

## On the Effectiveness of Macroprudential Policy



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*Since the global financial crisis that started in the mortgage subprime market in the US, many countries have implemented macroprudential policies with the aim to increase the resilience of the financial system and limit its amplification effects over the economic cycle. We present theoretical and empirical evidence on the effectiveness of macroprudential policy, on both, financial stability and economic growth focussing on capital measures and borrower-based measures. Our results reveal that macroprudential policy is effective in fostering banks' and borrowers' resilience and in curbing excessive credit growth when intended. Moreover, we show that macroprudential policy, by safeguarding financial stability, has an impact on long term economic growth through its effect on both the deepness of the recessions and the length of the expansions.*

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As demonstrated by the global crisis of 2008-2009, financial crises may have severe repercussions on the real economy, in light of the feedback loops between the financial sector and the real economy, which can reinforce the economic contractions after a negative shock (Laeven and Valencia (2020), Lo Duca et al (2017)). The severe economic and social costs stemming from the global financial crisis (2008-2009) prompted academic and policymakers around the globe to devote increased attention to the role of macroprudential policies in safeguarding financial stability (Borio (2003)). In this context, macroprudential policy has gained prominence in addressing externalities and market failures associated with financial intermediation, thereby complementing microprudential supervision and monetary policy, De Nicolò et al. (2014).

The ultimate objective of macroprudential policy is to contribute to safeguarding the stability of the financial system as a whole (European Systemic Risk Board (2014), FSB-IMF-BIS (2011)). This includes strengthening the resilience of the financial system and taming the build-up of vulnerabilities and smoothing the financial cycle, thereby ensuring a sustainable contribution of the financial sector to economic growth (Constâncio et al (2019)). Macroprudential instruments targeting the banking sector typically comprise capital measures and borrower-based measures<sup>1</sup>.

Capital measures encompass a set of capital requirements which increase the loss absorption capacity of banks, thereby fostering financial sector resilience. In addition, by altering banks' cost of capital, higher capital requirements affect the price and volume of credit, thereby contributing to taming the financial cycle by limiting credit excesses. The capital framework for banks is enshrined in the Basel III agreements, BCBS (2013) and comprises instruments such as the Countercyclical Capital Buffer (CCyB), buffers such as the Systemic Risk Buffer (SyRB) targeting risks of a structural nature, and buffers for "too-big-too fail" institutions such as those for Globally Systemically Important Institutions (G-SII) and Other Systemically Important Institutions (O-SII)<sup>2</sup>.

Borrower-based instruments directly affect the terms and conditions of lending which are closely related to the riskiness of loans. Borrower-based instruments<sup>3</sup> encompass limits to the size of the loan in relation to either the value of the underlying collateral (loan-to-value ratio, LTV), the income of the borrower (loan(debt)-to-income ratio, L(D)TI), limits to debt(loan), servicing costs in relation to the income of the borrower (D(L)STI)<sup>4</sup>, maximum maturity limits and amortisation requirements. Borrower-based measures contribute to financial stability by fostering both bank and borrower resilience. On the one hand, borrower-based instruments make debt more sustainable, thereby reducing the probability of default of individual borrowers and limiting amplification effects on consumption and investment in case of negative shocks. On the other hand, borrower-based instruments improve the quality of banks' mortgage loan portfolios through more prudent lending standards, which gradually render loan portfolios less risky. In turn, the decrease of banks' exposures to riskier households enhances their resilience during periods of negative economic shocks with positive spillovers to the broader economy. Finally, borrower-based measures contribute to taming the financial cycle, as they constrain the provision of credit to borrowers whose credit demand exceeds the conditions established in the regulatory limits.

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<sup>1</sup> Other measures, which can be available and have been used to different extent, especially in emerging economies, include provisioning requirements, other quantitative restrictions on the balance sheets of financial intermediaries (e.g. exposure limits, liquidity requirements, etc), taxation/levies on activities or balance sheet composition. For non-banks, macroprudential instruments are not yet fully developed and used, see FSB (2020).

<sup>2</sup> In the EU, the legal framework for the implementation of these instruments is harmonised and is enshrined in the EU Capital Requirements Directive (CRD IV) and the Capital Requirements Regulation (CRR).

<sup>3</sup> Activation of borrower-based instruments is at national discretion and subject to national legal or macroprudential frameworks.

<sup>4</sup> In some cases, limits are calculated based on the consolidated debt of the borrower (debt to income, DTI; debt service to income, DSTI).

While the existing literature on the impact of macroprudential policy concentrates on its positive effects on financial stability, evidence on its impact on economic growth is scarce and mixed. The studies that include GDP growth in their analysis (see Araujo et al (2020) and references therein), find a statistically significant negative effect of tighter macroprudential policy on economic activity, commonly referred to as the “cost of macroprudential policy” (Richter et al., 2018). However, macroprudential policy may have beneficial effects in the long run, by reducing the probability of financial crises and dampening their impact on economic activity when they occur.

