Impact of Monetary and Macroprudential Policies on Financial Stability

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Abstract: The objective of this paper is to study the impact of different instruments of monetary and macroprudential policy on financial stability, using a sample of 48 countries, over the period 2000-2016. Based on the recent survey conducted by the IMF in 2016, we extend the database created by Cerutti, *et al.* (2015), considering macroprudential instruments through a binary approach. The results show the effectiveness of both monetary and macroprudential policies in reducing credit growth and so, in stabilizing financial system. However, macro-prudential regulation is more effective than monetary policy, given the number of monetary policy objectives and the short-term interest rate limit. Macroprudential tools appear to be more effective for emerging countries, given the degree of openness and limited external financing possibilities; these tools are used to limit excessive lending. For advanced countries that are more financially open, with more diversified and sophisticated external financial sources, macroprudential tools seem to be less effective and difficult to monitor, they are used to control mortgage borrowing and foreign-exchange loans.

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I. INTRODUCTION

The collapse of the 2007/2008 crisis was characterized by a new debate on the relationship between monetary policy and financial stability and the necessity for the central bank to be more careful about financial risks through a new regulatory framework known as macroprudential regulation. Hence, the central bank's role in financial stability is complex. It involves different mechanisms, and depends on several factors, such as the coordination between monetary policy and macrporudential policy, the characteristics of the central bank and the characteristics of the country.

A large body of literature is carried out. The first category of studies are based on the relationship between monetary policy and financial

stability. In this context, there are those who show that prolonged monetary easing negatively affects financial stability (Ciccarelli *et al.* 2013 and Gelos, 2017); others demonstrate that targeting inflation negatively affects financial stability (Fouejieu, 2017; Fazio *et al.*, 2018). However, Blot *et al.* (2014) state that there is no positive relationship between price stability and financial stability because instability may appear in an optimum inflation situation. For Vasile and Anca (2013), interest rate efficiency depends on monetary policy, when the interest rate is used as monetary tool for inflation targeting, financial stability is encouraged. In addition, among countries with fixed exchange rates, the foreign interest rate that affects domestic variables may insure financial stability.

The second category of studies focus on the relationship between macroprudential policy and financial stability. In general, the effectiveness of macroprudential policy is based on the control of asset price growth rates and credit growth rates, which are the main sources of financial risk. Several authors study the effectiveness of a specific instrument in ensuring financial stability conducted on a single country (Jimènez and Sayrina, 2006; Keys *et al.* 2009; Catte *et al.* 2010; Igan and Kang, 2011; Gauthier *et al.* 2012; Glocker and Towbin, 2012). However, other researchers base their studies on a range of instruments on a sample of countries. They test the impact of macroprudential tools related to capital to credit and capital to liquidity, namely dynamic provisioning and credit growth limitation, foreign lending limitation, LTV ratio, reserve requirements and DTI ratio on the procyclicality of asset, debt and non-core liability growth. They prove the effectiveness of these tools in ensuring financial stability (Antipa *et al.* 2010; Barrell *et al.* 2010; Lim *et al.* 2011; Claessens and Ghosh, 2012; Tovar *et al.* 2012; Bruno and Shin, 2013; Lim *et al.* 2013; Cerutti *et al.* 2015).

Another series of studies examines the relationship between central bank characteristics and financial stability. They find that transparency, independence and communication can improve financial stability (Horváth and Vasko, 2016 and; Ioana-Iuliana and Tomuleasa, 2015, Klomp and J. Haan, 2008; Doumpos *et al.* 2015; Ioana-Iuliana and Tomuleasa, 2015; Mendonça and Moraes, 2018).

Other studies are interested to the interaction between macroprudential policy and monetary policy. There is some evidence that policy coordination is beneficial to financial stability (Gelain *et al.* 2013; Angeloni and Faia, 2013; Angelini *et al.* 2014; Klingelhöfer and Sun, 2018). Others prove the opposite (Beau *et al.*, 2012; Christensen *et al.* 2011; Gertler *et al.* 2012; De Paoli, 2013; Chen and Columba, 2016).

The objective of this paper is to study the effectiveness of monetary and macroprudential policies on financial stability. Based on the model developed by Cerutti *et al.* (2015), we study the impact of monetary policy and macro-prudential policy tools on financial stability. We use a sample of 48 countries, divided into 26 emerging and 22 advanced countries for annual data over the period 2000-2016.

