Have Domestic Prudential Policies Been Effective: Insights from Bank-Level Property Loan Data

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Abstract

The study examines the effectiveness of domestic prudential policies in restraining growth of real bank loan commitments and in preserving the quality of bank loans in the Philippines using panel bank data regression from the first quarter of 2014 to the fourth quarter of 2017. The study introduces three novel sets of database. First, the database includes measures of tightening and loosening of domestic prudential policies in the Philippines, by instrument, such as, credit-related instruments, liquidity-related instruments, capital-related, interconnectedness instruments, changes in banks' reserve requirements against domestic deposits and deposit substitutes, and currency-related instruments. These instruments are in turn classified into those that are adopted to preserve the banking system's resilience and to address cyclical movements. Another database documents changes in monetary policy actions using data on the Bangko Sentral ng Pilipinas' (BSP) overnight policy rate and its monetary operations rates under the Interest Rate Corridor system. The third database compiles and records the volume of loans granted by banks for new purchases of residential properties as well as the average acquisition cost of the property from the Real Property Price Index Report.

Following diagnostic and robustness checks, the study reveals important findings for the BSP. First, tightening of domestic prudential policies, particularly those tightening measures meant to preserve resilience of the banking system are effective in curbing growth of real bank loan commitments to borrowers for acquiring new residential properties. Second, this study highlights the bigger negative impact of tightening prudential measures on real bank loan commitments by universal and commercial banks compared to thrift banks. Third, the share of bank deposits to total liabilities, liquidity position and capital adequacy gap are important drivers of growth in real bank loan commitments to borrowers. Fourth, restricting both instruments meant to promote resilience of banking system and to address cyclical movements limits weakening of bank loan quality, with the latter type of instruments having bigger negative impact. Fifth, tightening of domestic prudential policies varies with monetary policy conditions and over the business and financial cycles in the Philippines.

Table of Contents

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1.   Introduction

The study examines the effectiveness of changes in comprehensive domestic macroprudential policies in restraining growth of real loan commitments by universal, commercial and thrift banks to non-financial sector in the Philippines. In recent findings, the use of domestic macroprudential policies (MPPs) to promote financial stability and prevent the occurrence of financial crisis, 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 maintaining price stability. In turn, central banks recognize that financial stability policy interacts and influence banking regulations as well as monetary policy actions, implying that central banks need to take into account 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 hover around these themes - the use of instruments or tools that either increase the resilience of the financial system or constrain systemic risks that are often associated with financial booms.[2] This study covers a more comprehensive set of domestic macroprudential policies classified by instrument, such as those related to credit (or asset-side instruments) which place restrictions on the amount that can be lent by banks, credit or credit growth (Boar et al 2017); liquidity which address the build-up of liquidity and

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foreign-exchange risks associated with lending booms; capital which aim to strengthen banks' ability to absorb risks; banks' reserve requirements on domestic deposits and deposit substitutes; structural or interconnectedness which aim to address vulnerabilities from interconnectedness and limit contagion (Orsmond and Price 2016); and currency (Bruno et al 2015), which place limits on net open currency positions and foreign currency lending of banks. This study then estimates the efficiency of these policies in curbing growth of real bank loan commitments to non-financial borrowers who are acquiring new residential properties using an unbalanced panel data regression from 2014 to 2017.

Importantly, such an analysis should also shed some explanation on the interaction between domestic macroprudential policies and monetary policy. For example, there is considerable, though not undisputed, evidence supporting the view that search for yield in a low interest rate environment contributed to the build-up of the financial crisis – this is the so-called risk-taking channel of monetary policy. This channel could be particularly relevant when economic agents anticipate that the low rate environment will persist or that monetary policy will always be eased in case of financial market stress. However, domestic macroprudential policies could also influence the transmission of monetary policy impulses. For instance, changes in the maximum LTV or debt-service-to-income (DSI) ratios could alter the supply of lending and, therefore, consumption decisions. Moreover, by changing credit conditions, domestic macroprudential policies could also affect the relevant real interest rate, modifying indirectly the monetary policy stance, even in the absence of any direct policy rate changes.

Moreover, the analysis in this study may help reveal insights into the discussions on the impact of microprudential regulations on domestic bank lending. Buch et al (2017) argued that some studies specifically examined the prudential policy spillovers from the perspective of a specific country and focused on domestic lending. In particular, Aiyar et al (2014) examined the impact of the spillovers that arise when an instrument covers domestic banks but is not applied to the branches of foreign banks operating in the domestic market. The same study found that spillovers have weakened policy effectiveness in the United Kingdom.

In the Philippines, a detailed study on the effectiveness of the use of prudential policies on the growth of bank credit is yet to be completed. Most of the studies are part of a bigger study or across jurisdictions. In particular, the latest study by Bayangos (2017) found that after controlling for episodes of sterilization of capital inflows across nine Asian emerging market economies for the period 2004-2015, capital inflow restrictions and domestic macroprudential policy are effective in curbing overall real bank and real housing credit and real house prices. Moreover, monetary policy tightening complements tight domestic macroprudential policy in restraining movements in real bank credit and real house prices.

There is a need to expand the analysis to include the impact of prudential policies on bank lending to households using loans granted. The latest available data show that lending activities remain robust as total bank loan portfolio grew by 17.3% year-on-year as of end-March 2018. Meanwhile, the share of loans for household consumption to TLP is around 11.1%. Demand for consumer loans (CLs) continued to rise, with residential real

estate loans capturing the largest share of consumer loans at 40.3%. Demand for condominium units and housing units drove the growth in residential real estate loans. In particular, loans used to acquire condominium units posted the second highest year-on-year growth at 24.1% while maintaining the lowest non-performing loan ratio among all housing segments at 2.3%. Factors driving such growth include strong domestic growth prospects over the medium-term, increased investment in public and private construction fuelled by the Build Build Build Program by the Government, firm capacity utilization of the manufacturing industry[3], and business and consumer optimism which in turn requires banks to expand client base, invest in technology and develop new products.[4] These factors are consistent with the results of the Banking Sector Outlook Survey for the first semester of 2018.

In terms of loans granted, total residential real estate loans (RRELS) granted in the first quarter of 2018 declined by 5.4% compared to the previous year. On a quarterly basis, total RRELs granted also declined by 16.3% compared to the fourth quarter of 2017. By type of housing unit, 48.9% were used for the acquisition of condominium units, followed by single detached units and townhouses at 43.2% and 7.6%, respectively.

Indeed, domestic macroprudential instruments are being more widely used in many empirical setting. It is then insightful to accumulate empirical findings and analyze the effectiveness of domestic macroprudential measures on restricting excessive credit growth as well as the interaction among domestic macroprudential policies, including microprudential limits, and changes in monetary policy instruments.

This study raises five main questions:

First, are domestic prudential policies effective in restraining growth of bank loan commitments using 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 over monetary policy conditions? ,

Fourth, do responses to domestic prudential policies vary over financial cycles of the Philippines?, and

Fifth, do responses to domestic prudential policies restrict bank riskiness?

