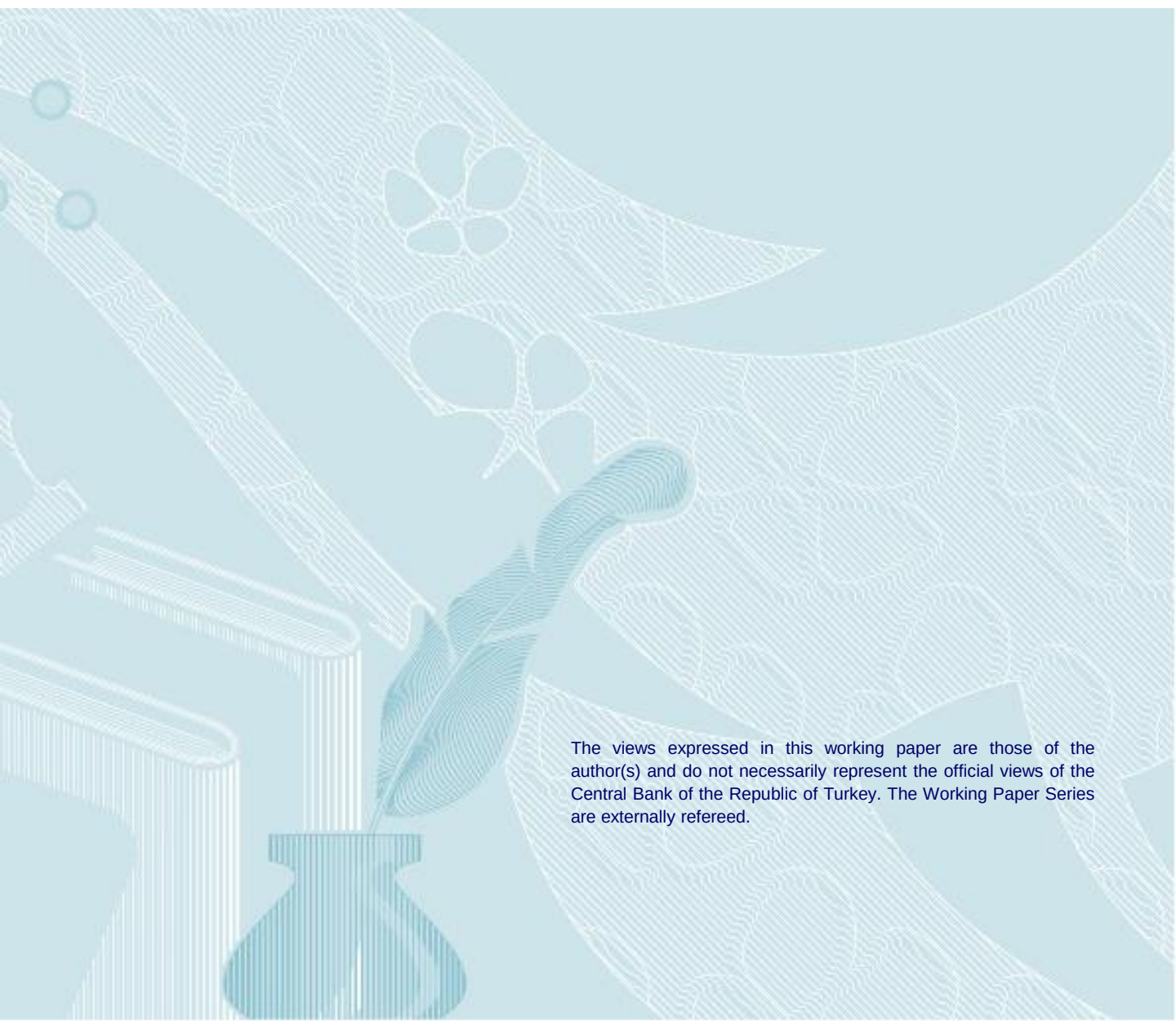

Are Macroprudential Policies Effective Tools to Reduce Credit Growth in Emerging Markets?

F. Pınar Erdem Etkin Özen İbrahim Ünalmış

Abstract

Macroprudential policies (MPPs) have become a part of the policy toolkit, especially in the aftermath of the 2008 global financial crisis both in advanced and emerging market economies. Hence, there is a growing body of literature investigating effectiveness of such policies. In this paper, using a data set of 30 countries and panel VAR approach, we contribute to this literature by testing whether MPPs are effective in controlling domestic credit growth in emerging markets and developing countries in the wake of a positive global liquidity shock. Results indicate that MPPs are effective to limit domestic credit growth especially during the expansion phase of the credit cycle. Second, the number of MPP tools matter to better manage the domestic credit growth, since insufficient number of measures are unable to prevent leakages and reduce the effectiveness of MPPs under a global liquidity shock.

Keywords: Macroprudential Policies, Credit Growth, Global Liquidity, Credit Cycle, Panel VAR.

JEL Classification: E43, E58, G18, G28

The views expressed in this study are those of the authors and does not necessarily represent the views of the Central Bank of the Republic of Turkey. We would like to thank anonymous referee of the CBRT Working Paper series.
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Non-Technical Summary

After the 2008 global financial crisis, macroprudential policies (MPPs) have become a important part of the policy tool kit to maintain financial stability. Quantitative easing policies of advanced country central banks increased the level of global liquidity and helped to ease external financial conditions for emerging markets and developing countries. Large capital inflows have created internal and external imbalances in those countries through lower interest rates and appreciation of domestic currency. One of the responses of these countries to limit these imbalances is to employ various kinds of MPP tools. According to Cerutti et.al. (2015) average number of MPPs implemented in emerging market and developing economies was less than 2.5 in 2007, yet reached 3.5 in 2014.

