Have domestic prudential policies been effective? Insights from bank-level property loan data

Veronica B Bayangos and Jeremy De Jesus[1]

1. Introduction

This study examines the effectiveness of changes in domestic macroprudential policies in restraining the growth of real loan commitments by universal, commercial and thrift banks to the non-financial sector in the Philippines. In recent findings, the use of domestic prudential policies to promote financial stability and prevent the occurrence of financial crises, which in turn prevent output losses associated with macroeconomic and financial volatility and financial crises, has been highlighted. The use of macroprudential tools to promote financial stability has likewise allowed many central banks to keep monetary policy focused on its primary objective of maintaining price stability. This has helped enhance monetary policy's credibility in this area. In turn, central banks have recognised that financial stability policy interacts with and influences banking regulations as well as monetary policy actions, implying that central banks need to consider the extent of policy interactions.

Many studies have defined macroprudential policy as a set of measures that prevent or mitigate systemic risk, either over time or across institutions and markets. There are variations on the national/institutional definitions of what constitutes macroprudential policy, but these often centre around the following theme: the use of instruments or tools that either increase the resilience of the financial system or constrain systemic risks often associated with financial booms. This study covers a more comprehensive set of domestic macroprudential policies classified by instrument, such as instruments related to credit (or asset side instruments), to liquidity, which address the build-up of domestic and foreign currency liquidity risks associated with lending booms, to capital, to banks' liabilities (such as reserve requirements on domestic deposits and deposit substitutes), to the structural aspect or interconnectedness (Orsmond and Price (2016)), and to currency exposures (Bruno et al (2015)). The study then estimates the effectiveness of these policies in curbing the growth of real bank loan commitments to non-financial borrowers acquiring new residential properties using an unbalanced panel data regression for the period from 2014 to 2017.

In the Philippines, a detailed study on the effectiveness of prudential policies on the growth of bank credit is yet to be completed. Most studies in this area include the Philippines as part of bigger cross-country studies. In particular, the latest study by Bayangos (2017) finds that, after controlling for episodes of sterilisation of capital inflows across nine Asian emerging market economies for the period 2004–15, capital

[1] Veronica B Bayangos, Director, Supervisory Policy and Research Department, Bangko Sentral ng Pilipinas (email: vbayangos@bsp.gov.ph). Jeremy De Jesus, Bank Officer IV, Department of Economic Statistics, Bangko Sentral ng Pilipinas (email: jdejesus@bsp.gov.ph). We are grateful for comments by the participants in the 62nd ISI World Statistics Congress, which was held on 19 August 2019 in Kuala Lumpur, Malaysia. The usual institutional disclaimer applies.

inflow restrictions and domestic macroprudential policy measures are effective in curbing overall real bank and housing credit and real house prices. Moreover, monetary policy tightening complements domestic macroprudential policy tightening in restraining movements in real bank credit and real house prices.

This study is broadly related to a growing area of empirical research on financial stability. The empirical literature on the effectiveness of domestic macroprudential policies in dampening credit cycles across economies remains relevant since the Great Financial Crisis (GFC). In recent years, empirical evidence on the efficiency of macroprudential policies in restraining excessive credit growth has expanded to include bank-level and credit registry data. However, credit registry data in many countries, including the Philippines, are limited and confidential. This study uses bank-level data from residential property loan reports involving 101 universal/commercial banks (U/KBs) and thrift banks (TBs).

This study raises five main questions. First, are domestic prudential policies effective in restraining growth of bank loan commitments based on bank-level residential property loan data in the Philippines? Second, do responses to a domestic prudential shock differ by type of bank? Third, do responses to domestic prudential policies vary with monetary policy conditions? Fourth, do responses to domestic prudential policies vary over the business and financial cycles of the Philippines? And fifth, do responses to domestic prudential policies restrict bank riskiness? It should be noted that the third and fourth are additional questions which this paper explores.

This study has three possible contributions to make to the empirical literature. First, it updates Bayangos (2017), who documents a database of domestic prudential measures and changes in monetary policy stance for the Philippines to include changes in prudential limits from the first quarter of 2014 to the fourth quarter of 2017. Second, it develops a new database using data from the quarterly bank reports on the residential real estate price index (RREPI) for the same period. Third, the study uses these databases to examine the effectiveness of both tightening and easing of domestic prudential policies on the growth of real bank loan commitments and the overall quality of bank loan portfolios. It then examines the importance of monetary policy reactions to address changes in real bank loan commitments and in the quality of banks' loan portfolios and the interaction among different domestic prudential policy instruments. This study is the first to adopt this approach for the Philippine data. The rest of the study is organised as follows. Section 2 discusses major developments in the Philippine banking system following the GFC in 2008. Section 3 presents the baseline databases and empirical methodology, while Section 4 highlights the main findings of the paper. Section 5 concludes.

2. The Philippine banking system after the GFC

The aftermath of the GFC in 2008 has confirmed, once again, that globalisation brings increasing exposure to the volatility of international financial markets and to other external shocks. Globalisation exposes emerging market economies to large surges and volatility of capital flows, especially when these are routed through the financial system. An important task for monetary authorities is to stabilise the macroeconomy and financial system as well as to steer economic development in the face of such uncertainties.