Despite considerable progress, presented by the model of Cerutti, *et al.* (2015), in assessing the effectiveness of macro-prudential policies, many shortcomings remain to be addressed: the database is incomplete in terms of the period of study and the number of tools considered. Therefore, we use an extended study period (17 years instead of 14 years), using more macroprudential tools (18 policies instead of 12 policies). Indeed, based on the most recent survey conducted by the IMF in 2016 on the use of macroprudential tools, we create a new database considering macroprudential tools through the binary approach, the same approach used by the Cerutti, *et al.* (2015). The effectiveness of macro-prudential measures is usually detected only through their impact on credit and housing price growth, in our study, we are moving towards assessing the side effects of macro-prudential policies, examining their impact on banking risk and therefore, financial instability.

The paper is organized as following. Section 2 exposes the empirical methodology, including the model to estimate, variables and data analysis. Section 3 presents our estimations results and interpretation. Section 4 concludes.

II. EMPIRICAL METHODOLOGY

A. Model

Our model is given as below:

$$FSI_{i,t}=a_0+a_1\,FSI_{i,t-1}+a_2\,Z_{i,t-1}+a_3\,X_{i,t-1}+a_4\,MPP_{i,t-1}+\epsilon_t$$

FSI (Financial stability index): matrix of financial stability variables, MPP (Macroprudential Policy), Z: matrix of monetary policy instruments, X: control variables matrix, a_0: is a constant, ϵ_t: is an error term (see Table 1 for variables definitions and data sources).

With, *i* designates the country and *t* the period.

To study the impact of each monetary and macroprudential policy instrument on financial stability indicators, we use the GMM system on a sample of 48 countries and for annual data from 2000 to 2016. In addition,

for robustness check, the sample is divided to advanced countries (22 countries) and emerging countries (26 countries) to compare the results between the two groups of countries (See countries list in table 2).

B. Variables and data analysis

Information on the use of macroprudential tools are limited, because they are not clearly identified in the litterature. Cerruti *et al.* (2015) have collected some data earlier on a set of 119 countries for the period 2000-2013. These data are extracted based on the IMF survey, the "Global macroprudential Policy Instruments" (GMPI), carried by IMF Monetary and Capital Department during 2013-2014. IMF staff asks directly country authorities about their use of macroprudential tools. The IMF survey cover 18 instruments, Cerruti *et al.* (2015) used only 12. In our analysis, and based on IMF survey carried on 2016, we try to extend the period of study to 2010-2016 and the number of tools to 18 (See table A1 in Appendix for the whole instruments classified by country and year). We also aggregate these measures along two categories: those addressed to borrowers (LTV+DTI), based on demand side (see Table A2 in Appendix) and those addressed to lenders (rr+ liquidity+ lfx+ capital+ custody+ lvr+ sifi+ cbc+ lcg+ llp+ loanr+ lfc+ ot+ ltd+ tax+ lev), based on supply side (see tableA3 in Appendix).

In order to compare advanced and emerging countries about the use of macroprudential tools, we plot the evolution of macroprudential policy tools over the period 2020-2016. Figure1 shows that there is an increase in use of macroprudential tools over time. However, emerging economies use most frequently macroprudential instruments than advanced countries. This is due to high exposition of emerging markets to external attacks, their more volatile capital flows and more vulnerable financial system. The macroprudential tools addressed to lenders sharply increase during the period 2011-2016 compared to those addressed to borrowers, mainly for advanced countries. This can be explained by their high level of market volatility (figures 2 and 3).