Following the rising popularity of MPPs, a growing body of literature has emerged to understand the effectiveness of such policies on credit growth. There is a consensus in the literature that to assess the effectiveness of MPPs on credit growth accurately, variety of MPPs and the phase of the credit cycle should be taken into account. However, studies evaluating the effectiveness of MPPs while controlling the phase of the credit cycle are limited. In this paper, we assess the effectiveness of MPPs on domestic credit growth in case of a positive global liquidity shock while controlling for the state of the credit cycle.

Our findings indicate that MPPs are effective tools to control domestic credit growth when the credit cycle is in expansion period. In addition, the number of MPPs implemented are controlled and it is concluded that higher number of MPPs is associated with not only lower credit growth but also shorter duration of credit growth after global liquidity shock. One of the possible consequences of MPPs is the substitution of activities, subject to new MPP measures, to areas not subject to MPP measures and this substitution is called leakage in the literature. Our results support the view that poor design of MPPs policies could lead to leakages in the financial system. Hence, MPPs should be designed in a way that players of the financial system and borrowers could not be able to bypass the rules and regulations.

1. Introduction

Macroprudential policies (MPPs) have long been used as a policy instrument to mitigate the adverse effects of domestic and global shocks[1]. The main motivation of policy makers has been to create a safety net for financial intermediaries to increase their resilience during down turns and restrict the buildup of vulnerabilities in balance sheets of agents in order to prevent large losses during asset price corrections.

After the 2008 global financial crisis (GFC), quantitative easing policies of advanced country central banks helped to ease external financial conditions for emerging markets and developing countries. Large capital inflows have created internal and external imbalances in those countries through lower interest rates and appreciation of domestic currency. One of the responses of these countries to limit these imbalances is to employ various kinds of MPP tools. Evidently, average number of MPPs implemented in emerging market and developing economies was less than 2.5 in 2007, but reached 3.5 in 2014[2].

Following the rising popularity of MPPs, a growing body of literature has emerged investigating the cost and benefits of such policies. Bruno et. al (2015) analyses the effectiveness of MPPs for capital flow management for 12 Asia-Pacific countries. They find that MPP tools can be used successfully to reduce cross-border banking sector and bond market flows. In addition, they show that effects of such policies are more powerful when they complement monetary policy in the same direction. For 13 Asian and 33 other economies Zhang and Zoli (2014) find that MPP measures help to curb housing price growth, equity flows, aggregate credit growth and bank leverage. Kuttner and Shim (2013) show that tightening debt to income ratio limits reduces housing credit by around 4 to 7 percent, while tightening loan to value ratio limits reduces housing credit by around 1 percent. Crowe et. al (2011) find that loan to value ratio limits prevent the buildup of financial imbalances. Classens et. al (2013) use bank level data from 2800 banks across 48 countries to analyze if MPPs can help to reduce buildup of banking sector vulnerabilities. They find that several MPP measures reduce growth in bank leverage, assets and non-core/core liabilities ratio during boom times and that their effectiveness strengthens with

[1] For a detailed history of the term macroprudential, see Clement (2010).
[2] See Cerutti et al. (2015)

the cycle. Using a data set covering 119 countries Cerutti et al (2015) show that MPP are correlated with lower credit growth especially in emerging market economies.

One of the possible consequences of MPPs is the substitution of activities, subject to new MPP measures, to areas not subject to MPP measures and this substitution is called leakage in the literature. In fact, Goodhart (2008) and Aiyar et al. (2014) mention that MPPs may lead to shifting activities to foreign entities and shifting risks to non-bank entities (shadow banking). Cizel et al. (2016) find that effect of MPPs on banking is substantially higher than the total credit growth, indicating substitution from bank-based financial intermediation to nonbank intermediation. Reinhardt and Sowerbutts (2015) state that effectiveness of MPP tools depends on the availability of regulatory arbitrage and they show that MPP measures on domestic banks' capital increases foreign borrowings. In a similar way Cerutti et al. (2015) show that cross-border activities of domestic banks increase after MPP measures taken.

In this paper, using panel VAR approach, we investigate effectiveness of MPPs to control domestic credit growth in case of a positive global liquidity shock. Having considered leakage literature, we test whether the number of MPPs in effect matters for controlling credit growth. Therefore, the novelty of this paper is to split the sample according to the number of MPPs in effect at a given time to test whether effectiveness of MPPs could depend on the variety of policies implemented. In addition, we take into account the state of the credit cycle to test how a global liquidity shock affects domestic credit growth and how the effectiveness of MPPs vary by the phase of credit cycle. As Cerutti et. al. (2015) mention, countries adopt MPPs precisely when credit cycle in expansion period and as a result effectiveness of these policies increase. While the credit cycle is dipping, assessing the effectiveness of MPPs would give misleading results.

Our results show that when the state of the credit cycle is taken into account, MPPs are effective tools to curb or control domestic credit growth as expected. In addition, the number of MPPs implemented does matter. Impulse-response results show that countries employing higher number of MPPs are more successful in controlling domestic credit growth. Specifically, higher number of MPPs is associated with not only lower credit growth but also shorter duration of credit growth after global liquidity shock. The rest of the paper is organized as follows. Section 2 presents the data and the methodology. Section 3 summarizes the results. Last section concludes.

2. Data and Methodology

2.1. Data

We analyze the impact of global liquidity on credit growth and the role of MPPs in limiting this impact using a sample which covers yearly data for 30 countries from 2000 to 2013. We do not include advanced countries as global liquidity stems mostly from them and the identifying assumption on the exogeneity of external shocks, in this case the global liquidity, may not hold for large countries. As we only analyze for the period from 2000 to 2013, we try to include every country where MPPs in effect as much as possible in order to keep our sample size relatively large.

i. Global Liquidity

We prefer to use cross border bank flows as global liquidity indicator based on the definition of Bank of International Settlements (BIS). BIS defined the global liquidity as the ease of funding in global financial markets (CGFS, 2011). Similar to BIS, Bruno and Shin (2012) and Domanski et al. (2011) define global liquidity as availability of ample and low-cost funding . Recently, Cerutti et al. (2015) defined global liquidity as a set of global factors associated with world-wide financial conditions. Therefore to capture both world-wide and domestic financial conditions, total claims and cross border international claims of both banks and non-banks are obtained for the relevant country.