In a recent study (Ampudia et al., 2021), we address this gap by providing a rich set of results on the effectiveness of macroprudential policy focussing not only on its benefits for financial stability, but also for economic growth. We implement a range of state-of-the-art models, encompassing theoretical and empirical approaches, and examine the implications of macroprudential policy from both the macro and the microeconomic perspective. The remainder of this article presents the main results of our research and their policy implications. We start from a macroeconomic perspective, illustrating the impact and transmission channels of capital and borrower-based instrument using a dynamic stochastic general equilibrium model. A panel VAR approach is then used to test the theoretical insights using macroeconomic data and information on macroprudential policy actions. While the macroeconomic evidence confirms the positive impact of macroprudential policy on aggregate financial stability, a microeconomic perspective is best suited to offer insights on its effects on the resilience of individual agents. To explore the relation between borrower-based instruments and borrowers’ resilience, we implement two empirical approaches using microeconomic data from household surveys. Finally, we explore the role of credit for the business cycle, comparing its effects on the expansions and on recessions.

First, on the theoretical side, we extend the dynamic stochastic general equilibrium model by Clerc et al. (2015) calibrated to the euro area, featuring multiple types of financial frictions, to explore the impact of capital and borrower-based measures on building resilience and containing vulnerabilities. The frictions in the financial sector affect the credit market for investment goods, housing capital and deposits, amplifying the transmission of exogenous shocks to the economy. In the model, borrowing households and firms receive credit from banks to finance house purchases and capital investment respectively. Banks are required to retain equity in proportion to the amount of issued loans and the macroprudential authority sets capital requirements which affect banks by increasing the cost of equity. In addition, LTV limits which constrains the loan amount in relation to the price of immovable property are introduced. Simulation results show that, in the long-run, tighter capital regulation is effective in increasing bank resilience, by reducing bank leverage and the probability of bank defaults. Capital requirements are also effective in affecting the credit cycle, as credit decreases when requirements are tightened. Furthermore, we find that higher capital requirements reduce the volatility of economic variables in response to (mainly) financial shocks and shocks to the riskiness of entrepreneurs. A better capitalised banking sector leads to lower total credit volatility as banks are less prone to default and therefore can continue to provide credit to the economy even in adverse circumstances. The results further reveal that, in the long-run, borrower-based measures are effective in increasing borrowers’ resilience, by reducing defaults, leverage and indebtedness of borrowing households. At the same time, LTV limits reduce mortgage credit, in turn dampening residential investment. Finally, LTV limits reduce the volatility of economic variables in response to shocks affecting the housing sector. Overall, the benefits outweigh the costs, as sounder household balance sheets resulting from borrower-based measures limit the impact of adverse developments in housing markets and their spillovers to consumption and investment.

Second, we use an empirical model (panel VAR) to complement the theoretical results and explore the dynamic responses of macroeconomic aggregates to qualitative macroprudential policy indicators in the euro area (see Budnik and Rünstler (2021) for additional details). Existing empirical studies, which find a statistically significant

effect of macroprudential policy on credit growth (see Araujo et al (2020) and Gadea and Perez Quiros (2021) and references therein), are mostly based on cross-country panel regressions and largely neglect the effect of macroprudential policy on GDP and inflation, as well as potential second round effects of these variables on future values of credit. The narrative panel VAR approach we propose addresses these shortcomings and provides deeper insights on the dynamics of the transition to the new steady state following macroprudential policy interventions. We rely on a sample of 12 initial euro area member states (excluding Luxembourg) and focus on three categories of instruments, namely minimum capital requirements, LTV limits and other borrower-based measures (such as DTI and DSTI limits). Information on macroprudential policy measures stems from the Macroprudential Policies Evaluation (MaPPED) database by Budnik and Kleibl (2018). We find a sizeable impact of macroprudential policy measures on credit (and house prices), and a small effect on output and inflation. In our sample, borrower-based measures have, on average, a larger impact than capital requirements, in line with the DSGE model simulations. We find that, in general, policy measures are subject to long lags. While their impact on GDP and inflation is rather short-lived, the responses of credit aggregates and house prices reach their maximum only after three years or longer and remain highly persistent thereafter. Such delayed response has implications for the conduct of counter-cyclical macroprudential policies, suggesting the need for a rule-based forward-looking approach.