In turn, the conduct of monetary policy under uncertainty has received significant attention during the last two decades or so. Discussions around this theme include the institutional design of monetary policy, strategies for operating in the markets and the monetary transmission mechanism. Among these areas, discussions on operational strategies in the markets have been crucial in recent years, with the implementation of flexible inflation targeting (IT) to preserve price stability.

In the Philippines, major components of these operational policies in the markets include reforms to the foreign exchange regulatory framework in 2007 and the formal shift in the monetary operations of Bangko Sentral ng Pilipinas (BSP) to an interest rate corridor (IRC) system in June 2016.

In 2007, BSP announced the implementation of a package of reforms in the foreign exchange (FX) regulatory framework to address the needs of a more globalised economy. Eleven waves of FX liberalisation reforms have been introduced since 2007. In November 2014, Republic Act (RA) No 10641 was approved and provided the legal basis for BSP to regulate and supervise the entry and operation of foreign banks in the country. Moreover, RA No 10574 was implemented to allow infusion of foreign equity into rural banks' capital.[2] The liberalisation of entry requirements for foreign banks is expected to contribute to promoting a more competitive banking environment. There are 29 foreign banks which have been approved and authorised to operate by BSP in the Philippines. In particular, BSP has approved 12 foreign bank applications (10 branches and two subsidiaries) since the implementation of RA No 10641.

The IRC is a system for guiding short-term market rates towards the BSP policy interest rate, which is the overnight reverse repurchase (RRP) rate. The primary aim of adopting the IRC is to improve the transmission of monetary policy. By helping ensure that money market rates move within a reasonably narrow range around the BSP policy rate, the IRC helps to enhance the link between the stance of BSP monetary policy and financial markets and, thereby, impact the real economy.

Domestic liquidity (M3) has expanded since 2007 following the surge in overseas remittances and capital flows. In particular, M3 grew by 65.9% from end-December 2004 to end-December 2007, and by 55.8% from end-December 2007 to end-December 2012. More recently, M3 grew by 68.1% from end-December 2013 to end-December 2018. However, year-on-year growth in M3 has dropped from 31.8% at end-December 2013 to 12.8% at end-December 2016 and further to 9.5% at end-December 2018. Nevertheless, M3 relative to nominal gross domestic product (GDP) climbed from 39.7% in 2004 to 48.9% in 2007, 49.7% in 2012 and 66.8% in 2018. When foreign currency deposits of residents are included, broader M3 (or M4) as a share of nominal GDP rose from 56.8% in 2004 to 57.0% in 2007, 59.2% in 2012 and 78.1% in 2018.

Meanwhile, the total resources of the financial system (including BSP) have also risen. The latest data show that total financial system resources grew by 52.3% from end-December 2013 to end-December 2018. The increase could be traced to the growth in loans, securities and other equities of banks.

[2] Under this law, non-Filipino citizens are allowed to own, acquire or purchase up to 60% of the voting stocks in a rural bank and become members of its Board of Directors.

Moreover, BSP pushed for a broad set of strategic reforms in the financial system to better promote financial stability, preserve the institutional safety and soundness of individual banks, and protect the public.[3] These included, first, the adoption of risk-based supervision to keep up with the growing complexity of the banking business. In turn, BSP gradually redirected its supervisory thrust on the measurement and management of banks' risk exposures. Second, driven by the emergence of complex banking groups and mixed conglomerates, BSP adopted consolidated supervision.

Against these developments, banks' business models in the Philippines have also evolved. The latest data show that the Philippine banking sector comprises 45 U/KBs, 54 TBs, and 472 rural and cooperative banks (R/CBs) with their combined assets approximating the size of the domestic economy. U/KBs are able to underwrite securities and take equity positions in manufacturing, agricultural and other enterprises. These banks are also encouraged to make equity investments, to promote longer-term lending and to inject competition into the financial system. By contrast, TBs and R/CBs, which are largely standalone banks, play a pivotal role in promoting inclusive development, especially in the countryside, by providing credit to the agriculture, forestry and fishing industries.

Moreover, more capital-based measures and disclosure standards have been implemented since 2008 due in part to the implementation of the Basel III requirements. BSP adopted the Basel III capital rules for U/KBs and their subsidiary banks on 1 January 2014. In particular, U/KBs were required to comply with the following new minimum capital ratios: 6.0% Common Equity Tier 1 (CET1), 7.5% Tier 1, and 10.0% total capital adequacy ratios (CARs). BSP also adopted the capital conservation buffer (CCB) of 2.5% effective 1 January 2014, the leverage ratio of 5% effective 31 July 2018 and the framework on the countercyclical capital buffer on 6 December 2018. However, simpler standards were applied to TBs and R/CBs that are not subsidiaries of commercial banks. Finally, BSP adopted the international framework for dealing with domestic systemically important banks (D-SIBs), requiring staggered implementation of higher capital buffers starting on 1 January 2017 and moving towards full compliance by 1 January 2019.[4] As a result, the latest data in 2019 show that banks' capitalisation has continued to build up, with capital ratios well above the minimum thresholds set by BSP (10%) and the Bank for International Settlements (8%).