ii. Macroprudential Policies

We use the database of IMF's Global Macroprudential Policy Instruments (GMPI) constructed by the IMF (2014) and Cerutti et al. (2015). The database is very detailed and covers several instruments: General Countercyclical Capital Buffer/Requirement (CTC); Leverage Ratio for banks (LEV); Time-Varying/Dynamic Loan-Loss Provisioning (DP); Loan-to-Value Ratio (LTV); Debt-to-Income Ratio (DTI); Limits on Domestic Currency Loans (CG); Limits on Foreign Currency Loans (FC); Reserve Requirement Ratios (RR); and Levy/Tax on Financial Institutions (TAX); Capital Surcharges on SIFIs (SIFI); Limits on Interbank Exposures (INTER); and Concentration Limits (CONC). Those measures and subset measures such as LTV_CAP have been aggregated along the following two categories: those aimed at borrowers' leverage and financial positions (LTV_CAP and DTI ratios); and those aimed at financial institutions' assets or liabilities (DP, CTC, LEV, SIFI, INTER, CONC, FC, RR_REV, CG, and TAX). To consider the possible complementarity of, or substitution between, using the two borrower-oriented measures authors also created a borrower union index, which is 1 if LTV_CAP or DTI is used and 0 otherwise, and a

borrower intersection index which is 1 if LTV_CAP and DTI is used and 0 otherwise. Then, an overall macroprudential index (MPI), which is just the simple sum of the scores on all 12 policies has been created. Instruments are each coded for the period they were actually in place, i.e., from the date that they were introduced until the day that they were discontinued. MPI works as a simple binary measure of whether or not the instruments were in place.

iii. Credit Growth

In this paper credit growth is defined as yearly percentage change in the domestic credit to private sector. Because our data set includes large number of emerging market and developing countries, we use The World Bank's World Development Indicators (WDI) database. Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.

iv. National accounts

Gross domestic product (GDP) series are taken from the IMF World Economic Outlook (WEO) database. Graph of credit growth, growth of international claims and total claims for each country are given in Figure 1 in the appendix.

2.2 Methodology

In this study, we first estimate the following equation by using panel fixed effects estimation:

$$\Delta Cr_{it} = \rho \Delta Cr_{it-1} + \delta \Delta GDP_{it} + \beta_1 \Delta GL_{it} + \beta_2 MPP_{it-1} + \beta_3 CC_{it} + \beta_4 CC_{it} * MPP_{it-1} + \gamma_i + \varepsilon_{it} \quad (1)$$

$$i \in \{1,2,\dots,30\} \ and \ t \in \{2000,\dots,2013\}$$

where, ΔCr_{it} is annual credit growth in country i at time t, ΔGDP_{it} is annual growth of gross domestic product, ΔGL_{it} is annual growth rate of global liquidity, MPP_{it} is the number of macroprudential policy tools implemented by country i at time t, CC_{it} is the state of the credit cycle (1 if the credit cycle is in expansion period and 0 if the credit cycle is in

contraction period[3]) and γ_i stands for constant term. Harding and Pagan's (2002) yearly algoritm is used to compute the peak and trough points of credit level for each country. A local peak (through) in Cr_{it} occurs at time t if $Cr_{it} < (>) Cr_{it+k}$ where k is the minimum duration of a phase. Expansion period is defined as the period between through and peak points. We also include $CC_{it} * MPP_{it-1}$ term to investigate the interaction between credit cycle and effectiveness of macroprudential policies.

In the next stage, we focus on the time series behavior of the domestic credit growth against a global liquidity shocks using a four variable panel vector autoregression (PVAR) model following Love and Zichinno (2006) and Abrigo and Love (2015). Our aim is to analyze not only the effectiveness of MPP tools to mitigate the effects of global liquidity shocks on domestic credit growth but also analyze how the effectiveness of MPP tools changes by the phase of credit cycle. The following first-order PVAR form is estimated:

$$Z_{it} = \Gamma_0 + \Gamma_1 Z_{it-1} + f_i + e_{it} \quad (2)$$

where, Zit is the four variable vector of { ΔGL_{it} $\Delta Credit_{it}$ MPP_{it} ΔGDP_{it} }. GL is the annual change of global liquidity indicator, Credit is the annual change of domestic credit, MPP is macroprudential policy index developed by Cerutti et.al. (2015). f_i is a vector of country specific effects and e_{it} is the vector of idiosyncratic errors.

Choleski decomposition of variance-covariance matrix of residuals is used in the estimation. In our specification it is assumed that global liquidity shocks have contemporaneous effect on credit growth, MPP and GDP growth while they affect global liquidity coming to the country by lag. This assumption is plausible since global liquidity is measured as a cross border bank flows to the country. Thus, global liquidity conditions are assumed to be exogenous and determined globally at a given time, but by lag cross border flows to the country are affected from domestic conditions. It is also assumed credit growth have effect on MPP tools and GDP growth contemporaneously while MPP and GDP growth respond to the credit growth by lag. Love and Zicchino (2006) states that in order

[3] Based on the methodology introduced by Bry and Boschan's (1971) and Harding and Pagan (2002) algorithm. It is used to compute the peak and through points of credit level for each country. CC takes the value of one at time t if credit cycle is in the expansion period.

to impose the restriction to have same underlying structure for each cross-sectional unit, fixed effects (f_i) are included in the panel VAR model. The country fixed effects are controlled to overcome the individual heterogeneity problem. However, as Nickell (1981) mentioned fixed effects estimator in autoregressive panel data models is inconsistent that fixed effects are correlated with regressors due to lags of dependent variables. Thus, following Love and Zichinno (2006) and Abrigo and Love (2015) GMM estimation is used. To remove the fixed effects Helmert procedure is employed. This kind of transformation allows us to preserve orthogonality between the transformed variables and lagged regressors so that we can use lagged regressors as instruments and estimate by GMM procedure.