Figure 1: All macroprudential policy tools by income level
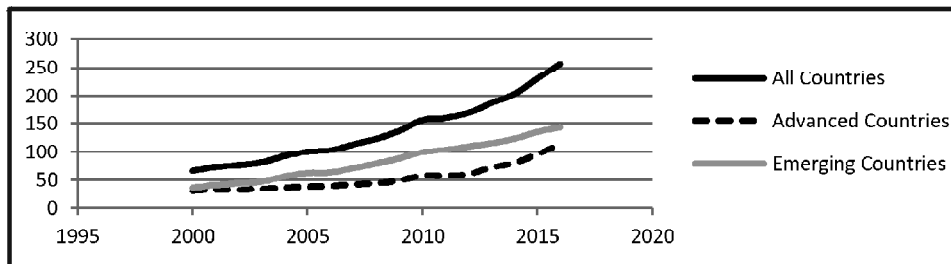
Figure 2: Macroprudential tools addresssed tolenders (Supply)
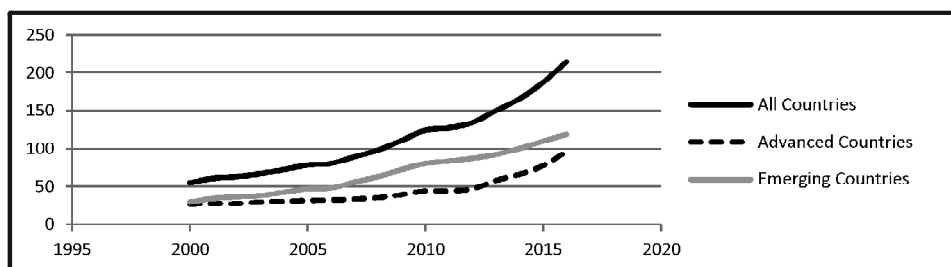
Figure 3: Macroprudential tools addressed to borrowers (Demand)
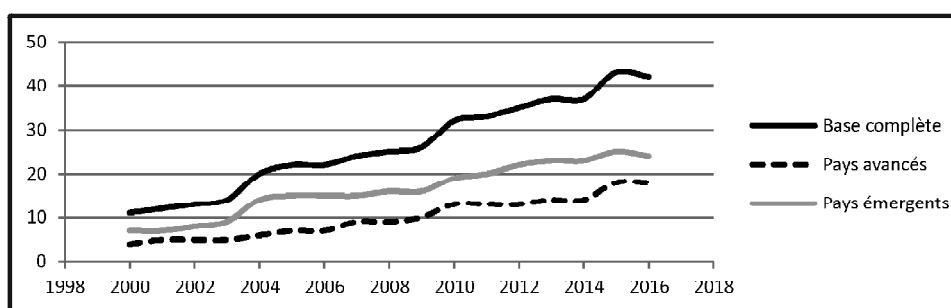
III. ESTIMATIONS RESULTS AND INTERPRETATIONS

The impact of macro-prudential policy on financial stability is estimated in three steps:

- Estimation of the impact of the overall aggregate index, which includes all macro-prudential policies,

- Estimation of the impact of the aggregate sub-indexes: the "supply" sub-index including macro-prudential policies for lenders (RR, LIQUIDITY, LFX, CAPITAL CONSERVATION, LVR, SIFI, CBC, LCG, LLP, LOANR, LFC, OT, LTD, TAX AND LEV) and the "demand" sub-index which includes macro-prudential policies for borrowers (LTV AND DTI),

- Estimation of the impact of individual macroprudential tools.

Financial stability is measured through two indicators: the rate of credit growth and the Z-score.

A. The impact of the global aggregate index

The credit growth rate is the dependent variable:

Table 1 : Variables definition

Matrix	Variables	Definitions	Sources
FSI	**Credit growth rate**	The growth rate of the banking system's debt to the private sector. Credit growth reflects cyclical fluctuations in domestic credit. Rapid credit growth is associated with increasing financial and macroeconomic instability, falling credit standards and increasing risks.	**WDI**
	Z-score	Measures the likelihood of a country's banking system failing. The Z-score compares the buffer of a country's banking system (capitalization and returns) to the volatility of those returns. It is estimated at (ROA + (equity/assets)) / SD (ROA); SD (ROA) is the standard deviation of the ROA. ROA, equity and assets are aggregated at country level. Calculated from the non-consolidated bank-by-bank data underlying Bankscope, (calculations made by WDI).	
MAPP	**Loan to value (LTV)**	Limits prepayments of mortgages by imposing or encouraging a limit or determining regulatory risk weights.	IFS
	Debt to income (DTI)	Debt/income ratio. Limits household indebtedness by imposing or encouraging a limit.	
	Leverage ratio (LEV)	Prevents banks from exceeding a minimum leverage ratio.	
	counter-cyclical capital buffer (CCB)	Require banks to hold capital at times when credit is growing rapidly	
	Reserve requirements (RR) :	Limits credit growth, can also be targeted to limit foreign currency credit growth.	
	capital conservation buffer (CONSERVATION)	Banks are required to hold a capital conservation buffer of 2.5% to withstand future periods of stress	
	Capital requirements (CAPITAL)	Capital requirements for banks, which include risk weights, systemic risk buffers and minimum capital requirements. Countercyclical capital buffers and capital conservation buffers are captured in their respective sheets and are therefore not included here. Sub-categories of capital measures are also provided, categorizing them into household (HH), corporate (Corp), broad-based (Gen) and FX (FX) targeted measures.	
	Leverage limits (LVR)	Limit on banks' leverage, calculated by dividing a capital measure by the bank's exposures that are not risk-weighted (for example, the Basel III leverage ratio).	
	Loan losses provisions (LLP)	Provisions for losses on loans for macro-prudential purposes, which include	