This study has three possible contributions to empirical literature. First, this study updates Bayangos (2017) study that documents a database of domestic macroprudential measures and changes in monetary policy stance for the Philippines to include changes in microprudential limits from the first quarter of 2014 to the fourth quarter of 2017. There are good reasons why the study uses the Philippines as the country case. Many studies have

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[3] Latest data show that the Purchasing Managers' Index remained above the 50 percent ideal threshold.
[4] See Bayangos, Veronica (2018), "Implementation of Macroprudential Policies in the Philippines: Have These Been Efficient", presentation during the SEACEN Course on Financial Cycles and Crises on 14 September 2018, BSP.

observed that following the lessons during the 1997-1998 Asian Financial Crisis, Asian central banks, including the Philippines, have the experience in implementing both micro and macro prudential policies. Another reason is that similar to most central banks in emerging Asia, the Bangko Sentral ng Pilipinas (BSP) continues to be responsible for banking supervision; hence, is required to maintain stability of the financial system using macroprudential and supervisory tools.

In particular, the database includes measures of tightening and loosening of domestic macroprudential policy by instrument, such as, credit-related instruments or asset-side instruments which place restrictions or caps on the amount that can be lent by banks, credit or credit growth (Boar et al 2017); liquidity-related instruments which address the build-up of liquidity and foreign-exchange risks associated with lending booms; capital-related measures which aim to strengthen banks' ability to absorb risks; changes in banks' reserve requirement ratio against domestic deposits and deposit substitutes; structural or interconnectedness instruments which aim to address vulnerabilities from interconnectedness and limit contagion (Orsmond and Price 2016); and currency-related instruments (Bruno et al 2015), which place limits on the net open currency positions and foreign currency lending of banks.

Another database documents changes in monetary policy actions using data on the Bangko Sentral ng Pilipinas' (BSP's) overnight policy rate, monetary operations rates under the Interest Rate Corridor (IRC) system such as the new Term Deposit Facility rates.

Second, it develops a new database using data from the quarterly bank reports on the Residential Real Estate Price Index (RREPI) from the first quarter of 2014 to the fourth quarter of 2017. This database compiles and records the volume or number of loans granted for new purchases of 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. The focus of this database is the average acquisition cost of residential property as indicator of loan commitment (or, the amount that can be drawn or borrowed) to a borrower for the purchase of new residential property by a universal/commercial (UBs/KB) or a thrift bank (TB) and the number of loans granted for new purchases of properties.[5]

In particular, there were 120,102 loans granted by banks from the first quarter of 2014 to the fourth quarter of 2017. The growth of loans granted by universal/commercial banks and thrift banks dropped to 14.8% in 2017 from 17.5% in 2015 and from 20.1% in 2016. The data are generated from the quarterly report submitted by banks on all Residential Real Estate Loans (RRELs) granted for the generation of RREPI. Under BSP Circular No. 892 dated 16 November 2015, the BSP requires all universal/commercial banks (UBs/KBs) and thrift banks (TBs) in the Philippines to submit a quarterly report is a first in the Philippines and is expected to provide a valuable tool in assessing the real estate and credit market conditions

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[5] In the estimation, the nominal indicators such as the average acquisition cost of the property, the approved value of the residential unit and the appraised value of the lot were converted into real terms using the Implicit Price Deflator for Real Estate Activities from the National Income Accounts of the Philippine Statistics Authority.

in the country. The RREPI is computed as weighted chain-linked index based on the average appraised value per square meter weighted by the share of floor area of new housing units.

Third, the study uses these sets of database to examine the effectiveness of both tightening and easing of domestic macroprudential policies to growth of real bank loan commitments and the overall quality of bank loan portfolio. The study will then examine the importance of monetary policy reaction to address changes in real bank loan commitments and in changes in the quality of loan portfolio and the interaction among different instruments of domestic prudential policies. To the best of our knowledge, a study that analyzes the efficacy of tightening and easing of domestic macroprudential policies, including those related to capital and liquidity instruments, and changes in monetary policy in addressing the growth of real bank loan commitment and changes in quality of bank loan portfolio using panel data regression from the first quarter of 2014 to the fourth quarter of 2017 has not been published in the Philippines.

Moreover, the study recognizes that the efficiency of domestic macroprudential measures in restraining bank loan commitments is symmetrical, that is both loosening and tightening end should be taken into account and that the effects has lags. The results of the study confirm the findings by MacDonald (2015). Basically, MacDonald (2015) found that tightening measures have greater effects when credit is expanding quickly and when house prices are high relative to income. By contrast, loosening measures seem to have smaller effects than tightening, but the difference is negligible in downturns. Moreover, loosening measures are found to have small effects and are dependent on the cycle.

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 has remained relevant since the GFC. In recent past years, empirical evidence of the efficiency of macroprudential policies in restraining excessive credit growth has expanded to include bank-level data 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 and thrift banks.

The results of this study reveal important findings. First, tightening of domestic macroprudential policies, particularly those measures pertaining to tightening of bank capital requirements and credit-related instruments are effective in curbing growth of real bank loan commitments to borrowers for acquiring new residential properties. Second, this study highlights the bigger negative impact of tightening measures on real bank loan commitments by universal and commercial banks compared to thrift banks. Third, the growth of real domestic bank deposits, growth of real total bank assets, and real exchange rate appreciation are important drivers of growth in real bank loan commitments to borrowers. Fourth, restricting both capital-based and credit-related measures limits risk-taking activities by banks. Fifth, tightening of domestic macroprudential policies varies with financial cycles in the Philippines. Sixth, monetary policy tightening complements tightening of credit-related macroprudential policies in restraining growth in real bank loan commitments.

The rest of this study is organized as follows. Section 2 presents some major empirical findings from selected literature. Section 3 discusses baseline database and empirical methodology, while Section 4 highlights the main findings of the paper. Section 5 concludes.

2. Survey of Empirical Findings[6]

Financial stability can be seen as the overarching goal of macroprudential policy tools, with specific measures motivated by specific objectives (Boar et al 2017). In general, the use of all types of macroprudential instruments has increased across all economies over the past decade though there are some notable differences in their use across economies (Cerutti et al. 2015, Orsmond and Price 2016). Advanced Asian economies (Hong Kong, Singapore, and South Korea) have made considerably more use of credit-related instruments (Lee et al, 2015). Other advanced economies tended to use more structural tools (Orsmond and Price, 2016). Meanwhile, emerging and developing Asia has relied more on liquidity-related and credit-related instruments (Lee et al, 2015).

In Asia, housing-related macroprudential measures have been used extensively relative to other regions, as some Asian economies have faced overheating housing markets (Zhang and Zoli, 2014). In particular, adjustments in the Loan-To-Value (LTV) ratio have been used most actively among housing-related measures in Asia. Changes in reserve requirements (RR) on local currency deposits have also been quite common, reflecting the fact that in some economies reserve requirements are used as monetary policy measure. Emerging market and developing economies have also used more MPPs compared with many advanced economies, which could be attributed to their greater exposures to external shocks, such as volatile capital flows, and their less liberalized financial systems (Claessens, 2014).

As to the effectiveness of implemented MPPs, there is growing evidence that macroprudential policy tools are effective. Several studies have shown that the LTV ratio, which limits the percentage of the value of an asset that can be financed by a bank loan (thereby ensuring an adequate cushion of collateral value for the loan in the event of a default), has been effective in slowing down credit, which is often a precursor of financial crisis. For instance, Wong, Ho, and Tsang (2015) showed empirical evidence that the LTV policy in Hong Kong has aided the country's banking sector in dealing with the boom-and-bust cycles of the property market over the past two decades. In particular, tightening the LTV cap was found to have been effective in reducing household leverage and credit growth. In turn, the resulting lower leverage reduced the sensitivity of mortgage default risk to property price shocks, thereby enhancing banking stability.