One of the difficulties when analyzing the effects of MPP on certain variables is the possible endogeneity of the policies themselves. As stated by Bruno et. al (2015), implementation of MPP takes time due to initial discussions among the government, central bank and other public authorities. Hence, introduction of MPP could coincide with the late stages of the credit boom. Therefore, they argue that reported results should be taken with some caution as there would be coincidence but not a casual effect. GMM methodology allows us to to overcome the possible endogeneity problem mentioned in the literature as it includes lagged regressors as instruments[4].

3. Empirical Results

Estimation results of equation (1) is shown in Table 1. GDP growth is highly significant in explaining credit growth without depending on global liquidity measures. MPP tools reduce credit growth at 10 percent significance level when we measure global liquidity using cross border international claims of banks or cross border total claims of banks. State of the credit cycle is highly significant at all cases indicating that rate of credit growth is higher during the expansion phase of the credit cycle. Interaction between credit cycle and MPP implementations is statistically significant meaning that if MPP tools are put in place during expansion phase of the credit cycle their effect on reducing credit growth rates is higher.

[4] It is assumed that $E[e_{it}]=0$, $E[e_{it}'e_{it}]=\sum$ and $E[e_{it}'e_{is}]=0$ for $t>s$.

Fixed effects panel estimation provides evidence on the effectiveness of MPP tools on credit growth and how their impact become stronger during expansion period of credit cycle. Next, panel VAR model is estimated to examine the how the impact of shocks varies by time[5]. Responses of credit growth to a global liquidity shock, proxied by cross border international claims and cross border total claims, when the credit cycle is not controlled (CC_{it} =0) is shown in Figure 1. Domestic credit growth gives a positive and significant response to both global liquidity measures for about 5 years. However, MPP implementation has no significant dampening effect on domestic credit growth. When the credit cycle is controlled, as CC_{it} =1 if credit cycle is in expansion phase, domestic credit growth increases as a response to the global liquidity increase and implementation of MPPs immediately reduce credit growth significantly with a long lasting effect (Figure 2). This result shows that effectiveness of MPPs should be considered as state dependent.

Table 1.
Response of Credit Growth to a 1% Permanent Increase in Global Liquidity with no Credit Cycle

	(2) Int.Clm. Growth	(3) Tot.Clm. Growth
$\Delta Credit_{it-1}$	0.237***	0.238***
	[0.027]	[0.026]
ΔGDP_{it}	0.016***	0.016***
	[0.003]	[0.003]
MPP_{it-1}	-0.018*	-0.017*
	[0.009]	[0.009]
CC_{it}	0.209***	0.208***
	[0.030]	[0.029]
$CC_{it} * MPP_{it-1}$	-0.002	-0.002
	[0.010]	[0.009]
ΔG4M2		
ΔInt.Clm.	0.146***	
	[0.020]	
ΔTot.Clm.		0.161***
		[0.023]
Observations	409	409
R-squared	0.695	0.703
Number of id	30	30
Wald Tests:	$\beta_2+\beta_4=0$	$\beta_2+\beta_4=0$
p-value:	0.005***	0.007***

[5] Based on the MMSC Bayesian information criterion (MBIC) developed by Andrews and Lu (2001), first order panel VAR is preferred model.

In the next step, we split our data set in terms of the number of MPPs implemented in that period[6]. Our aim is to analyze whether the number of MPPs implemented have any influence on the rate of credit growth. Figure 3 shows that if the number of MPPs are less than 3 effect of global liquidity shock on credit growth lasts about 6 years. However, if the number of MPPs in implementation is higher than 2 effect of global liquidity shock lasts about 4 years. In other words, MPPs are effective to reduce the persistency in credit growth after a global liquidity shock[7].

Finally, we split MPPs in terms of supply or demand restriction measures. Specifically, we estimate VAR model for MMP's that are imposed on borrowers such as LTV_CAP and DTI rations and MPPs that are imposed on lenders such as DP, CTC, LEV, SIFI, INTER, CONC, FC, RR_REV, CG and TAX. Results are shown in Figure 4 and Figure 5. When we do not control for credit cycle, effect of MPPs on credit growth is insignificant. However, during the expansion period of the credit cycles MPPs that are imposed on financial sector are highly effective tools to reduce credit growth. On the other hand, number of observations for MPPs imposed on borrowers are rather limited and hence it is not possible to find reliable results.

4. Conclusion

The number of countries using MPPs has risen especially in the aftermath of the 2008 financial crisis. A new empirical literature has been flourishing on the effectiveness of such policies, yet there is still no consensus. This paper shed light on the effectiveness of such policy tools to curb or control domestic credit growth in case of a positive global liquidity shock in emerging market and developing countries. Panel data estimation results show that global liquidity shocks cause a significant increase in domestic credit growth in emerging and developing economies. Therefore, we argue that MPPs have a role to mitigate the adverse effects of global liquidity shocks. On the other hand, effectiveness of MPPs depends on the phase of the credit cycle – i.e. MPPs are more effective during credit expansion periods.

[6] Sufficient number of sample size is considered for the threshold of number of MPP tools
[7] Our findings do not change whether we use cross border international claims or cross border total claims.

We also analyze the time series behavior of credit growth in case of a global liquidity shock using a panel VAR model. Impulse-response analyses show that when credit cycle is controlled, MPPs are effective policy tools to curb domestic credit growth. In order to test whether the number of MPPs matter for controlling credit growth we split the data set according to the number of MPPs that are in effect at a given time. Estimation results show that the number of MPPs is matter for controlling credit growth. Our results support the view that poor design of MPP policies could lead to leakages in the financial system. Hence, MPP policies should be designed in a way that players of the financial system and borrowers could not be able to bypass the rules and regulations.