These measures were complemented by an increase in the risk weight on non-deliverable forward (NDF) transactions in 2013, and the conduct of a real estate stress test (REST) on banks' real estate exposures starting from 2014. Moreover, in 2014 BSP approved the adoption of major enhancements to the regulations governing credit risk-taking activities of banks and non-banks with quasi-banking functions (B/NBQBs). Basically, the amendments strengthened credit risk management in these financial institutions in line with global best practices and the Basel Core Principles for Effective Banking Supervision. In 2015, BSP approved the enhancements to the reporting requirements for banks on motor vehicle loans and salary loans.

Meanwhile, liquidity standards were adopted to mitigate systemic risk. To promote short-term resiliency of the liquidity risk profile of banks, a liquidity coverage

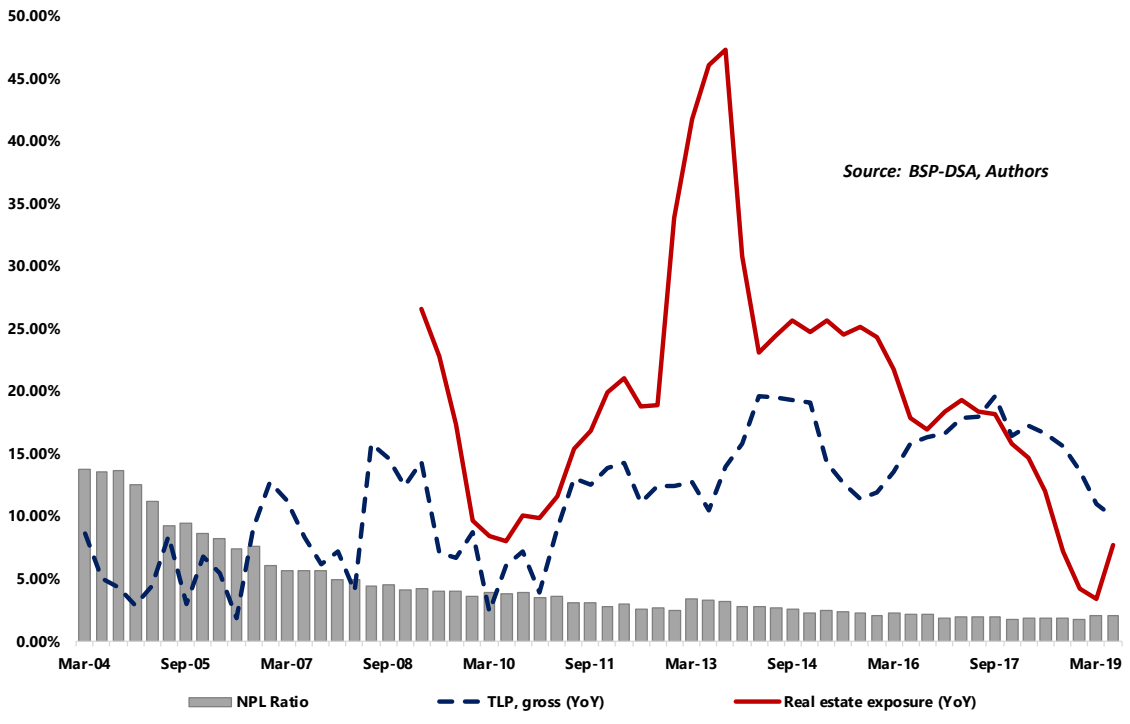
[3] These efforts are generally guided by the *Core Principles for Effective Banking Supervision* issued by the Basel Committee on Banking Supervision (BCBS).

[4] The framework on D-SIBs was recently enhanced, with staggered implementation of capital buffers by 1 January 2022.

ratio (LCR) rule was issued in March 2016. A net stable funding ratio (NSFR) rule was issued in June 2018 to promote resiliency over the longer term by creating additional incentives for banks to fund their activities from more stable sources. In March 2019, standalone TBs, R/CBs and NBQBs were required to submit minimum liquidity ratio (MLR) reports.

The significant increase in the financial system's resources was driven by a rapid expansion in banks' total loan portfolio starting at end-June 2011 (Figure 1). Year-on-year growth of banks' total loan portfolio climbed from 13.0% at end-June 2011 to 19.5% at end-March 2014 and further to 19.6% at end-September 2017, before it dropped to 10.1% at end-June 2019. Meanwhile, consumer loan growth rose from 12.4% at end-September 2010, reached its peak at end-March 2015, dropped to 20.6% at end-September 2016 and went further down to 11.7% at end-June 2019. Real estate loans continued to drive the expansion in real estate exposure of banks, taking up 85.4% of the expansion. Year-on-year growth of banks' real estate exposure reached its peak at 47.3% at end-September 2013. This growth dropped to 21.8% at end-March 2016 and further to 7.7% at end-June 2019.