Limits to credit growth (LCG)	dynamic provisioning and sectorial provisions (e.g. housing loans). Limits on the growth or volume of global credit, credit to households, or credit to businesses by banks, and penalties in the event of strong credit growth. Subcategories of limits to credit growth are also classified as targeted measures for the household sector (HH), targeted measures for the corporate sector (Corp) and large-scale measures (Gen).
Loan restrictions (LoanR)	Lending restrictions, which are more appropriate than those considered in "LCG". They include lending limits and prohibitions, which may be conditioned by the characteristics of the loan (maturity, size, LTV ratio and type of loan interest rate), the banks characteristics of (e.g. mortgage banks) and other factors. Sub-categories of lending restrictions are also provided, classified into measures targeted at the household sector (HH) and measures targeted at the corporate sector (Corp). Restrictions on foreign currency loans are recorded in "LFC".
Limits on Foreign Currency (LFC)	Foreign Currency Loan Limits and Rules or Recommendations on FC loan
Taxes (TAX)	Tax measures Taxes and levies applied to specific transactions, assets or liabilities, such as stamp duties and capital gains taxes.
Liquidity requirements	Measures taken to mitigate systemic risks of liquidity and funding, including minimum requirements for liquidity coverage ratios, liquid asset ratios, stable and net funding ratios, core funding ratios and currency-neutral external debt restrictions.
Limits on the loan-to-deposit ratio (LTD)	Loan/Deposit Ratio (LTD) limits and penalties for high LTD ratios.
limits of foreign exchange positions (LFX)	Limits on net or gross open foreign exchange positions, foreign exchange exposure limits and foreign exchange financing, and regulation of asymmetric exchange rates.
SIFI	Measures taken to mitigate the risks of systemically important financial institutions at the global and national levels, including capital and liquidity surcharges.
Other (OT)	Macroprudential measures not included in the above categories, such as stress tests, restrictions on profit distribution and structural measures (e.g. exposure limits between financial institutions).
MAPP Index	This is the global aggregate index including the 18 individual macroprudential measures, so varies between 0 and 18)
Demand Index	It is an aggregate sub-index including 2 measures (ltv+ dti) policies intended at borrowers, therefore varies between (0 and 2).

	Supply Index	This is an aggregate sub-index includes 16 measures (rr+ liquidity+ lfx+ capital+ custody+ lvr+ sifi+ cbc+ lcg+ llp+ loanr+ lfc+ ot+ ltd+ tax+ lev) policies aimed at lenders, thus varies between (0 and 16).	
Z	**Interest rates**	The short-term interest rate (money market rate; interbank market rate, three-month Treasury bill rate).	IFS-OCDE
X	**Growth rate**	Refers to the positive change in the production of goods and services in an economy over a given period.	WDI
	Inflation rate	The percentage of increase/decrease in the prices of goods and services over a given period.	

Table 2: Countries list

22 *Advanced Economies*
Australia, Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Greece, Iceland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal. Singapore, Spain, Sweden, Switzerland.

26 *Emerging* Economies
Armenia, The Bahamas, Brazil, Chile, China, Colombia, Costa Rica, Egypt, Guyana, Hungary, India, Indonesia, Jamaica, Malaysia, Mexico, Paraguay, Peru, Philippines, Romania, Russia, South Africa, Sri Lanka, St. Kitts and Nevis, Thailand, Trinidad and Tobago, , Ukraine,

For the whole sample, the MAPP aggregate index is associated negatively and statistically significant with credit growth, which prove the effectiveness of macroprudential policies in reducing credit growth. This is affirmed by the majority of research investigating on the impact of macroprudential policies on financial stability indicators (Antipa *et al.* 2010; Barrell *et al.* 2010; Lim *et al.* 2011; Claessens and Ghosh, 2012; Tovar *et al.* 2012; Bruno and Shin, 2013; Lim *et al.* 2013; Cerutti *et al.* 2015; Alam *et al.* 2019).