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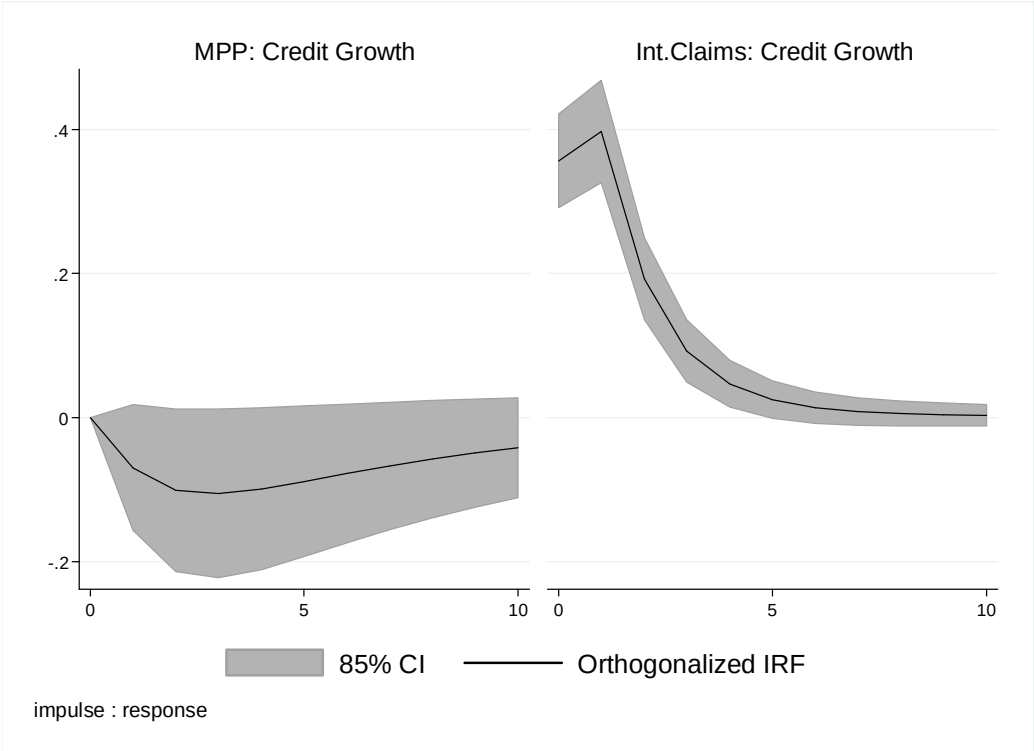
FIGURES:

Figure 1: Response of Credit Growth to a 1% Permanent Increase in Global Liquidity (with no control of Credit Cycle)

Global Liquidity Measure: International Claims:



Global Liquidity Measure: Total Claims

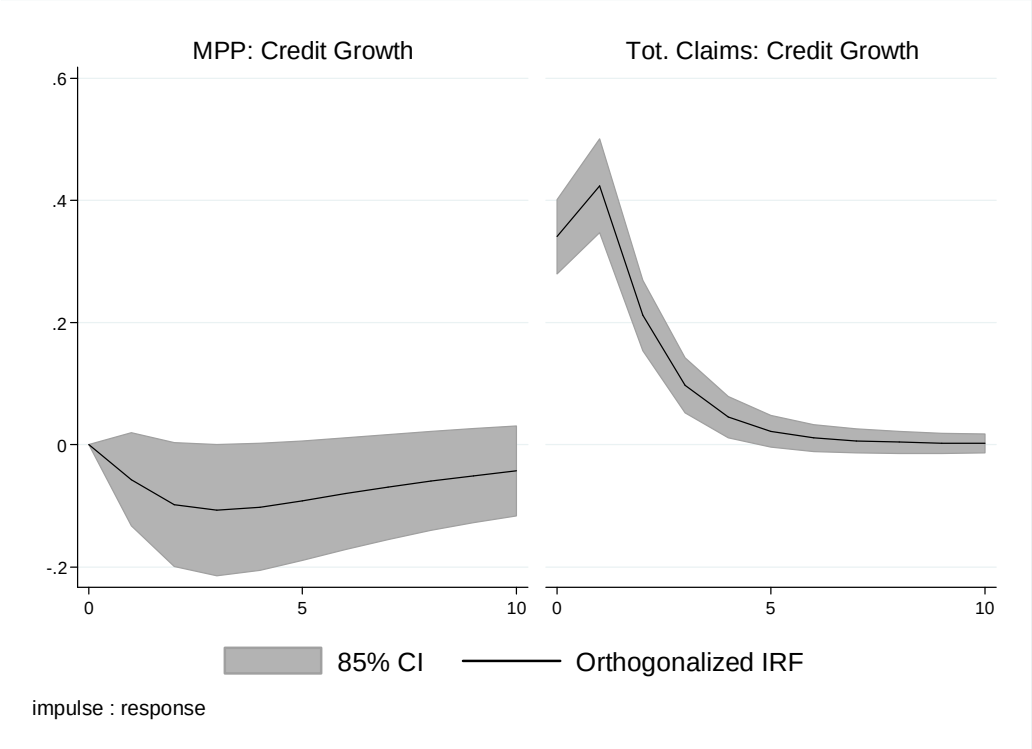
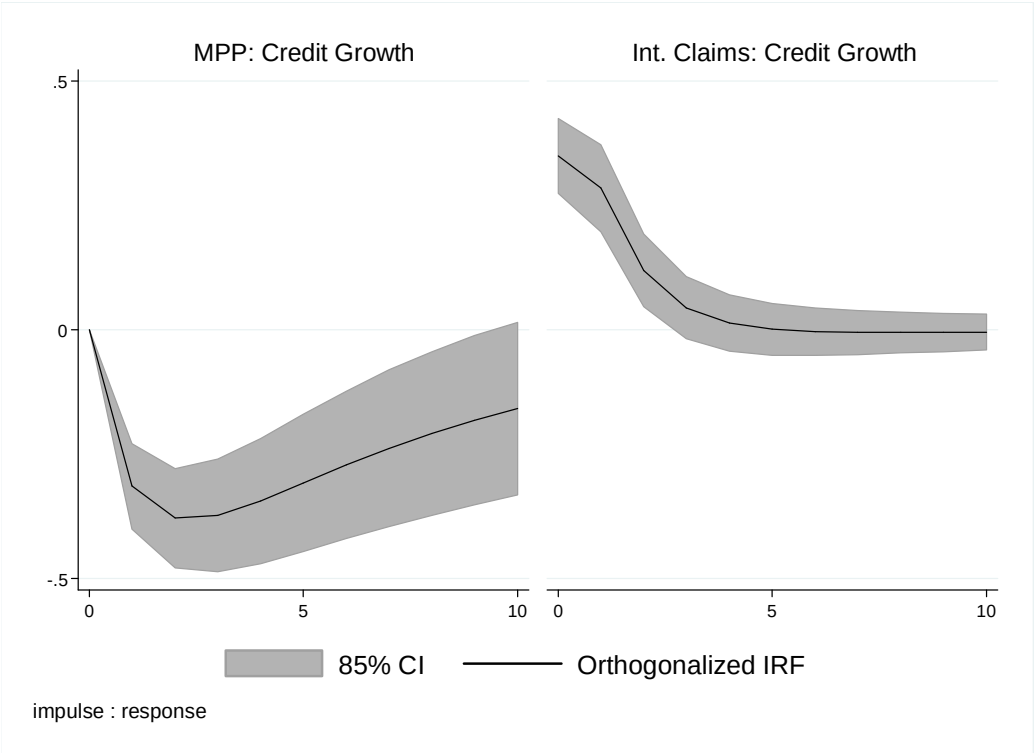