Since the implementation of the two LTV ratios[7] in 2010 and 2011, Bank Negara Malaysia (BNM) noted that the annual growth in borrowers with multiple housing loans

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[6] The insights from this section's survey of empirical findings basically extends the survey discussed in Bayangos (2017) and notes from Parcon-Santos, H. (2017), "Macroprudential Policy Implementation and Effectiveness in the Philippines", BSP, Unpublished manuscript.

declined sharply to 2.3 percent as of end-June 2013, compared to 15.5 percent in 2010. The BNM also observed a higher proportion of housing loans with LTV ratio below 80 percent compared to the previous two years (i.e., 75.2 percent of overall housing loans as of end-June 2013, compared to 60.6 percent as of end-November 2010). Meanwhile, the Bank of Thailand reported that banks' average LTV ratio declined following changes in LTV ratios in 2009, 2011, and 2013.[8]

Meanwhile, evidence on the effectiveness in Asia of the DTI ratio has been limited as the use of the tool in Asia has been less frequent.[9] This could reflect the difficulties associated with obtaining and verifying income data.[10] Nonetheless, for Asian countries that have implemented DTI ratio, there is evidence of its effectiveness. For instance, Lui and Liu (2015) noted that the debt-servicing ratio in Hong Kong for new mortgages significantly went down to around 35 percent from over 40 percent before stricter limits were imposed by the Hong Kong Monetary Authority (HKMA). Likewise, the Authority Monetary Brunei Darussalam (AMBD) observed a couple of positive outcomes following the implementation of the total debt service ratio (i.e., ratio of total debt obligations to net monthly income) policy in June 2015. For instance, household indebtedness, as measured by personal loans (including credit cards), has declined by 30.4 percent from (Brunei Dollar) BND2.3 billion in 2010 to BND1.6 billion in June 2017. This reflected the steady and controlled growth of personal loans among households in the country. Moreover, the ratio of "bad loans" to total loans in the household sector, as indicated by the non-performing loan (NPL) ratio has also declined from 2.3 percent in December 2014 to 1.9 percent in June 2017, suggesting better and more disciplined debt management by households, as well as more prudent granting of loans by banks and finance companies.

There is likewise evidence that sector-specific capital buffers, which raise risk weights against certain types of exposures thereby increasing the amount of capital that banks must hold, help reduce lending in targeted sectors. This tool is used to increase the protection of financial institutions against systemic risk arising from high exposure to vulnerable sectors. In 2011 and 2013, the Central Bank of the Republic of Turkey imposed higher risk weights on consumer loans and credit cards, respectively. According to Kara (2015), the higher risk weights, along with the LTV caps for housing and vehicle loans, were considered effective in containing loan growth, with the share of consumer loans vis-à-vis total loans declining considerably since 2011. Moreover, these tools have been considered as instrumental in reversing the upward trend in the household indebtedness ratio in recent years. Nevertheless, based on the IMF Financial Stability System Assessment on Turkey, loan losses on retail loans (mainly credit card) in the country were higher by over 40 percent in 2015 relative to 2011.

Meanwhile, Habermeier et al (2011) examined the effectiveness of foreign exchange tax in Brazil (2008), the Unremunerated Reserve Requirements (URR) in Colombia

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[7] In 2010, the maximum LTV ratio for the third or more housing loans was set at 70 percent. In 2011, the maximum LTV ratio for housing loans by non-individuals (e.g., business enterprise, sole proprietor) was set at 60 percent.

[8] LTV was set to 80 percent for housing loans valued at 10 million Baht or more, 90 percent for condo units, and 95 percent LTV ratio for low-rise residences valued at less than 10 million Baht.

[9] Implemented only in China, Hong Kong, South Korea, and most recently Singapore.

[10] Morgan et al. (2015).

(2007–2008) and in Thailand (2006–2008), and extensive outflow liberalization in Korea (2005–2008). The study assessed the success of controls in achieving four objectives: (a) stemming capital flows; (b) lengthening the maturity of capital flows; (c) allowing greater room for raising domestic interest rates; and (d) easing currency appreciation pressures. Using Vector Auto regression (VAR), the study showed mixed evidence. In particular, while targeted prudential measures often appear to be effective in reducing credit growth and foreign currency lending, there are cases that they were ineffective (e.g., in stemming credit growth in Colombia in 2007 and foreign currency lending to households in Korea in 2008). Moreover, Habermeier et al (2011) emphasized that the effectiveness of prudential measures often depends on the accompanying macroeconomic policies.

There is likewise evidence on the effectiveness of MPPs on cross-country studies. For instance, in a study of ten Asian economies, Morgan, Regis, and Salike (2015) found that countries that implemented LTV policies have significantly lower growth in mortgage loans compared to non-LTV economies, suggesting the effectiveness of LTV policies. Similarly, Forbes et al (2015), using a propensity-matching methodology, showed that MPPs imposed on international transactions from 2009 to 2011 across 60 countries have significantly reduced some measures of financial fragility. In particular, increases in macroprudential measures related to international transactions significantly reduced bank leverage, inflation expectations, and bank credit growth over the following years.

Using sets comprehensive database of domestic macroprudential policies and capital flow management measures across 12 Asia Pacific economies, Bruno et al (2015) found that banking sector and bond market capital flow management policies are effective in slowing down banking and bond inflows, respectively. Nonetheless, capital flow measures and domestic macroprudential policy can have diverse impacts across countries with varying capital controls. Moreover, empirical analysis on the interaction between MPP and monetary policy suggests that macroprudential policies are more successful when they complement monetary policy. This is consistent with the principle that when monetary policy and macroprudential policies pull in opposite directions, conflicting message is being conveyed to economic agents, that is, they are being told simultaneously to borrow more and borrow less.

Similarly, Bayangos (2017) found that after controlling for episodes of sterilization of capital inflows across nine Asian emerging market economies for the period 2004-2015, capital inflow restrictions and domestic macroprudential policy are effective in curbing overall real bank and real housing credit and real house prices. Moreover, monetary policy tightening complements tight domestic macroprudential policy in restraining movements in real bank credit and real house prices. However, when domestic macro prudential policy and monetary policy action are combined with tightening capital inflow measures, the significance of either one policy in addressing real credit and real house price movements disappears.

Using a set of indexes of macroprudential policies in 57 advanced and emerging market economies from the first quarter of 2000 to the fourth quarter of 2013, Akinci and Olmstead-Rumsey (2015) documented how these indexes are correlated with other policy

measures, such as monetary policy and capital flow management policies.[11]   Using a panel data model, they found that macroprudential policies are usually implemented along with bank reserve requirements, capital flow measures, and monetary policy to curb excessive credit growth. In particular, they found that in the case of emerging market economies, macroprudential policies and capital inflow restrictions (except portfolio flows) targeting the banking sector were effective in curbing credit growth.   Moreover, their counterfactual exercise showed that these measures are useful in addressing house price inflation.

Meanwhile, using meta-analysis techniques, Gambacorta and Murcia (2017) summarized the results of a joint research project by eight central banks in the Americas region to evaluate the effectiveness of macroprudential tools and their interaction with monetary policy using meta-analysis techniques.   These five Latin American countries (Argentina, Brazil, Colombia, Mexico and Peru) used confidential bank-loan data while Canada, Chile and the United States used data for credit origination and borrower characteristics.   The study revealed that macroprudential policies have been quite effective in stabilizing credit cycles. Moreover, the propagation of the effects to credit growth is more rapid (they materialize after one quarter) for policies aimed at curbing the cycle than for policies aimed at fostering resilience (which take effect within a year) and that macroprudential tools have a greater effect on credit growth when reinforced by the use of monetary policy to push in the same direction.