Figure 1. Growth of Outstanding Bank Loans, Bank Real Estate Exposure and NPL Ratio



As banks continue to adhere to sound credit underwriting standards set by BSP through the issuance of Guidelines on Sound Credit Risk Management Practices in October 2014, loan quality remains satisfactory, with the NPL ratio of banks roughly around 2.1% during the past five years (Figure 1). Likewise, the banking system has also continued to set aside adequate provisioning for credit losses, with the NPL coverage ratio still above 100%. The NPL definition was also aligned with international standards as BSP adopted Philippine Financial Reporting Standard (PFRS) 9 starting on 1 January 2018 that prescribed the use of an expected credit loss model.

Liquidity is a strength of Philippine banks. The banking system maintains sufficient buffers to meet liquidity and funding requirements as the LCR is way above

BSP's current regulatory threshold of 100%. In particular, banks hold sufficient high-quality liquid assets (HQLAs) that can be easily converted into cash to service liquidity requirements over a 30-day stress period.

Banks have also taken advantage of the growing and deepening domestic capital markets, opting to increase their issuances of fixed income securities, including bonds and long-term negotiable certificates of deposit (LTNCDs) to better manage their funding costs. This increase can be attributed to the enhanced rules for the issuance of bonds and commercial papers.

3. Baseline databases and empirical methodology

3.1 Data

This study compiles and constructs three unique sets of databases for the Philippines on bank-level loan commitment, domestic prudential policies and monetary policy actions.

Measure of bank-level loan commitment

This database compiles the volume or number of loans granted for purchases of new residential properties, the average acquisition cost of the property, the appraised value of the residential unit, the appraised value of the lot, the location of these properties, the type of residential property – classified into single-detached, duplex, apartments and condominiums – from 101 banks. The focus of this database is the compilation of the average acquisition cost of residential property as an indicator of the commitment of banks to grant loans based on the acquisition cost of the property. The data are generated from the quarterly report submitted by U/KBs and TBs on all residential real estate loans (RRELs) granted for the generation of the RREPI for the Philippines.

Database on domestic prudential policies

This database includes all the domestic prudential measures adopted by BSP, classified by instrument. For example, *capital-related measures* aim to strengthen banks' ability to absorb risks by adjusting their capital and provisioning requirements. These measures include Basel III capital requirements, adjustments in specific risk weights and provisioning requirements. *Liquidity-related instruments* address the build-up of domestic and foreign currency liquidity risks associated with lending booms. These instruments include the LCR and intraday liquidity requirements. *Structural* or *interconnectedness instruments* aim to address vulnerabilities from interconnectedness and limit contagion. These include interbank exposure limits and additional loss-absorbing capacity for systemically important banks. *Asset-related measures* (or *credit-related instruments*) place restrictions or caps on the amount that can be lent by banks such as the maximum loan-to-value (LTV) ratio and administrative measures in relation to credit or credit growth. *Reserve requirements* are imposed against bank deposits and deposit substitutes. Finally, *currency-related instruments* place limits on net open currency positions and foreign currency lending by banks. The first category captures the measures that are intended to preserve the resilience of the banking system. These include capital- and liquidity-based measures as well as structural or interconnectedness measures. The second category includes

those measures that are expected to address excessive cyclical swings. These include asset side instruments, reserve requirements on banks and currency-related instruments. These two categories are then aggregated to capture both the measures designed to promote banking system resilience and those designed to contain excessive cyclical movements.

Moreover, each policy action in the database is classified into either a tightening or loosening measure. Such a classification is used to verify the extent of asymmetric effects of tightening and loosening measures. This study follows the approach adopted by Kuttner and Shim (2013) and McDonald (2015) in estimating the magnitude of the effectiveness of each instrument. A one-year window (or a four-quarter effect) is used to account for the most appropriate lag effects in the implementation of a tightening or loosening of domestic macroprudential policy. A separate index is constructed for each type of prudential instrument. The idea is that a macroprudential policy tightening dummy variable takes the value of +1 if a prudential instrument is tightened during a quarter, and 0 otherwise. For loosening measures, a macroprudential policy loosening dummy variable takes the value of +1 if a prudential instrument is loosened during a quarter, and 0 otherwise. The database includes a measure of the intensity of implementation of prudential policy by considering the number of times a policy is implemented. The average of these measures is also used.

The study compiles data on the use of domestic prudential instruments. The database shows that the most frequently used macroprudential measures from 2002 to the fourth quarter of 2017 were currency instruments (41.8% of the total), followed by capital-based instruments (29.5%), liquidity-based instruments (13.1%), asset side instruments (6.1%), and interconnectedness instruments (1.2%). During the same period, a total of 108 tightening measures and 102 loosening measures were recorded. Thirty-four measures were classified as being neutral, largely pertaining to changes in reporting requirements. On balance, BSP implemented more tightening than loosening measures. In particular, a majority of the tightening measures were capital- and liquidity-related measures for Basel III compliance, while most of the loosening measures were currency-related measures implemented in connection with the liberalisation of BSP's FX framework starting in 2007. Similarly, there were more measures relying on resilience-based instruments (56.3% of the total) than on cyclical-based instruments (43.7%) from the first quarter of 2014 to the fourth quarter of 2017. Of the total measures adopted, 44.3% were tightening measures, 41.8% loosening measures and 13.9% neutral measures.