The interest rate has a negative and statistically significant effect on credit, but lower than the effect of macroprudential policies (0.439 < 1.238), so macroprudential instruments are more effective on financial stability. There are three explanations: First, the bias of endogeneity may not be fully resolved. Secondly, the short-term interest rate used may not be the best indicator of monetary policy. Third, monetary policy has other objectives than managing credit flows, such as targeting inflation, which makes it less powerful in this area (Alam *et al.* 2019).

The coefficients for the growth rate and inflation variables are positive and significant as expected.

Considering two sub-sample, advanced and emerging countries, the results presented show that the MAPP index has higher impact for emerging economies than for advanced countries (2.154>0.655), which shows that macroprudential policies are more effective in emerging countries. Two explanations can be presented: first, macroprudential tools are more popular and more used in emerging markets than in the case of advanced countries characterized by the multiplicity of funding sources that may be more effective than these regulations. Second, the majority of advanced countries are open countries, which makes it difficult to make macro-prudential tools that will be easily overcame specifically by borrowers' access to different sources of financing, highlighting the need for capital flows regulation

measures. Emerging markets then tend to be less open, which facilitates the establishment and continuation of macro-prudential policies. Hence, the degree of openness of countries is an important condition in the choice of policies to be implemented.

For GDP growth, the associated coefficients are positive and significant but with low elasticity for both groups of countries (0. 851 and 0. 81 respectively for advanced and emerging countries). Hence, credit growth is not associated with economic growth in these countries due to the financial system development that promote economic activity, unlike in the case of developing countries where growth is closely associated with credit growth.

Similarly for the monetary policy instrument, the interest rate is associated with negative and significant coefficients (-0.781 and -0. 329 respectively for advanced and emerging countries). This shows the weak performance of monetary policy in reducing credit growth due to the development of the financial system that offers more sources of financing, which reduces dependence on credit bank.

Table 3: The impact of the Global Macroprudential Policy Index (GMPI) on credit growth rates and the Z-score

Variables	Credit growth rate			Z-score		
	All	Advanced	Emerging	All	Advanced	Emerging
MAPP	-1.238***	-0.655*	-2.154***	-0.007***	-0.049	-0.009**
	(0.11)	(0.377)	(0.981)	(0.002)	(0.03)	(0.003)
GDP	0.815***	0.851***	0,81***	-0.005***	0.014***	-0.001
	(0.026)	(0.065)	(0.059)	(0.000)	(0.003)	(0.001)
INFLATION	0.163***	0.624***	-0.033	-0.009***	-0.038***	-0.002**
	(0.02)	(0.242)	(0.088)	(0.001)	(0.009)	(0.001)
INTEREST RATE	-0.439***	-0.781***	-0,329***	-0.002*	-0.032***	-0.005***
	(0.035)	(0.282)	(0.139)	(0.001)	(0.004)	(0.001)
AR(1)[1]	0.0049	0.0869	0.0195	0.1476	0.0149	0.0035
AR(2)[1]	0,6472	0.4793	0.1670	0.2294	0.2645	0.5868
Sargan test[2]	1	1	1	1	1	1

The robust standard deviations grouped by country are in brackets. ***, ** and * indicate significance at levels of 1.5% and 10%, respectively

The Z-score is the dependent variable

The global aggregate index is associated with a negative and significant coefficient with the "Z-score" which shows that of macroprudential tools can reduce banking risk-taking and so, reduce financial instability. Similarly for monetary policy, monetary easing and inflation targeting lead to an increase in financial risks through risk taking channel.

B. The impact of the "Supply" and "Demand" aggregate sub-indices

The credit growth rate is the dependent variable

Both "supply" and "demand" indices are associated with negative and significant coefficients to credit growth with a higher effect than the respective monetary policies for both regressions and seem to be more effective in the case of emerging economies. In fact, only tools intended for the borrower are associated with a significant and negative coefficient exclusively for emerging countries. In addition, both control variables are associated with positive coefficients is significant with credit growth.