While the foregoing highlighted evidence of the effectiveness of domestic macroprudential policy, it is important to emphasize that the efficiency depends largely on the specific tools used to address specific objectives. It is likewise important to underscore that the effectiveness of a chosen MPP tool may depend on the interaction with other policies. Likewise, the transmission mechanism of MPP is complex and therefore may be subject to considerable uncertainty (IMF 2013).   Uncertainties about the transmission channels may not only create difficulties in assessing the effectiveness of a particular macroprudential instrument, they may also create the potential for unintended consequences (BIS CGFS 2012).

All the above findings point to implications for monetary policy implementation. In past few studies, there seems to be no clear pattern regarding the effective use of macro prudential policy and monetary policy in addressing excessive bank and house prices in EMEs. The results of empirical studies argued that while monetary policy should not be the principal tool to address financial stability issues and particularly property market bubbles, many suggested that it should not be taken out menu of policy options for the sake of focusing on inflation targeting either. Studies have underscored that what may be needed is an enhanced understanding of the effectiveness of non-monetary policies, in particular microprudential and macroprudential policies, in combination with monetary policy.

In recent past years, Kuttner and Shim (2013) have investigated the effectiveness of nine non-interest rate policy tools, including macroprudential measures, in stabilizing house prices and housing credit, using data from 57 countries spanning more than three decades. Their results showed that using conventional panel regressions, housing credit growth has

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[11] Bruno et al (2015) also showed correlations among monetary policy, macro prudential policy and capital flow measures.

been significantly affected by changes in the maximum DSTI ratio, the maximum LTV ratio, limits on exposure to the housing sector and housing-related taxes. However, only the DSTI ratio limit has a significant effect on housing credit growth when they used mean group and panel event study methods. Among the policies considered, a change in housing-related taxes is the only policy tool with a discernible impact on house price appreciation. Moreover, Kuttner and Shim (2013) and Bruno et al (2015) showed that macroprudential policies are more successful when they complement monetary policy by reinforcing monetary tightening, than when they act in opposite directions.

This study examines the effectiveness of changes in a comprehensive measure of domestic prudential policies in restraining the growth of real loan commitments of universal and thrift banks to borrowers for new purchases of residential property and riskiness of these banks' loan portfolio using unbalanced panel data regression from the first quarter of 2014 to the fourth quarter of 2017.

3. Data and Empirical Strategy

3.1 Baseline database

Measure of bank loan commitment. This database compiles and records 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 average acquisition cost of residential property as 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 universal/commercial and thrift banks on all Residential Real Estate Loans (RRELs) granted for the generation of a Residential Real Property Price Index (RREPI) for the Philippines. This report covers residential real estate loans granted to individual households for the purpose of financing the acquisition of housing units and any associated land that is or will be occupied by the borrower.[12] It should be noted that in the exercise, this study used the appraised value of the residential unit and the appraised value of lot in real terms.

Database for domestic prudential policies. This database includes all the domestic prudential measures adopted by the BSP, classified by instrument, such as, *capital-related* measures that aim to strengthen banks' ability to absorb risks, adjusts banks' capital requirements. These measures include Basel III capital requirements and adjustments in risk-weights as well as provision requirement; *liquidity-related instruments* which address the build-up of liquidity and foreign-exchange risks associated with lending booms. These instruments include the liquidity coverage ratio (LCR) and intraday liquidity requirements; *structural or interconnectedness instruments* that aim to address vulnerabilities from interconnectedness and limit contagion. These include interbank exposure limits and

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[12] Residential real estate loans granted to individual households to finance the purchase of vacant lots, construction and improvement of housing units, and ancillary real estate activities are not included.

additional loss-absorbing capacity for systemically important banks; *asset-related measures (or credit-related instruments) that* place restrictions or caps on amount that can be lent by banks such as debt-service-to-income (DSTI) ratio as well as administrative measures in relation to credit or credit growth; *reserve requirements* imposed against bank deposits and deposit substitutes; and *currency-related instruments* that place limits on net open currency positions (NOP) and foreign currency lending of banks. The first category captures the measures that are intended to preserve 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, banks' reserve requirements and currency-related instruments. These two categories are then aggregated to capture both the measures that are meant to promote resilience of the banking system and to contain excessive cyclical movements.

Moreover, the dataset is classified into tightening and loosening measures. Such a classification is used to verify the extent of asymmetric effects of each type of tightening and loosening measures. This study follows the approach 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. Moreover, a separate index is constructed for each type of prudential instrument. The idea is that a dummy variable is assigned to a value of positive one (1) if all the measures are tightening; 0, otherwise.[13] For loosening measures, a dummy variable is assigned to a value of positive one (1) if all the measures are loosening; or, 0 otherwise. The database includes a measure of the intensity of implementation of prudential policy by taking into account the number of times a policy is implemented. Taking the average of these measures is also used. However, in the exercise, tightening measures are found to be more effective than loosening measures in estimating the effectiveness of domestic macroprudential policies in restricting real bank loan commitments and banks' risk-taking activities in lending.

Figure 1 and Table 1 (Technical Appendix 1) shows the use of domestic macroprudential instruments, including the years these were imposed based on the Manual of Regulations for Banks (MORB)[14] from the Supervisory Policy and Research Department (formerly the Office of Supervisory Policy Development) and various BSP Annual Reports. These were cross-checked with the list of issuances published in the Official Gazette as well as sets of database and research from the International Monetary Fund (IMF), the World Bank and the Bank for International Settlements (BIS).

Figure 1 and Table 1 show that majority of the macroprudential measures implemented from 2002 to the fourth quarter of 2017 were currency instruments (41.8% of

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[13] See, for example, Kutner, K N and I Shim (2012): "Taming the real estate beast: The effects of monetary and macroprudential policies on housing prices and credit", RBA-BIS conference volume on 'Property Markets and Financial Stability'; Kuttner, K N and I Shim (2016): "Can non-interest rate policies stabilize housing markets? Evidence from a panel of 57 Economies". Journal of Financial Stability, Vol 26, pp. 31-44, October; and Bruno, V, I Shim and H Shin (2017): "Comparative assessment of macroprudential policies", Journal of Financial Stability, Vol 28, pp. 183 – 202, February.

[14] MORB is the primary source of regulations governing entities supervised by the BSP. It provides the rules and policy issuances that implement the broader provisions of Republic Act No. 8791, also known as the General Banking Law of 2000, as well as other pertinent banking laws.

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 (34) measures were classified as being neutral. These measures largely pertain to changes in reportorial requirements.

Figure 1: Number of Domestic Prudential Measures Implemented in the Philippines March 2002-December 2017
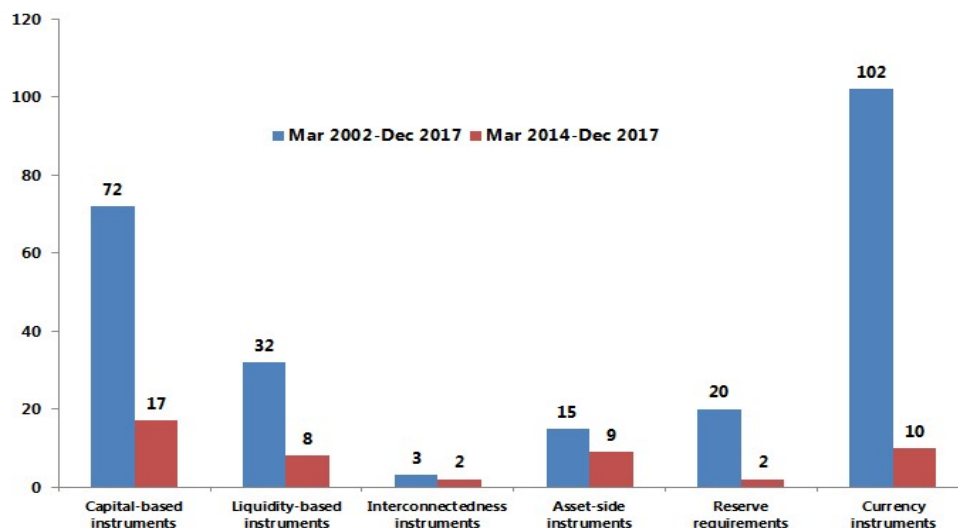
Source of data: Authors' updates from Bayangos (2017).