Measures of monetary policy actions

This database compiles and updates monetary policy actions by BSP based on the Bayangos (2017) database to include Term Deposit Facility (TDF) rates under the IRC system introduced in June 2016. From this database, we construct two indexes of tightening and loosening policy actions, respectively. Similar to the previous specifications for macroprudential measures, for each change in the central bank official policy rate, a monetary policy tightening dummy variable takes the value of +1 if a hike in policy rate is accompanied by a rise in TDF rates (hence the monetary policy stance is tight) and 0 otherwise. A monetary policy loosening dummy variable takes the value of +1 when the reduction in policy rate is accompanied by a drop in TDF rates (hence the monetary policy stance is loose) and 0 otherwise. The database also includes a measure of the intensity of monetary policy actions by considering

the number of times a policy is implemented. The average of these measures is also used.

Vector of controls

This data set includes macro-financial indicators and bank-specific characteristics used in the study. These include changes in real GDP, inflation, real overseas Filipino remittances, the monetary policy rate, the TDF rate, the bank lending rate, the neutral interest rate, the output gap, the bank credit-to-GDP ratio gap, the nominal peso-dollar rate and real effective exchange rates. The bank-specific characteristics in the data set include the size of a bank (or total resources in real terms), the liquidity ratio defined as liquid assets relative to total assets, capital ratios including the total CAR and the ratio of Common Equity Tier 1 to total assets, funding composition using outstanding deposits relative to total liabilities, the profitability of banks using real net interest income, and the quality of bank loans measured by the NPL ratio, non-performing asset ratio and non-performing coverage ratio.

3.2 Empirical analysis

The empirical analysis includes two parts. The first part estimates the impact of each prudential tool or measure on bank lending to household borrowers and on bank risk-taking activities measured by banks' NPL ratios. The second looks at the impact of prudential tools on monetary policy conditions and financial cycles. While the first part takes the baseline specification proposed by the BIS, the second takes the following specifications.[5]

Do responses to macroprudential policies vary with monetary policy conditions?

In this specification, additional interaction terms are introduced which combine macroprudential policy indicators and monetary policy actions (measured by the neutral interest rate (NRR) based on the Taylor rule).[6] This is seen in equation (1) as

$$\begin{aligned}\Delta logLoans_{b,t} = \; & a_b + \sum_{j=1}^{k} \gamma_j \Delta logLoans_{b,t-j} + \sum_{j=1}^{k} \beta_j \, \Delta MaP_{t-j} + \\ & \sum_{j=0}^{k} \vartheta_j \, r_{t-j} + \sum_{j=1}^{k} \rho_j \, \Delta MaP_{t-j} \; * \; r_{t-j} \; + \sigma X_{b,t-1} + \\ & \theta macrovars_{b,t} + \varepsilon_{b,t}\end{aligned} \tag{1}$$

Following Bruno et al (2017), equation (1) estimates the effectiveness of macroprudential tools when changes in monetary policy push in the same or opposite direction.[7] The test is on the overall significance of $\sum_{j=1}^{k} \rho_j$.

Do responses to macroprudential policies vary over business and financial cycles?

[5] For the detailed baseline specification, refer to the article by Cantú et al in this volume.

[6] The neutral interest rate (NRR) is derived as NRR = (10-year average of real one-year secondary rates) − ((real one-year secondary rates − real five-year secondary rates) − (real one-year secondary average − real five-year secondary average)).

[7] In the estimation of $\sum_{j=0}^{k} \vartheta_j \, r_{t-j}$, the contemporaneous impact is considered.

In this specification, additional interaction terms are included which combine macroprudential policy indicators and real GDP growth (measured by the output gap or the difference between actual real GDP growth and the average output gap from four approaches).[8] This is seen in equation (2) as

$$\begin{aligned}\Delta logLoans_{b,t} = \; & a_b + \sum_{j=1}^{k} \gamma_j \Delta logLoans_{b,t-j} + \sum_{j=1}^{k} \beta_j \, \Delta MaP_{t-j} + \\ & \sum_{j=0}^{k} \vartheta_j \, \Delta logGDP_{t-j} + \sum_{j=1}^{k} \mu_j \, \Delta MaP_{t-j} \; * \; \Delta logGDP_{t-j} \; + \\ & \sigma X_{b,t-1} + \theta macrovars_{b,t} + \varepsilon_{b,t}\end{aligned} \tag{2}$$

The goal of this exercise is to determine the possible presence of endogeneity between the output gap and macroprudential tools. For example, the effects of these tools may be higher when the output gap has widened or vice versa. The test is on the overall significance of $\sum_{j=1}^{k} \mu_j$. In this study, a measure of the financial cycle using the credit-to-GDP gap or the difference between the actual credit-to-GDP ratio and its trend is used in the regression model.[9] In the empirical analysis, this study also considers separate consumer loans-to-GDP ratios for U/KBs and TBs.

Estimation method

In this study for the Philippines, the parameters in the models are estimated using unbalanced panel generalised method of moments (GMM) approach, which is a more appropriate empirical methodology to address the endogeneity between real bank loan commitments and NPLs with bank-specific characteristics and macroeconomic indicators. To handle cross section fixed effects, data are transformed into first difference. Moreover, residuals are clustered by banks.