Figure 2: Response of Credit Growth to a 1% Permanent Increase in Global Liquidity (Credit Cycle is in Expansion Phase)

Global Liquidity Measure: International Claims:



Global Liquidity Measure: Total Claims

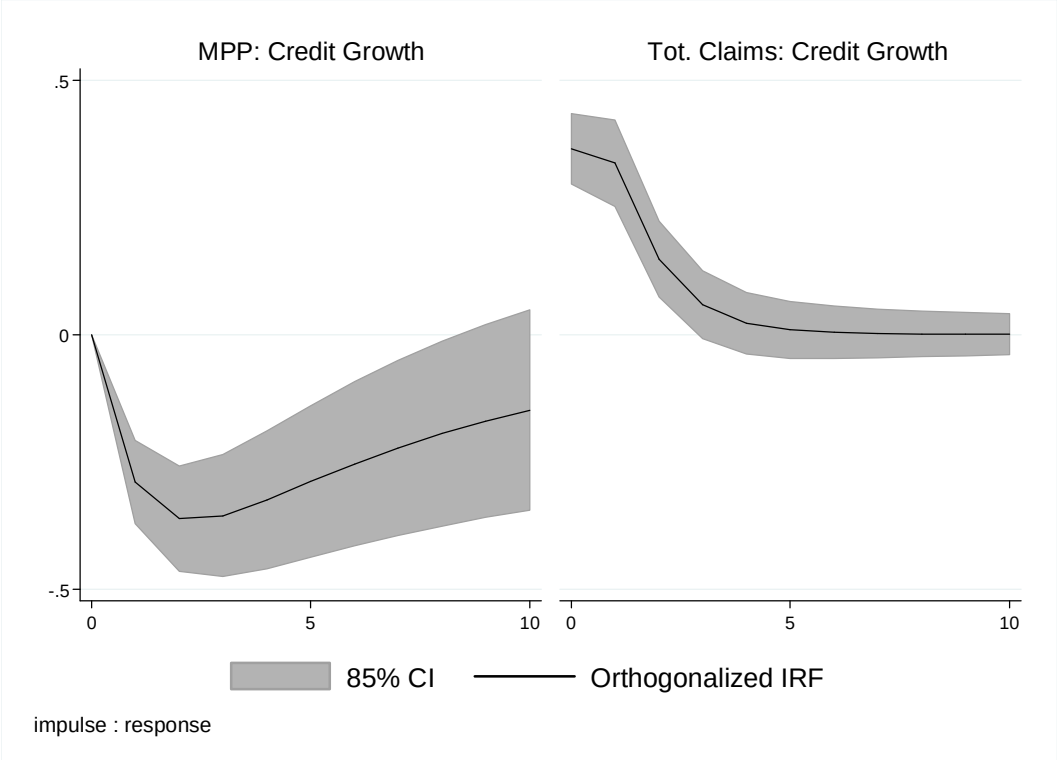


Figure 3: Response of Credit Growth to a 1% Permanent Increase in Global Liquidity when Number of MPPs are higher than 2 or else.