The Z-score is the dependent variable

Similarly, monetary policy leads to an increase in financial risks, and macroprudential policies seem ineffective in securing financial stability even if the supply index is associated with a positive and statistically significant coefficient, but this impact is slight (0. 0058) mitigated by the negative coefficient associated with the demand index (-0. 104).

Table 4: The impact of aggregated macroprudential policy sub-indices (supply and demand) on financial stability

	Credit Growth Rate			Z-score		
Variables	All	Advanced	Emerging	All	Advanced	Emerging
SUPPLY	-1.256 ***	-0.896	-1.061	0.0058**	-0.062***	-0.01**
	(0.138)	(0.726)	(1.326)	(0.002)	(0.02)	(0.005)
GDP	0,852***	0,832***	0,796***	-0.005***	0.014 ***	-0.001
	(0.025)	(0.058)	(0.046)	(0.000)	(0.03)	(0.001)
INFLATION	0,168***	0.559***	0.02	-0.009***	-0.037 ***	-0.002**
	(0.022)	(0.247)	(0.096)	(0.001)	(0.01)	(0.001)
INTEREST RATE	-0,398 ***	-0.664***	-0,401***	-0.02**	-0.02***	-0.005***
	(0.026)	(0.308)	(0.17))	(0.000)	(0.004)	(0.001)
AR(1)[1]	0.0046	0.0860	0.0367	0.1563	0.1754	0.0041
AR(2)[1]	0.0514	0.4815	0.1289	0.2003	0.2425	0.5752
SARGAN TEST	1	1	1	1	1	1
DEMAND	-2.286***	-0.723	-5.857***	-0.104***	-0.244	-0.022***
	(0.661)	(0.593)	(2.23)	(0.013)	(0.183)	(0.005)
GDP	0,837***	0.774***	0,774***	-0.006***	0.011***	0.000
	(0.02)	(0.073)	(0.064)	(0.000)	(0.002)	(0.001)
INFLATION	0.15***	0.571***	-0.053	-0.009 ***	-0.041***	-0.003**
	(0.024)	(0.268)	(0.072)	(0.001)	(0.007)	(0.001)
INTEREST RATE	-0.35***	-0.797***	-0,293***	-0.004***	-0.022***	-0.004**
	(0.063)	(0.317)	(0.131)	(0.001)	(0.004)	(0.001)
AR(1)[2]	0.0049	0.0829	0.0268	0.1520	0.2133	0.0054
AR(2)[1]	0.0469	0.4769	0.1306	0.2304	0.2160	0.5584
SARGAN TEST[3]	1	1	1	1	1	1

Source: The robust standard deviations grouped by country are in brackets. ***, ** and * indicate significance at levels of 1,5% and 10%, respectively.

C. The impact of individual macroprudential policies

The credit growth rate is the dependent variable

For the whole sample, most of the tools are effective, but when we differentiate countries based on income; the results show that the Loan/Value ratio (LTV) and the reserve requirement (RR) are only effective for advanced countries. Hence, the problems of these countries are associated with the development of the mortgage market and foreign exchange loans given their degree of openness. While the Debt/Income Ratio (DTI) cap, the Currency Loan Limit (LFC) and the loan/deposit ratio (LTD) cap are only effective for emerging economies. Hence, the problem of these countries are associated with excessive lending.

The Z-score is the dependent variable

As expected, most individual tools are ineffective. For all regressions, existing policies with a positive and statistically significant impact appear to be neutralized by ineffective policies. For the whole countries of our sample, the tools (LEV, TAX, CAPITAL, LCG, LVR and OT) seem to be effective in reducing banking risk and enhancing financial stability. However, these effects seems to be mitigated by negative effects of other tools (LTV, DTI, RR, SIFI and LIQUIDITY). Similarly, for advanced countries where the effectiveness of (LIQUIDITY) is limited by the ratio (DTI). While for emerging markets, the effectiveness of LEV and LIQUIDITY tools is abated by DTI and CONSERVATION tools.