Robustness checks

Diagnostic tests are used to check for normality of residuals across equations at 1%, 5% and 10% levels of significance. The results are broadly robust against normality tests and different specifications of dependent and independent variables. The residual tests show that all estimated coefficients are significant and that the instruments used are not correlated with the residuals (using a Hansen test). The standard errors of regression are robust and the errors in the first difference regression exhibit no second-order serial correlation (using a serial correlation test).

4. Results

The regression results reported in Tables 1–4 reveal important findings. First, a tightening of domestic prudential instruments, in particular those tightening measures that are meant to preserve banking system resilience, is effective in curbing growth of real bank loan commitments to borrowers for acquiring new residential

[8] (1) production function approach, (2) structural vector autoregression (SVAR), (3) macroeconomic unobserved components model (MUCM), and (4) Hodrick-Prescott (HP) filter.

[9] Credit-to-GDP gaps are derived, in line with the Basel III guidelines for the countercyclical capital buffer, as the deviations of the credit-to-GDP ratios from their (real-time) long-term trend. The consumer loans-to-GDP ratio was also used in the estimation.

properties. The results show that tightening macroprudential policies has a direct negative impact that can last up to four quarters on real bank loan commitments to borrowers based on the real acquisition cost of new properties from March 2014 to December 2017. Importantly, the results reveal that the impact of tightening domestic macroprudential policies varies with both business and financial cycles. Overall, these results confirm other studies' findings that prudential policy tightenings are likely to be effective.

However, looking at the relationship between the index of macroprudential policies and the gap between the actual total CAR and the requirement of 10%, we note that the relationship between the two is negative in all specifications. This relationship consistently holds even when we use the ratio of Common Equity Tier 1 to total assets. This is also consistent with Layaoen and Domantay-Mailig (2018),[10] who find that following the adoption of Basel III regulations, most U/KBs and their subsidiary TBs in the Philippines have become more risk-sensitive. In general, these banks adjust their regulatory capital ratios through changes in the level of capital (ie, capital stock, additional paid-in capital, retained earnings and undivided profits). In addition, U/KBs and their subsidiary TBs have less pressure to adjust their risk-weighted exposures but are more inclined to maintain a reasonable balance between changes in the size of assets and capital.

Moreover, banks' funding costs[11] in general dropped from March 2014 to December 2017, while the gap of the total CAR and the 10% regulatory threshold has broadly climbed and settled at an average of 5.5 percentage points. There was a slight uptick in banks' funding costs following the rise in BSP's overnight policy rate in 2018. Such a negative relationship between bank funding costs and higher capital requirements implies that higher capital requirements could increase investors' confidence in the banking sector, by supporting banks' resilience as well as their ability to increase lending.

In a second important finding, this study highlights the bigger negative impact of tightening prudential measures on real bank loan commitments to maintain resilience of U/KBs than that of TBs, an indication of the presence of a bank lending channel.

Third, real bank loan commitments to household borrowers are driven by bank deposits (relative to total liabilities), the liquidity position and capital adequacy (gap relative to the regulatory threshold). Moreover, monetary policy tightening complements prudential policy tightening in restraining the growth of real bank loan commitments.

Meanwhile, a real exchange rate appreciation reacts to tightening of prudential measures. This finding is significant at the 5% level and across specifications of real effective exchange rates.[12] In particular, the real effective exchange rate rose by 5.6% year-on-year in 2015 but dropped by 3.6% in 2016 and further by 4.2% in 2017. In

[10] Layaoen and Domantay-Mailig (2018) examine U/KBs' motives for maintaining "excess" capital using quarterly panel data for 34 U/KBs (including 14 foreign banks) in the Philippines from December 2012 to June 2017.

[11] Defined as the ratio of annualised interest expense and average interest-bearing liabilities.

[12] In the exercise, the following three measures of real effective exchange rate (REER) were used: the overall REER (Trading Partners Index), the Trading Partners Index – Advanced Countries (TPI-A) and the Trading Partners Index – Developing Countries (TPI-D).

the earlier literature, a local currency appreciation typically leads to a decline in net exports and, consequently a fall in real output. In recent empirical studies, however, a currency appreciation is often associated with buoyant economic activity and rapid credit growth following the growing influence of global financing conditions. An appreciation of the local currency can lead to the perception that risks have decreased, encouraging borrowers to increase their leverage and, in turn, their vulnerability to subsequent shocks. Such a phenomenon has become known as the risk-taking channel of currency appreciation.[13]

Fourth, in general, restricting prudential measures limits risk-taking activities by banks. The results show a negative impact of tightening domestic macroprudential measures on the ratio of NPLs to total loans. It should be noted that as part of BSP's continued assessment of the quality of the total bank portfolio and bank exposures to the real estate sector, supervising BSP departments concerned are closely monitoring actions taken by banks to manage their exposure to the real estate sector effectively. This finding is consistent with the behaviour of the NPL coverage ratio, which has improved for both U/KBs and TBs since end-December 2016.

Meanwhile, the results reveal that the impact of both the business cycle (output gap) and financial cycle (credit-to-GDP ratio) on the movements of the NPL ratio is positive and significant. However, when prudential measures are adopted, the impact on the NPL ratio becomes negative.