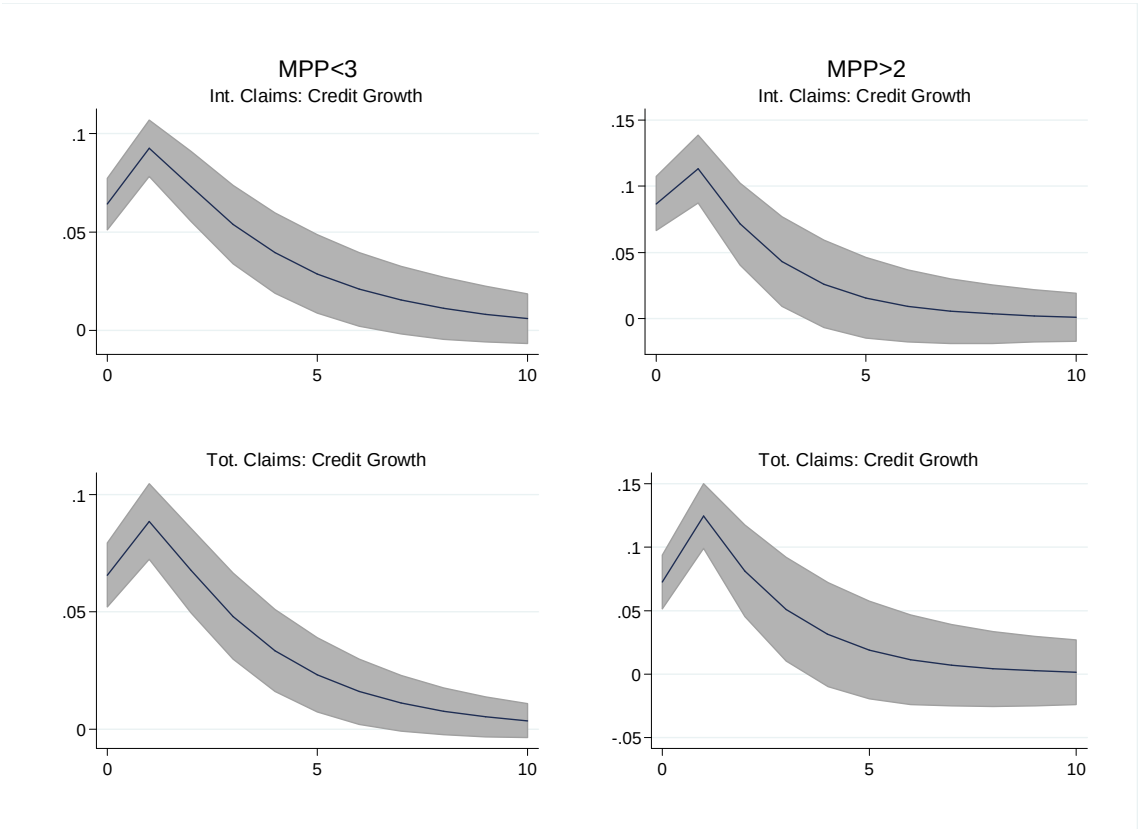


Figure 4: Response of Credit Growth to a 1% Permanent Increase in Global Liquidity by using Financial Based MPPs (with no control of Credit Cycle)

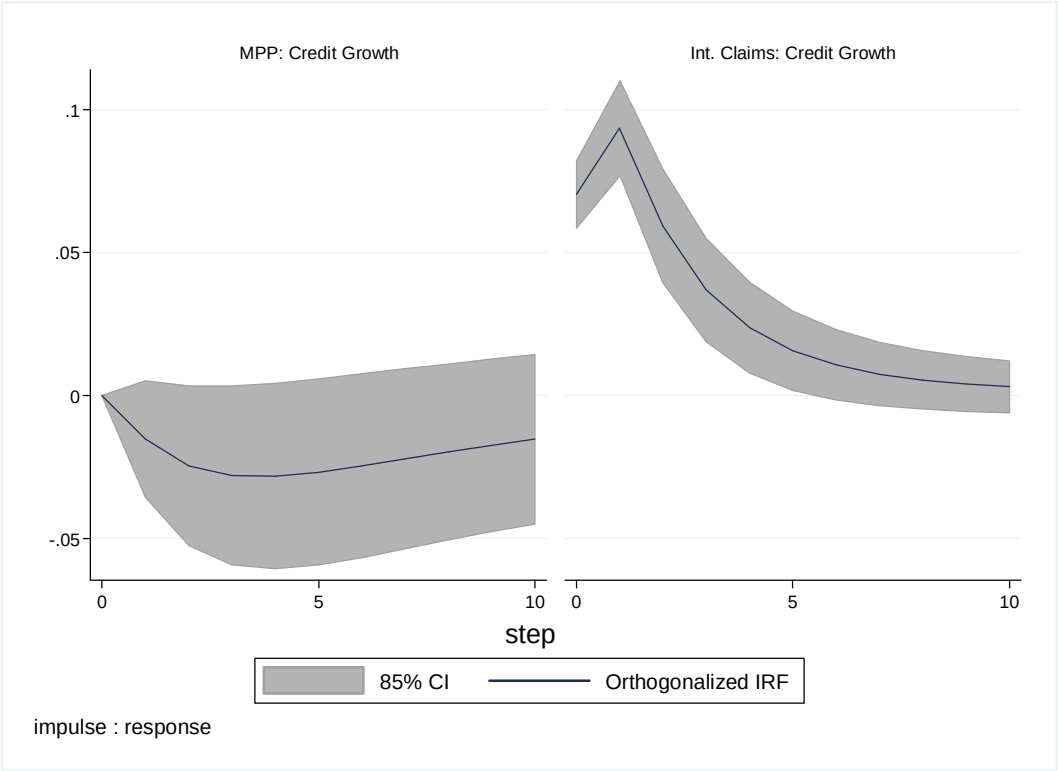
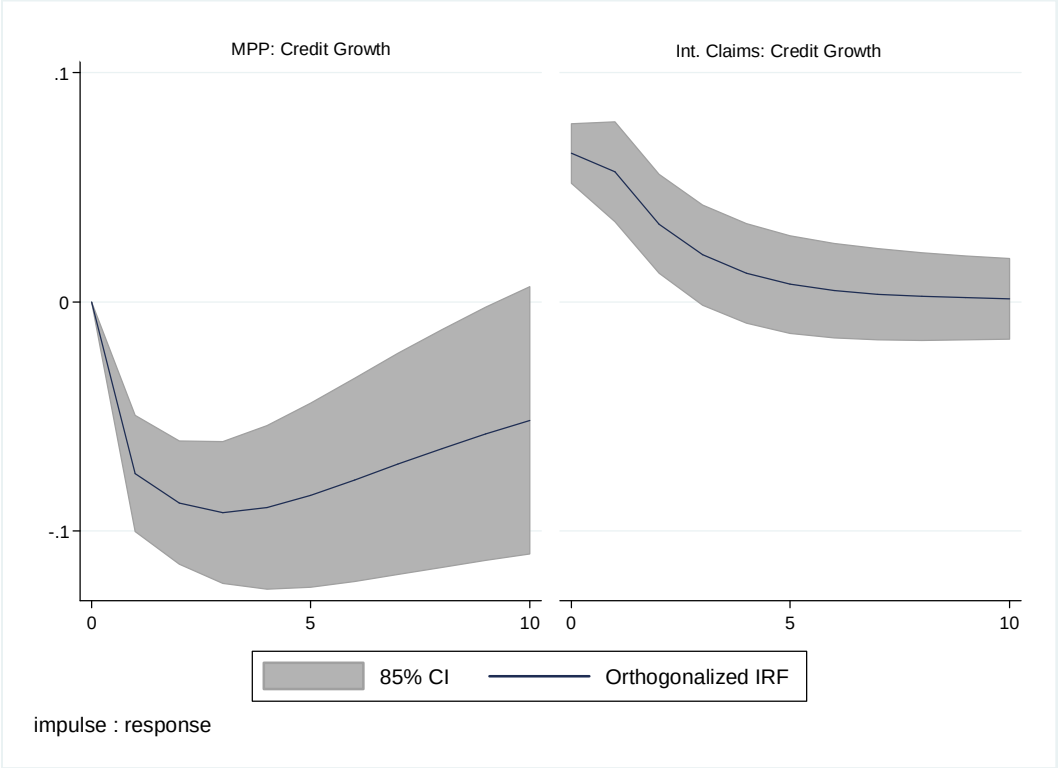