On balance, the BSP implemented more tightening than loosening measures. In particular, majority of the tightening measures were capital- and liquidity -related measures for Basel III compliance while those of loosening measures were for currency-related instruments and were implemented in connection to the liberalization of the BSP's foreign exchange framework starting in 2007.

Indeed, more capital-based measures were implemented after the GFC due in part to the implementation of the Basel III requirements particularly from the first quarter of 2014. The BSP adopted the Basel III capital rules for UBs/KBs and their subsidiary banks effective 1 January 2014. Basically, the BSP adopted the revised risk-based capital adequacy framework, particularly on the minimum capital and disclosure requirements. Universal/KBs were required to comply with the new minimum capital ratios of 6.0% Common Equity Tier 1 (CET1) ratio, 7.5% Tier 1 ratio, and 10.0% total Capital Adequacy Ratio (CAR). Moreover, the BSP adopted the Capital Conservation Buffer (CCB) of 2.5% effective 1 January 2014. Banks that do not meet the 2.5% CCB are restricted from paying dividends, buying back shares and paying discretionary employees' bonuses.

Similarly, there were more resilience-based instruments (at 56.3%of the total instruments) adopted compared with cyclical-based instruments (at 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% were loosening and 13.9% were neutral measures. These tightening measures included the increase in the capital risk weight on NDF transactions in 2013, the conduct of REST or real estate stress test on banks' real estate exposures starting 2014. Moreover, in 2014, the BSP approved the adoption of major enhancements to the regulations governing credit-risk taking activities of banks and quasi-banks (B/NBQBs) following a comprehensive policy review. Basically, the amendments strengthened credit risk management in these financial institutions in line with global best practices and Basel Core Principles for effective bank supervision. In 2015, the BSP approved the enhancements to the reporting requirements of banks on motor vehicle loans and salary loans.

Measures of monetary policy actions. This database compiles monetary policy actions by the BSP. Basically, this section updates Bayangos (2017) database to include Term Deposit Facility rates under the Interest Rate Corridor (IRC) system introduced in June 2016. This database is an index of both tightening and loosening policy actions using a four-quarter window based on the estimates. Similar to previous specifications, for each of the central bank official policy rate, a dummy variable is assigned to a value of positive one (1) if the hike in policy rate is accompanied by a rise in TDF rates; hence, the monetary policy stance is tight; 0, otherwise, or when the reduction in policy rate is accompanied by a drop in TDF rates; hence, the monetary policy stance is loose. The database also includes a measure of the intensity of monetary policy actions by taking into account the number of times a policy is implemented. Taking the average of these measures is also used.

Vector of controls. This dataset includes macro-financial indicators and bank-specific characteristics used in the study. Table 2 in Technical Appendix 1 presents the macro-financial indicators and bank- specific characteristics as well as the definition and descriptive statistics of variables used in regression models. The macro-financial indicators include changes in real Gross Domestic Product (GDP), inflation, real overseas Filipino remittances, monetary policy rate, Term Deposit Facility (TDF) rate, bank lending rate, neutral rate of interest rate, output gap, bank credit to GDP ratio gap, nominal peso-dollar rate, real effective exchange rates.

The bank-specific characteristics in the dataset include the size of a bank (or total resources in real terms), liquidity ratio defined as liquid assets relative to total assets, capital ratios using capital adequacy ratio and Common Equity Tier 1[15] ratio to total assets, funding composition using outstanding deposits relative to total liabilities, profitability of banks using real net interest income, and quality of bank loans using non-performing loans, non-performing assets and non-performing coverage ratio. In the study, the regression exercise considered both the actual ratios and the gap from regulatory thresholds such as in liquidity coverage ratio (gap from 100% regulatory threshold) and capital adequacy ratio (gap from the 10% regulatory threshold). The regression exercise also used both consolidated and solo bases. For solo indicators, the type of bank (universal/commercial bank and thrift bank) dummy is included.

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[15] Common Equity Tier 1 (CET1) is a component of Tier 1 capital that consists mostly of common stock held by a bank.

3.2 Empirical Methodology

Estimation method. To date, there is no generally accepted framework for analyzing the effectiveness of domestic macroprudential polices on credit and the quality of credit. Many studies explored the use of instrumental variables and Vector Auto Regression (VAR) with a variable ordering assumption to address such a problem. Moreover, the results are sensitive to the details of model specification, notably the choice of control or instrument variables. In this study, the parameters in the models are estimated using unbalanced panel Generalized Method of Moment (GMM) that is a more appropriate empirical methodology to address the endogeneity between real bank loan commitments and non-performing loans 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.

Empirical analysis. This section organizes the analytical bases used in the study. The first part includes equations (1) to (7) which estimate the impact of each prudential tool or measure on bank lending to household borrowers as well as the impact on monetary policy conditions and economic cycles while the second part includes equation (8) which looks at the impact on the loan quality using non-performing loans by banks.

<u>*Impact on bank lending to household borrowers.*</u> The first step of the empirical analysis is to evaluate the impact of a change in prudential tools on credit availability using a panel methodology. In particular, the impact at the loan level could be estimated by means of the following panel equation,

$$\Delta logLoans_{b,t} = a_b + \sum_{j=1}^{k} \gamma_j \Delta logLoans_{b,t-j} + \sum_{j=1}^{k} \beta_j \Delta MaP_{t-j} + \vartheta X_{b,t-1+} \theta macrovars_{b,t} + \varepsilon_{b,t} \tag{1}$$

where $\Delta logLoans_{b,t}$ is the quarterly change *t* in the logarithm of loan committed by bank *b* to a household borrower based on the acquisition cost of the property in real prices over a given period after the introduction or change in a macroprudential tool, a_b are bank fixed effects, $\vartheta X_{b,t-1}$ are bank characteristics, $\theta macrovars_{b,t}$ are macro-financial indicators. The main coefficient of interest is $\sum_{j=1}^{k} \beta_j$ which represents the impact of changes in a domestic macroprudential policy on bank loan commitment to household borrowers.[16] Table 1, columns I and II, in Technical Appendix 2, show the results of the regression models.

In arriving at the main dependent variable, this study considered the quarterly growth of appraised value of the residential unit, the appraised value of the lot and the average acquisition cost of the property. As indicated in the previous section, these indicators are converted in real terms using the Implicit Price Deflator for Real Estate Activities from the National Income Accounts. Among these three variables, the real average acquisition cost of the property proved to be statistically stable and reliable as the main

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[16] In the empirical estimation, the lag effects included contemporaneous impact. However, these contemporaneous estimates did not yield significant results.

dependent variable. The variables are quarterly from March 2014 to the fourth quarter of 2017 across 101 universal/commercial and thrift banks.