In general, the results indicate that despite the relative rise in the size of bank loan portfolios, banks have become more risk-sensitive in their lending behaviour as the quality of loans (measured by the NPL ratio and NPL coverage ratio) has remained relatively stable amid adverse shocks to the macroeconomic environment.[14] Simply put, banks have not just lent more, but lent to capable borrowers as well.

5. Conclusion

This study examines the effectiveness of changes in a comprehensive measure of domestic prudential policies in restraining the growth of real loan commitments of U/KBs and TBs to borrowers for new purchases of residential property and the riskiness of these banks' loan portfolios using a panel data regression from the first quarter of 2014 to the fourth quarter of 2017. There are improvements that the study intends to pursue moving forward. From the technical point of view, the study intends to explore the use of ageing of NPLs of U/KBs and TBs in assessing the extent of risk-taking activities by banks and to examine the impact of domestic macroprudential policies on net interest margins of banks. Moreover, the study aims to use difference-in-differences analysis to check the robustness of the results and to assess the effects of domestic macroprudential policies on the supply of loans in greater detail.

The use of credit registry data will be a future research area to assess the impact of domestic macroprudential policies on household and firm credit risk. Matching firm balance sheet information with credit registry data could help us to fill this gap.

[13] See Bruno and Shin (2015a,b) and Cerutti et al (2014) with special focus on the banking sector, and Sobrun and Turner (2015) and Feyen et al (2015) for an extension to bond markets.

[14] See Cachuela (2018), who reports impulse response functions from a panel VAR using bank-level data on 53 banks (36 U/KBs and 17 TBs) covering the period from the first quarter of 2012 to the fourth quarter of 2017.

The approval into law of the creation of a Credit Information System on 31 October 2008, known as Republic Act No 9510, "An act establishing the Credit Information System and for other purposes" and the establishment of the Credit Information Corporation (CIC) to address the need for a comprehensive, centralised and reliable credit information system is indeed a significant development. The main purpose of the CIC is to strengthen the submission of basic credit data, both positive and negative credit information in the entire data subject provided by submitting entities.

Nevertheless, the study's findings have important policy implications. First, the finding that tightening domestic macroprudential policies is effective in reducing the growth of real bank loan commitments underscores the critical role for structural policies to enhance the capacity of the economy to cope with volatility, along with improved regulation and supervision of the financial sector.

Second, given the influence of a real effective exchange rate appreciation in driving growth in real loan commitments, there is a need for more in-depth understanding of exchange rate dynamics, their impact on the economy and the effectiveness of policy instruments, in both the short and longer term, as well as the risk-taking channel of currency appreciation.

Third, an important point to consider is the role of domestic macroprudential measures in cross-border issues. The cross-border effects of prudential measures can be both positive and negative. The positive effect concerns the public good aspect of financial stability, wherein actions enhancing financial stability in one country also benefit others. Policies that prevent the build-up of systemic risk in one jurisdiction may reduce the probability of crises that subsequently spread elsewhere.

Finally, the finding that tightening of domestic macroprudential policies restricts risk-taking activities by banks underscores the role of bank supervision and the resulting macroprudential policy in managing risks to banking sector stability in the Philippines. Importantly, BSP, cognisant that a "one size fits all" framework is not appropriate for all banks, adheres to the principle of proportionality in the adoption and application of certain prudential regulations.

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Annex: Tables

Table 1

Dep var:	ΔIn(Loans)		NPL	
	(1)	(2)	(3)	(4)
Lag Dep Var	–0.360***	–0.424***	0.583***	0.603***
ΔMaP Dummy: −1, 0, +1	–0.108***	–0.050*	–0.036***	–0.028***
ΔMaP x ln(Total assets, t-1)		–0.272		0.050**
ΔMaP x Liquidity ratio (t-1)		–0.006***		–0.011***
ΔMaP x Capital ratio (t-1)		–0.451*		–0.128***
ΔMaP x Deposit ratio (t-1)		–0.588**		0.213***
ΔReal effective exchange rate (t)	0.323*	0.158**	–0.443***	–0.437***
Liquidity ratio (t-1)	0.093	0.047	–0.036***	–0.184***
Capital ratio (t-1)	–0.157*	0.047	–0.049***	0.105***
Deposit ratio (t-1)	–0.649	0.047	–0.185***	–0.567***
Time period	Q1 2014–Q4 2017			
Number of banks	56	56	56	56
Residual clustered by	bank-level			
Observations	530	530	530	530
Bank fixed effects	Y	Y	Y	Y
R-squared	0.336	0.389	0.879	0.889
Adjusted R-squared	0.302	0.357	0.783	0.799