Table 5: The impact of individual macroprudential policies on credit growth rates and Z-score

	Credit Growth Rate			Z-score		
	All	*Advanced*	*Emerging*	*All*	*Advanced*	*Emerging*
LTV	-3.529***	-2.264***	3.397	-0.25***	-0.131	-0.002
	(0.437)	(0.628)	(4.852)	(0.029)	(0.259)	(0.015)
DTI	-9.189***	-1.169	-15.466**	-0.121***	-0.349*	-0.065**
	(1.22)	(4.747)	(4.797)	(0.015)	(0.196)	(0.031)
RR	-13.009***	-2.211**	-8.202	-0.259***	0.075	-0.079
	(0.651)	(0.861)	(5.938)	(0.045)	(0.18)	(0.182)
LEV	2.974		-5.413	0.387***	-15.497	0.111**
	(2.286)		(6.774)	(0.038)	(12.645)	(0.056)
CBC	-4.589***	-1.041	-20.902	0.085	-0.257	0.057
	(0.536)	(70.467)	(135.373)	(0.072)	(0.163)	(0.289)
TAX	-0.016	16.501***	2,807	0.14***	-0.321	-0.072
	(1.123)	(1.999)	(7.205)	(0.023)	(0.279)	(0.052)

contd. table 5

	Credit Growth Rate			Z-score		
	All	*Advanced*	*Emerging*	*All*	*Advanced*	*Emerging*
CAPITAL	-7.378***	-5.559	-4.691	0.078***	0.016	-0.037
	(0.239)	(3.622)	(3.554)	(0 .008)	(0.058)	(0.028)
LOANR	-4.03***	-0.968	7.731	0.000	-0.132	-0.05
	(0.775)	(2.386)	(5.806)	(0.023)	(0.122)	(0.042)
LFX	1.073	-6.01	-1.49	0.049	-0.514	0.000
	(0.89)	(17.559)	(4.666)	(0.049)	(1.082)	(0.028)
LFC	-12.371***	1.016	-7.018*	-0.031	0.389	-0.087
	(1.014)	(19.229)	(4.106)	(0.135)	(0.543)	(0.14)
LCG	0.17	5.415	-4.096	0.478***	-1.375	-0.017
	(2.912)	(4.351)	(7.235)	(0.179)	(1.627)	(0.09)
LTD	-2.796		-23.392*	0.163		0.107
	(6.213)		(12.093)	(0.174)		(0.29)
LVR	8.401***		0.074	0.133***		0.047
	(1.082)		(3.773)	(0.032)		(0.047)
LLP	-7.402***	0.512	2.321	-0.002	7.226	-0.008
	(0.95)	(2.973)	(3.728)	(0.014)	(14.752)	(0.027)
SIFI	-5.778***	-32.166		-0.133**		
	(0.869)	(29.74)		(0.055)		
LIQUIDITY	0.62	-14.024	-2.794	-0.168***	0.03*	0.03*
	(1.489)	(9.181)	(9.539)	(0.022)	(0.175)	(0.016)
CONSERV-ATION	-1.377***	3.964	4.039	0.013	-0.009	-0.088*
	(0.493)	(18.413)	(18.572)	(0.013)	(0.084)	(0.051)
OT	1.673	-5.218	-1.856	0.155***	-0.071	0.006
	(1.319)	(7.782)	(6.55)	(0.013)	(0.072)	(0.079)

Each instrument is added separately to the basic regression, but their coefficients are represented in the same column for greater compactness. The robust standard deviations are in brackets. ***, ** and * indicate significance at levels of 1.5% and 10%, respectively.

IV. CONCLUDING REMARKS

A large body of literature shows the complexity of the central bank's role in financial stability, where several mechanisms and factors may play an important role. First, the study of the relationship between monetary policy and financial stability shows that the two monetary policy instruments that are inflation targeting and monetary easing, lead to an increase in financial risks through the risk-taking channel. Second, most studies on the relationship between macroprudential policy and financial stability shows the effectiveness of macroprudential regulation. Third, studies of the relationship between the interaction of the two monetary and macroprudential policies with financial stability shows that there is no consensus. Some of them prove the effectiveness of the coordination between the two policies, however, other find an ineffective relationship. Finally, the study of the relationship between the characteristics of the

central bank and financial stability shows the effectiveness of three characteristics: independence, transparency and communication.