Third, to complement the macroeconomic results, we assess the impact of macroprudential policy on the resilience of individual agents using two empirical models relying on microeconomic data. To explore the relation between borrower-based instruments and borrowers' resilience, we use household level survey data for Italy and Spain<sup>5</sup> to study the effect of LTV ratios at origination on borrowers' probability of default. We estimate a probit model where the dependent variable is a dummy indicating whether the household has been late or missed payments on its loans during the last 12 months, the independent variable of interest is the LTV at origination for the main loan on the household's main residence and additional controls account for a series of loan and household characteristics. The results reveal that the probability of defaulting increases with the level of the LTV at origination. In Italy, an LTV at origination of 20% is associated with a probability of default of around 1%, while an LTV at origination of 80% is associated with a probability of default of almost 6%. In the case of Spain, for the same range of LTV at origination, the probability of default increases from 10% to 15%. By increasing LTV, some of the riskiest loans are curtailed, decreasing the average probability of default. To study the interaction of combinations of borrower-based measures and their impact on the resilience of banks and borrowers while accounting for macro-economic feedback effects, we rely on a more complex modelling framework. Specifically, we use the semi-structural, micro-macro integrated household balance sheet model of Gross et al. (2021) which has also been implemented, with country-specific modifications, in a related policy analysis for Slovakia (Jurča et al. 2020). The methodology integrates an empirical micro module simulating the unemployment status of borrowers and a semi-structural macro module (SVAR) into a dynamic household balance simulator to determine the impact on household and bank resilience of borrower-based measures, relative to a no-policy scenario. The model uses data from the 3rd wave of the Household Finance and Consumption Survey (mortgage loans originated over the 2014-17 period) to simulate household balance sheets forward and characterize the distribution of lending standards (LTV, DSTI and DTI) across a sample of 19 EU countries. The results suggest that borrower-based measures can significantly enhance borrower resilience and support bank solvency ratios. Income-based policies (DSTI and DTI) improve the resilience of borrowers and the risk profile of mortgage exposures primarily through compressing probabilities of default (reduction of 50-60 bps relative to a no-policy baseline scenario), while collateral-based policies exert their impact primarily through reducing the loss-given-default (by 300 bps relative to a no-policy baseline scenario.) In both cases, the effect is much stronger when

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<sup>5</sup> In particular, we use data from the Italian Survey of Household Income and Wealth (SHIW) and the Spanish Encuesta Financiera de las Familias (EFF).

considering the joint implementation of LTV, DSTI and DTI caps. Furthermore, the analysis suggests that borrower-based measures are relatively more effective in containing the risks associated with lower income borrowers which are often associated with higher (looser/riskier) lending standards. Borrower-based measures are also found to increase the quality of bank mortgage portfolios over time and thereby support the capital position of banks. The median increase in the capital ratio across the 19 banking systems in the sample of countries is about 100 bps compared to a no policy scenario. While about 1/5th of the contribution to improved solvency results from the reduction in loan loss provisioning affecting the numerator of the capital adequacy ratio, the rest results from the reduction in risk weighted assets as a result of the decreased credit risk parameters.

Finally, we turn to assessing the effect of credit on economic growth and the business cycle. From a broader macroeconomic perspective, the analysis so far has quantified only the short-run negative effects of macroprudential policy on GDP growth. However, the financial stability benefits from macroprudential policy are expected to exert a positive effect on long term growth to justify macroprudential policy intervention. To explore the role of credit on the business cycle characteristics, we compare its effects on the expansions and on recessions (see Gadea et al. (2020)). The effects of credit on the business cycles are measured by how this difference change according to the level of credit. Using data from 53 countries for an unbalanced panel of quarterly data starting in 1947, we find that, in the two years prior to the onset of recessions, the variation in credit to GDP has a non-linear relation with the size of the cumulation during the recession. Adjusting a mixture of normal distributions, we show that if the variation of credit belongs to the first quartile of the distribution of the data, with an 80% probability, the recession will imply a loss in wealth of 3% of GDP with a 80% probability, and a loss in wealth of 20% of GDP otherwise. On the contrary, being in the fourth quartile imply a loss in wealth of 6% in the mild scenario, which has a probability of 58% and a 42% probability of having a loss of 30%. During expansions, the relation between credit and cumulation is completely different: the duration of expansions depends on the intensity of credit during the expansion periods. Specifically, on average, unconditional to the level of credit, the expected duration of an expansion is close to 25 quarters. If credit is low, such expected duration reduces to 18 quarters while, when expansion has been correctly fuelled by credit, the expansion on average around 35 quarters. Bringing these results together, we find that variation in credit in the third quartile of the distribution implies the maximum amount of cumulation over the cycle. The increase in cumulation is associated with a higher expected GDP growth due to longer expansions that more than compensate the deeper recessions.

In conclusion, we provide a rich set of results on the effectiveness of macroprudential policies in increase the resilience of banks and borrowers and in curbing excessive credit growth when intended. Moreover, we show that financial stability has an impact on long term economic growth through its effect on both the deepness of the recessions and the length of the expansions. The jury is still open on whether macroprudential policy did enough to make the system more resilient prior to the recent Covid-19 pandemic, its first test case, and on whether the macroprudential policy response to the crisis was effective. The experience during the coronavirus pandemic will be of key importance to reflect on potential improvements of the existing macroprudential policy framework. ■

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