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 2

Dep var:	Δln(Loans)		NPL	
	(1)	(2)	(3)	(4)
Lag Dep Var	–0.439***	–0.447***	–0.572***	–0.112*
ΔMaP_cyc Dummy: −1, 0, +1	–0.266*	0.193*	–0.026***	–0.087***
ΔMaP_res Dummy: −1, 0, +1	–0.350***	–0.642*	–0.009***	–0.009***
ΔMaP_cyc x ln(Total assets, t-1)		–0.392		0.042
ΔMaP_cyc x Liquidity ratio (t-1)		–0.246***		–0.081***
ΔMaP_cyc x Capital ratio (t-1)		–0.287***		–0.401***
ΔMaP_cyc x Deposit ratio (t-1)		0.788		–0.012***
ΔMaP_res x ln(Total assets, t-1)				0.101***
ΔMaP_res x Liquidity ratio (t-1)		–0.294*		0.009***
ΔMaP_res x Capital ratio (t-1)		–0.817*		–0.005
ΔMaP_res x Deposit ratio (t-1)		–0.165**		–0.017***
ΔReal effective exchange rate (t)	0.323*	0.250	0.087***	0.035***
Liquidity ratio (t-1)	–0.090*	0.417*	–0.133***	–0.001*
Capital ratio (t-1)	–0.409**	–0.225***	0.170***	0.170***
Deposit ratio (t-1)	–0.175**	0.540*	–0.574***	–0.007
Time period	Q1 2014–Q4 2017			
Number of banks	56	56	56	56
Residual clustered by	bank-level			
Observations	530	530	530	530
Bank fixed effects	Y	Y	Y	Y
R-squared	0.311	0.322	0.657	0.781
Adjusted R-squared	0.3	0.2989	0.611	0.7

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 3

Dep var:	ΔIn(Loans)		NPL	
	(1)	(2)	(3)	(4)
Lag Dep Var	–0.629***	–0.341**	0.017***	0.024***
ΔMaP_eas Dummy: +1, 0	0.650	0.156**	0.002***	0.033***
ΔMaP_tigh Dummy: +1, 0	–0.285**	–0.017***	–0.008***	–0.014***
ΔMaP_eas x ln(Total assets, t-1)		–0.1698		–0.014
ΔMaP_eas x Liquidity ratio (t-1)		0.156**		0.005***
ΔMaP_eas x Capital ratio (t-1)		0.639**		0.134***
ΔMaP_eas x Deposit ratio (t-1)		–0.473**		–0.016***
ΔMaP_tigh x ln(Total assets, t-1)		–0.126**		–0.202**
ΔMaP_tigh x Liquidity ratio (t-1)		–0.221**		–0.036***
ΔMaP_tigh x Capital ratio (t-1)		–0.203**		–0.234***
ΔMaP_tigh x Deposit ratio (t-1)		0.127**		–0.139***
ΔReal effective exchange rate (t)	0.032***	0.054***	0.027**	0.002*
Liquidity ratio (t-1)	–0.175***	–0.664**	–0.037***	–0.019***
Capital ratio (t-1)	0.063**	–0.414***	0.306***	0.234***
Deposit ratio (t-1)	–0.134***	0.114*	–0.144***	–0.087***
Time period	Q1 2014-Q4 2017			
Number of banks	56	56	56	56
Residual clustered by	bank-level			
Observations	530	530	530	530
Bank fixed effects	Y	Y	Y	Y
R-squared	0.331	0.343	0.823	0.912
Adjusted R-squared	0.322	0.339	0.8	0.867

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 4

Eco var:	*r*				Δln(GDP)				Credit gap			
Dep var:	Δln(Loans)		NPL		Δln(Loans)		NPL		Δln(Loans)		NPL	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lag Dep Var	–0.443***	–0.423***	–0.455***	–0.406***	–0.446***	–0.421***	0.598***	0.012***	0.225**	0.315***	0.097*	0.772**
ΔMaP Dummy: −1, 0, +1	–0.054**	0.880	–0.539***	–0.694***	–0.213*	–0.452***	0.007***	–0.009***	–0.002***	–0.166**	–0.010***	–0.872**
Eco Var	0.257**	0.374	–0.144**	0.132	–0.087**	–0.027	0.002***	–0.134***	0.147**	0.242***	0.304**	0.329***
ΔMaP x Eco Var	–0.699**	0.003**	–0.044***	–0.068*	–0.036**	–0.001*	0.353*	–0.339**	–0.626***	–0.111***	–0.359***	–0.136**
ΔREER (t)		0.249***		0.132***		0.096*		0.151***		0.268***		0.353**
Liquidity ratio (t-1)	0.482**	0.850***	0.125*	0.365	–0.042***	0.311*	–0.057***	–0.034***	–0.066***	0.144***	–0.118***	0.198*
Capital ratio (t-1)	0.223***	0.297*	0.364**	–0.119**	–0.633***	0.182	0.363***	0.635***	0.801***	–0.254**	0.503***	–0.251**
Deposit ratio (t-1)	–0.510*	–0.010	–0.119*	0.576**	–0.004***	–0.053*	–0.124***	–0.06***	–0.224***	0.116**	–0.003***	0.101**
Time period	Q1 2014-Q4 2017											
Number of banks	56	56	56	56	56	56	56	56	56	56	56	56
Residual clustered by	bank-level											
Observations	530	530	530	530	560	560	530	530	530	530	530	530
Bank fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.478	0.521	0.31	0.409	0.339	0.451	0.899	0.939	0.911	0.923	0.889	0.854
Adjusted R-squared	0.432	0.472	0.282	0.389	0.311	0.426	0.812	0.898	0.834	0.899	0.845	0.823

The independent term for *r* is Δ*r*. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.