Figure 5: Response of Credit Growth to a 1% Permanent Increase in Global Liquidity by using Financial Based MPPs (Credit Cycle is in Expansion Phase)

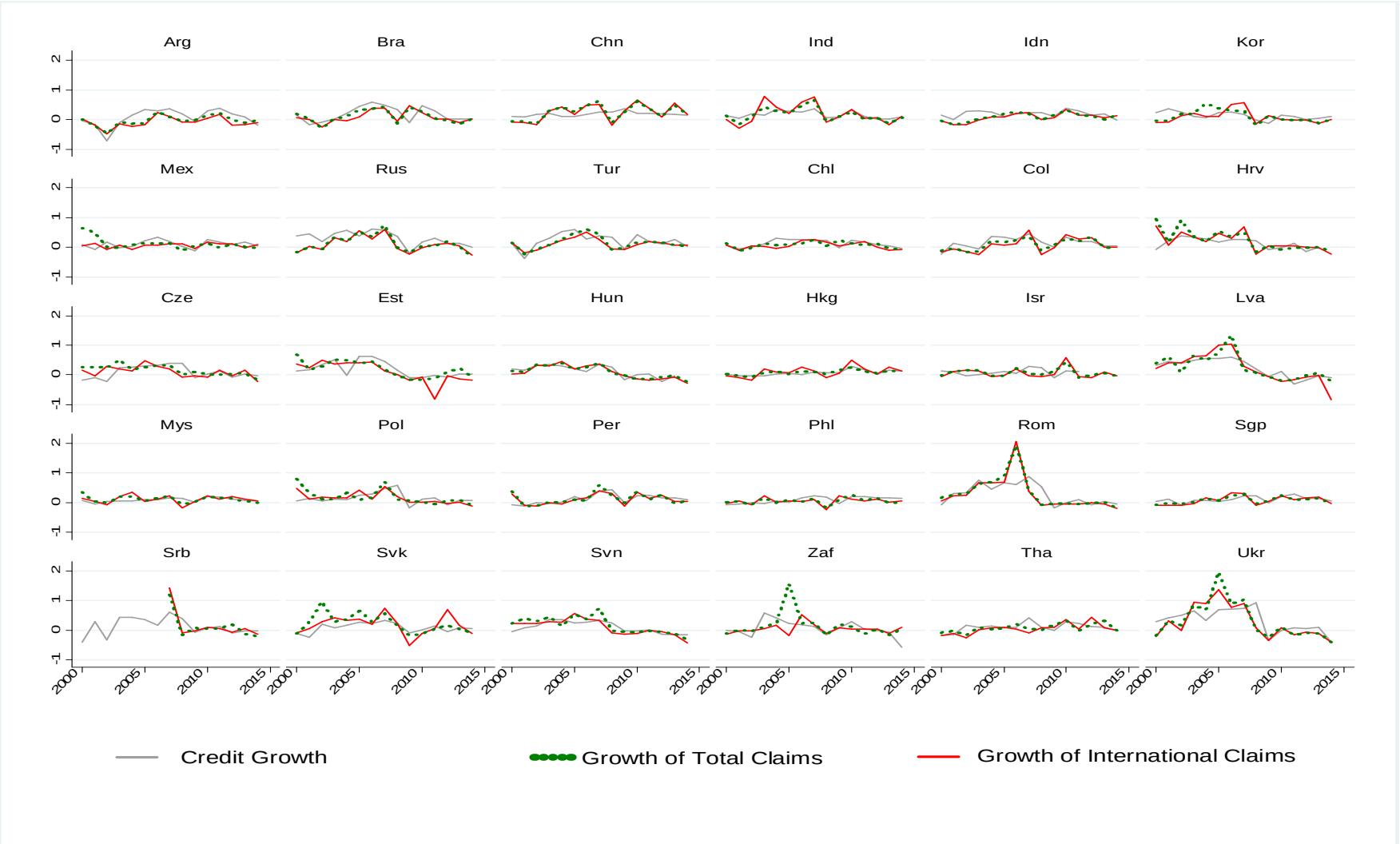


APPENDIX:

Table A1: Sample of Countries

Argentina	Hong Kong
Brazil	Israel
China	Latvia
India	Malaysia
Indonesia	Poland
Korea, Rep.	Peru
Mexico	Philippines
Russia	Romania
Turkey	Singapore
Chile	Serbia
Colombia	Slovak Rep.
Croatia	Slovenia
Czech Republic	South Africa
Estonia	Thailand
Hungary	Ukraine

Figure A1: Credit Growth, International Claims and Total Claims



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