Moreover, this study considers two separate dummies for tightening actions and loosening actions. Such an approach could help verify asymmetric effects of each prudential tool (Kuttner and Shim, 2016; Bruno et al, 2017). The exercise also takes into account the intensity or the total number of times each prudential tool has been used, classified by tightening and loosening measures and by resilience- and cyclical- based measures. Moreover, the estimation uses the net intensity on the use of each prudential tool, that is, net tightening and net loosening.

In the exercise, the study also estimates how much it takes for a given prudential tool to propagate its effects on lending or the optimal k in equation 1. *Equation 1* considers only the effect after one quarter. However, the propagation effects could be longer, especially with respect to the implementation of a bank loan commitment. To this end the study considers a specification that takes into account the sum of one (1) lag to four (4) lag effects to capture the total effects in t as seen in equation 1. In the exercise, the propagation of the effects of changes in domestic macroprudential policy to changes in loan commitment is significant across different regression models up to four quarters. This finding is reasonable because before any macroprudential policy change is implemented, the BSP ensures that such a change is exposed for comments to relevant BSP departments under the Financial Supervision Sector, different banking groups and industry associations to avoid surprises and a monitoring period of at least two quarters is usually observed.

Do responses to a macroprudential shock differ by type of banks? This section looks at the difference between domestic universal/commercial banks' (U/KBs) and thrift banks' (TBs) responses to a macroprudential shock. In the database, there are 101 respondent banks, 38 of which are U/KBs and the remaining 63 are TBs. However, only 56 banks consistently reported residential property loans granted on a quarterly basis from the first quarter of 2014 to the fourth quarter of 2017. Hence, data of these 56 banks are used in regression models.

In the Philippines, both the U/KBs and TB's have been contributing largely to the continued rise in consumer loans. As of end-March 2018, U/KBs grabbed about 75.4% of the annual growth in consumer loans. Moreover, the annual growth of both U/KBs and TBs as of end-March 2018 was posted at 20.3% and 11.0%, respectively. Moreover, the BSP regulations segment banks based on their affiliation for purposes of compliance with Basel III capital and liquidity standards as well as in compliance with the prudential reporting requirements. The Basel standards as well as prudential reports are required to be complied with on both solo and consolidated bases. Thrift, rural and cooperative banks that are subsidiaries of UKBs/KBs are required to comply with the Basel III capital and liquidity standards, similar to their parent banks. However, stand-alone thrift banks, rural and cooperative banks are subject to simpler framework.[17]

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[17] In particular, stand-alone thrift banks, rural and cooperative banks are subject to a hybrid version of the Basel rules called as Basel 1.5. The Basel 1.5 framework follows the three pillars espoused by the Basel II framework but with certain iterations. For instance, under Pillar I, stand-alone thrift banks, rural and cooperative banks are governed by the same standards on the quality of capital under the Basel III framework, except for the adoption of the capital conservation buffer and the

To test for the difference, this study includes interaction terms that are the product of macroprudential policy indicator and bank-specific characteristic *X* as seen in equation 2,

$$\Delta logLoans_{b,t} = a_b + \sum_{j=1}^{k} \gamma_j \Delta logLoans_{b,t-j} + \sum_{j=1}^{k} \beta_j \Delta MaP_{t-j}$$
$$+ \vartheta X_{b,t-1} + \sum_{j=1}^{k} \delta_j \Delta MaP_{t-j} * X_{b,t-j} + \theta macrovars_{b,t}$$
$$+ \varepsilon_{b,t}$$

(2)

The test is on the overall significance of $\sum_{j=1}^{k} \delta_j$. The vector of controls includes macro-financial variables and bank-specific characteristics as seen in Tables 1, 2 and 3 (column II) in Technical Appendix 2.

This approach builds on the bank lending channel literature. In order to discriminate between loan supply and loan demand movements, the literature has focused on cross-sectional differences between banks. Following Gambacorta (2005)[18] , this equation relies on the hypothesis that certain bank-specific characteristics, such as, size, liquidity, the deposit-to-total-funding ratio and capitalization, influence only the loan supply movements, while a bank's loan demand is independent of these characteristics. This approach basically assumes that after a macroprudential policy tightening, the ability to shield loan portfolios is different between highly-capitalized and less-capitalized banks.

Do responses to macroprudential policies vary over monetary policy conditions? In this section, additional interaction terms are introduced which combine macroprudential policy indicators and monetary policy actions (measured by the neutral interest rate or NRR based on Taylor rule[19]). In particular, average NRR increased from 2.9% in the first quarter of 2014 to 3.8% in the first quarter of 2016 but dropped to 3.5% during the fourth quarter of 2017. This is seen in equation 3 as,

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

(3)

Following Bruno et al (2017), *equation 3* estimates the effectiveness of macroprudential tools when changes in monetary policy push in the same or opposite direction.[20] The test is on the overall significance of $\sum_{j=1}^{k} \rho_j$. Table 4 shows the results of regression model.

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countercyclical capital buffer. The minimum capital adequacy ratio is at 10% which is the same ratio applied to UKBs/KBs and their subsidiary thrift banks.

[18] See Gambacorta, L. (2005): "Inside the bank lending channel", European Economic Review, Vol. 49, pp. 1737 – 1759.

[19] The neutral interest rate (NRR) is derived as NRR=(10-year average of real 1-year secondary rates)-((real 1-year secondary rates - real 5-year secondary rates) - (real 1-year secondary average - real 5-year secondary average)).

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

Do responses to macroprudential policies vary over the financial cycles? In this section, additional interaction terms which combine macroprudential policy indicators and real GDP growth (measured by the output gap or the difference between the actual real GDP growth and the average output gap from four approaches[21]). This is seen in equation 4 as,

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

(4)

The goal of this exercise is to determine possible presence of endogeneity between output gap and macroprudential tools or their effects may be higher when output gap has widened or vice versa. The test is on the overall significance of $\sum_{j=1}^{k} \mu_j$ (Table 5).[22] In this study, a measure of financial cycle using credit-to-GDP gap or the difference between the actual credit-to-GDP ratio and its trend is used in the regression model.[23] In the exercise, this study also considered separate consumer loans-to-GDP ratios for U/KBs and TBs. Table 5 shows the regression results.

Impact on bank risk. In literature, the use of macroprudential tools is also intended to limit excessive bank risk-taking activities in lending and consequently, the probability of the occurrence of a financial crisis. This study looks at how macroprudential tools have an impact on specific measures of bank riskiness such as gross non-performing loans over total assets.[24] This is seen in equation 5 as,

$$NPL_{b,t} = a_b + \sum_{j=1}^{k} \gamma_j NPL_{b,t-j} + \sum_{j=1}^{k} \beta_j \Delta MaP_{t-j} + \vartheta X_{b,t-1+} \theta marcrovars_{b,t} + \varepsilon_{b,t}$$

(5)

where a_b are bank fixed effects, $\vartheta X_{b,t-1}$ are bank characteristics, $\theta macrovars_{b,t}$ are macro-financial indicators. The main coefficient of interest is $\sum_{j=1}^{k} \beta_j$ which represents the impact of changes in a domestic macroprudential policy on bank risk-taking activities as seen in non-performing loans (NPL).

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

[22] In the estimation of $\sum_{j=0}^{k} \vartheta_j \Delta logGDP_{t-j}$, the contemporaneous impact is used.