Our empirical study focuses on the impact of monetary and macroprudential policies on financial stability as represented by two indicators, the credit growth rate and the Z-score. The results show the effectiveness of both policies in reducing credit growth. Macro-prudential regulation is more effective than monetary policy, given the multiplicity of monetary objectives and the short-term interest rate limit. Macroprudential tools appear to be more effective for the emerging countries group given the degree of openness and limited external financing possibilities; they are aimed at addressing excessive lending. For advanced countries that are more financially open and offer more diversified and sophisticated external financial sources, macroprudential tools appear to be less effective and difficult to monitor, they are intended to restrict mortgage borrowing and foreign-exchange loans. However, central bank policies appear to be ineffective in reducing banking risk, it encourage investors to move to the shadow banking system, the development of corruption and the increase in financial risk through the risk-taking channel.

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Appendix

Table A1: The use of all macroprudential policies over time (MAPP)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Armenia	1	3	3	3	3	3	3	4	4	4	5	5	6	6	6	6	6
Australia	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	4	6
Austria	2	2	2	3	3	3	3	3	3	3	4	4	5	5	5	5	5
Bahamas	1	1	1	1	2	3	3	3	3	3	3	3	4	4	4	4	4
Brazil	1	1	1	1	1	1	1	3	3	4	4	4	4	5	5	8	8
Belgique	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4
Czech Republic	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	5
Chile	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
China	1	1	3	4	5	5	5	7	7	8	10	11	11	12	13	14	14
Colombia	3	3	3	4	4	4	4	5	5	6	6	6	6	6	6	6	6
Costarica	1	2	2	2	3	4	4	4	4	4	4	4	4	6	6	7	7
Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESTONIA	1	1	1	1	2	2	3	3	3	3	3	3	3	3	4	7	8
Filande	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	5
France	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4
Germany	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Greece	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4
Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungury	0	1	1	1	1	1	1	1	1	1	4	4	4	4	5	5	5
Iceland	1	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	5
India	1	1	1	1	2	3	3	3	3	4	6	6	6	6	8	11	11
Indonisia	0	0	0	0	0	1	1	1	2	3	4	4	5	5	6	6	7
italy	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	5
jamaique	1	1	1	1	3	3	3	3	3	3	3	3	3	4	5	5	5

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
japan	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4
Luxembourg	3	3	3	3	3	3	3	3	3	3	3	3	5	5	6	6	7
Malta	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Malaysia	4	4	4	4	4	5	5	6	6	6	7	8	8	8	8	8	8
Mexico	0	0	0	0	0	0	0	0	1	2	1	1	1	2	3	4	5
Netherlands	1	1	1	1	1	1	1	3	3	3	3	3	4	4	5	5	6
New Zealand	0	0	0	0	0	0	0	0	0	1	1	1	1	4	4	5	5
Norway	2	2	2	2	2	2	2	2	2	2	4	4	4	5	5	7	7
Paraguay	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4
Peru	2	2	2	2	2	2	2	2	2	2	3	4	6	6	6	6	6
Phellepine	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6
Portugal	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Romania	1	1	1	1	3	4	4	4	7	7	7	7	8	8	8	8	9
russia	1	1	1	1	1	1	1	1	2	3	3	3	3	3	3	3	5
Singapore	2	2	2	2	2	2	2	2	2	2	3	3	3	5	5	6	7
si rilanka	1	2	3	3	3	3	3	3	4	5	5	5	5	5	5	6	6
south africa	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	3	6
Spain	2	2	2	2	2	2	2	2	3	5	5	5	5	5	5	5	7
St.Kitts	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Sweden	0	0	0	0	1	1	1	1	1	1	2	2	2	2	4	5	6
switzerland	0	0	0	0	0	0	0	1	3	3	3	3	6	6	6	6	6
thailand	0	0	0	1	1	2	3	3	3	4	4	4	4	4	4	4	4
Trinidad and Tobago	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Ukraine	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2

Table A2: The use of macroprudential policies intended at borrowers: Demand (LTV+ DTI)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Armenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bahamas	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Belgique	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chile	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
China	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Colombia	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Costarica	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Filande	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greece	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungury	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2
Iceland	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
India	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	1
Indonisia	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
italy	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
jamaique	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

contd. table A2

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malysia	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
Mexico	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1
Netherlands	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2
New Zealand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Norway	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2
Paraguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peru	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Phellepine	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Portugal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Romania	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2
russia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Singapore	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
si rilanka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
south africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
St.Kitts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
switzerland	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
thailand	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2
Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0