[23] 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. Consumer loans-to-GDP was also used in the estimation. In future exercise, this study will consider the series using a one-sided Hodrick-Prescott filter with a smoothing factor lambda of 400,000, taking account only of information up to each point in time.

[24] In literature, other measures include expected default frequency, Z-score, Credit Default Swap (CDS). This study also looks at how macroprudential tools have an impact on specific measures of bank riskiness such as non-performing loan coverage ratio (provisions/total assets).

Following Chavan and Gambacorta (2016), $NPL_{b,t}$ is a logit function of the ratio of gross NPL to total loans for bank *b* at time *t*. In particular, the logit function is given in equation 6 as,

$$NPL_{b,t} = \ln\left[\frac{NPL}{1 - NPL\ ratio}\right] \tag{6}$$

Given the perceived persistence of NPL, this study uses a dynamic specification that includes lagged value of the NPL as an explanatory variable. *Equation 5* considers only the effect after one quarter. Similar to the earlier specifications, the propagation effects could be longer. To this end the study considers a specification that takes into account the sum of one (1) lag to four (4) lag effects to capture the total effects in *t as* seen in equations (1) to (4). In the exercise, the propagation of the effects of changes in domestic macroprudential policy to changes in non-performing loan ratio is significant across different regression models up to four quarters.

This study replicates *equations 1 to 4* using the NPL ratio as the main dependent variable. Tables (7) to (12) in Technical Appendix 2 presents the results of the regression models. Latest data on total non-performing loan ratio (gross) increased slightly to 1.8% as of end-March 2018 from 1.7% in the fourth 2017. Meanwhile, non-performing consumer loan ratio of U/KBs and TBs was recorded at 4.0% as of end-March 2018, slightly higher than the ratio recorded in previous quarters. Moreover, the overall non-performing RELs ratio saw a slight increase to 1.7% as of end-March 2018 compared to the 1.6% recorded in previous quarters. In the estimation, non-performing ratio of both total bank loan portfolio and consumer loans are considered.

Similar to specifications in *equations 1 to 4*, the bank-specific characteristics $\vartheta X_{b,t-1}$ in equation 5 includes the size of a bank (or total resources in real terms), liquidity ratio, capital ratios using capital adequacy ratio and Common Equity Tier 1 ratio to total assets, funding composition using outstanding deposits relative to total liabilities, and profitability of banks using real net interest income. In this section, the estimation considers both the actual ratios and the gap from regulatory thresholds such as in liquidity coverage ratio (gap from 100% regulatory threshold) and capital adequacy ratio (gap from the 10% regulatory threshold). The estimation also uses both consolidated and solo bases. For solo indicators, the type of bank (universal/commercial bank and thrift bank) dummy is included. The $\theta marcrovars_{b,t}$ includes macro-financial indicators such as changes in real GDP, inflation, real overseas Filipino remittances, monetary policy rate, Term Deposit Facility (TDF) rate, bank lending rate, neutral rate of interest rate, output gap, bank credit to GDP ratio gap, nominal peso-dollar rate, real effective exchange rates.

3.3. Robustness checks

First stage diagnostic tests are used to check for normality of residuals across equations. Results of the Breausch Pagan normality test reject the null hypothesis of normality at 5% level of significance. Moreover, the Breusch Pagan fixed effects for random

effects showed that the coefficients are not zero and negative. Meanwhile, the results are broadly robust against different specifications of dependent and independent variables at 5% level of significance.

Second stage residual tests are also used to check the significance of estimated coefficients and the residuals. The results show that all estimated coefficients are significant and that the instruments used are not correlated with the residuals (using Hansen test[25]), based on 5% and 10% levels of significance. Meanwhile, standard errors of regression are robust and that the errors in the first difference regression exhibit no second order serial correlation (using serial correlation test[26]) at 5% and 10% levels of significance.

4.   Results

Technical Appendix 2, Tables 1 to 12, provide the main equations used in the model and the estimates. Following diagnostic and robustness checks, the results reveal important findings.

First, tightening of domestic prudential policies (Table 1), particularly those tightening measures (Table 3) that are meant to preserve resilience of the banking system (Table 2) are effective in curbing growth of real bank loan commitments to borrowers for acquiring new residential properties. Results in *equations 1 to 3* show that tightening macroprudential policies have direct and negative impact on real bank loan commitments to borrowers based on real acquisition cost of new properties from March 2014 to December 2017. Moreover, results in *equations 1 to 3* show that the impact of tightening domestic prudential policy measures can last up to four quarters. Importantly, results in Tables 4, 5 and 6 reveal that tightening domestic macroprudential policies vary with both business and financial cycles in the Philippines. Overall, these findings confirm other studies' observation that prudential policies are more likely to find effectiveness.[27]

An important component of the domestic microprudential measures of the BSP is the issuance of the comprehensive guidelines on Credit Risk Management System in 2014. The guidelines focused on sound credit underwriting practices and emphasized that cash flow analysis or the ability-to-pay plays an important role in determining a borrower's creditworthiness. Moreover, banks have internal policies on assessing a borrowers' paying capacity which include the use of debt-to-income ratios. Under such guidelines, banks which have been found to have weak credit risk management system will be the subject to supervisory actions. All these measures are meant to curb incipient excessive risk appetite. In turn, the year-on-year growth of loans granted to residential real estate sector dropped from 17.5% in 2015 to 14.8% in 2017.

Second, this study highlights the bigger negative impact of tightening prudential measures on real bank loan commitments to maintain banks' resilience in Tables 2 (column II) and 3 (column II) by universal and commercial banks compared to thrift banks,

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[25] Refers to Hansen test of over identifying restrictions problem.
[26] Refers to test for serial correlation in a panel regression.
[27] See De Gregorio et al (2000).

an indication of the presence of bank lending channel. Universal and commercial banks (and their subsidiaries) are the largest bank category in terms of resources and are generally able to offer the widest variety of banking services among banks. Meanwhile, thrift banks (particularly the stand-alone thrift banks) are primarily engaged in obtaining savings of depositors for investment and lending. Thrift banks (both subsidiaries and stand-alone banks) typically offer loans for personal or household finance and financing for home building and development. These banks also provide short-term working capital and medium- and long-term financing to businesses, as well as to their chosen markets and constituencies, especially small- and medium- enterprises and individuals.[28]

Third, real bank loan commitments to household borrowers are driven by bank deposits (relative to total liabilities), liquidity position and capital adequacy (gap relative to the regulatory threshold). Results in Tables 2 and 3 indicate that these indicators react to restrictions in domestic prudential policies.

The latter finding on banks' capital adequacy ratio relative to regulatory threshold of 10% is consistent with the finding by Layaoen and Domantay-Mailig (2018). Layaoen and Domantay-Mailig (2018) examined U/KBs' motives for maintaining "excess" capital using the empirical model by Heid et al (2004) and Malovaná (2017). The model was applied to quarterly panel data for 34 U/KBs (including 14 foreign banks) in the Philippines from December 2012 to June 2017 using a Dynamic Panel Generalized Method of Moments (GMM). The results revealed that, in general, U/KBs and their subsidiary TBs adjust their regulatory capital ratios through changes in the level of capital (i.e., capital stock, additional paid-in capital, retained earnings and undivided profits). In addition, U/KBs and their subsidiary TBs have lesser 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. The capital buffer theory likewise holds true for most U/KBs and their subsidiary TBs in the Philippines and that following the adoption of Basel III regulations, they have become more risk-sensitive.

Moreover, monetary policy tightening complements tightening of prudential policies in restraining growth of real bank loan commitments. Results in *equation 4* show the direct negative impact of using monetary policy rate gap (neutral interest rate based on Taylor rule) and prudential policies in curbing real bank loan commitment.

Meanwhile, it may be noted across estimations in regression models, real exchange rate appreciation reacts to tightening of prudential measures. This finding is significant at 5% level of significance and across specifications of real effective exchange rates.[29]

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[28] The thrift banking system is composed of savings and mortgage banks, private development banks, stock savings and loan associations and microfinance thrift banks. Banks are classified also as rural and cooperative banks (RBs and Coop banks) and are typically found in rural communities where they offer basic financial services. RBs are privately owned and managed. Meanwhile, Coop banks, are cooperatives that are allowed to engage in the business of banking. Coop banks are organized/owned by cooperatives or a federation of cooperatives. This study only covered universal and thrift banks.

[29] In the exercise, the three measures of real effective exchange rate (REER) were used. These measures include the overall REER (Trading Partners Index) which measures the average effective exchange rates of the peso across the currencies of the 14 major trading partners of the Philippines; the Trading Partners Index- Advanced Countries (TPI-A) which measures the effective exchange rates of the peso across currencies of trading partners in advanced countries comprising of the United States, Japan, Euro Area and Australia; and the Trading Partners-Developing Countries (TPI-D) which measures the effective

In particular, real effective exchange rate rose by 5.6% year-on-year in 2015 but dropped to 3.6% in 2016 and further by 4.2% in 2017. In the earlier literature, a 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. Currency appreciation 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 which has become known as the risk-taking channel of currency appreciation was discussed in Bruno and Shin (2015a, 2015b) and Cerutti et al (2014) with special focus on banking sector, and was extended to bond markets in Sobrun and Turner (2015) and Feyen et al (2015), among others.

Fourth, in general, restricting prudential measures limits risk-taking activities by banks. Tables 7 and 9 (Column II) shows the negative impact of tightening domestic macroprudential measures on non-performing loans relative to total loans. It should be noted that as part of the BSP's continued assessment of the quality of total bank portfolio and bank exposures to real estate sector, supervising BSP departments concerned are closely monitoring actions taken by banks to manage effectively exposure to the real estate sector. This finding is consistent with the behavior of the non-performing loan coverage ratio. The NPL Coverage Ratio of both universal and thrift banks has improved from its end-December 2016 ratio. In particular, the average NPL Coverage Ratio of U/KBs in 2016 and 2017 was 137.1%, above the ideal coverage ratio of 100%.

Tables 7 to 12 show that, except for Table 8, the positive and significant coefficient of lagged dependent variable suggests a persistence in the NPL ratio. This is expected since the loan in the books of banks take time to be recovered or written off. Table 8 (column II) shows that restricting prudential tools to address resilience and cyclical movements have negative impact on the movements of NPL ratio, although the latter (cyclical measures) have bigger impact than those instruments that are meant to promote resilience in the banking system. Meanwhile, *equations 7 to 12* in Section 3.2 (Empirical Methodology) indicate that liquidity position, capital adequacy gap and deposits relative to total liabilities had lagged negative impact on the NPL ratio. Moreover, assuming all other things to be constant, *equation 10 (column I)* implies that real monetary policy rate has positive impact on the NPL ratio, even when combined with prudential policies. However, after controlling for other macroeconomic indicators such as real effective exchange rate, the impact of real monetary policy rate becomes negative along with the adoption of prudential policies (Table 10, column II).

Meanwhile, the results in Tables 11 and 12 reveal that the impact of both business (output gap) and financial cycles (credit-to-GDP ratio) on the movements of NPL ratio are positive and significant. However, when prudential measures are adopted, the impact on the NPL ratio becomes negative.

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exchange rates of the peso across 10 currencies of partner developing economies — China, Singapore, South Korea, Hong Kong, Malaysia, Taiwan, Indonesia, Saudi Arabia, United Arab Emirates, and Thailand.

In general, the results are consistent with analysis that despite the relative rise in the level of bank loan portfolio, banks have been more risk-sensitive[30], although the level of bank loan portfolio is not the focus of these estimations. A modified version of the model specification of Joh and Jeong (2017)[31] and a panel structural VAR using quarterly data of 53 Philippine banks[32] are used to simulate the impact of macroeconomic and bank-specific variables on TLP and NPL. The main finding of the simulation is that growth in TLP will not necessarily translate to the deterioration of loan quality. The ordering of variables in the simulation is such that macroeconomic conditions (i.e. real GDP, inflation, monetary policy rate) feeds into bank-specific variables (i.e. average lending rate, CAR, deposits, assets), before finally affecting the variables of interest. This is to fully account the effects of macroeconomic conditions and bank soundness on lending growth and performance. The results show that NPL growth responds positively to shocks to growth of inflation, monetary policy rate and average lending rate, stressing the effects of higher interest rates on the ability of borrowers to repay debt. However, on a positive note, robust economic growth has a significant impact on lowering NPL in the long-run.

Moreover, the response of the growth of NPL to shocks to growth in TLP appears to be modest, highlighting that growth in NPL remains stable amid growth in TLP. The simulation implies that after an initial positive response to TLP growth, the NPL actually declines after five quarters before stabilizing in the succeeding periods. Moreover, positive shocks to growth in real GDP are found to be generally insignificant with respect to the growth in TLP. Meanwhile, positive shocks to inflation, monetary policy rate and average lending rate are found to negatively impact the growth in TLP initially, after which the impact diminishes. This could mean that TLP growth remains stable despite fluctuations in business cycles and interest rates.

5. Conclusion

This study examined the effectiveness of changes in a comprehensive measure of domestic prudential policies in restraining the growth of real loan commitments of universal and thrift banks to borrowers for new purchases of residential property and riskiness of these banks' loan portfolio using unbalanced panel data regression from the first quarter of 2014 to the fourth quarter of 2017. Moreover, the study introduced three sets of database. First, the database is classified into the nature of domestic prudential measures such as tightening and loosening as well as according to instrument and purpose such as those meant to promote resilience and to address cyclical movements from March 2002 to the fourth quarter of 2017. Instruments used to preserve resilience of the banking sector

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[30] Cachuela, Rafael Augusto (Forthcoming 2018). Technical Box Article: "Does Expansion of Bank Lending Leads to Weakening of Loan Quality in the Philippines", *Status Report on the Philippine Financial System, First Semester 2018*. Bangko Sentral ng Pilipinas.

[31] Joh, S.and S. Jong (2017). "Lending Behavior or Prudent Banks around the 2007 Financial Crisis," http://www.korfin.org/korfin_file/forum/2017co-conf16-2.pdf. The original model of the authors examined how bank-level characteristics, such as capitalization, profitability and asset size, affect their lending behavior around the Global Financial Crisis. A bank's financial soundness was deemed to influence its risk-taking behavior as evidenced by the growth and performance of its loans. In order to determine the impact of loan growth to the growth in non-performing loans, macroeconomic variables were included to take into account its effects on the supply of credit and on the ability of borrowers to repay debt. Macroeconomic variables as determinant of non-performing loans is widely used in the literature.

[32] Quarterly data from 2014 to 2017 using 53 banks (36 UKBs, 17 TBs).

included liquidity-related instruments, capital-related measures which aim to strengthen banks' ability to absorb risks and interconnectedness instruments. Instruments meant to dampen excessive cyclical behavior included credit-related instruments, changes in banks' reserve requirements against domestic deposits and deposit substitutes, and currency-related instruments. Another database documents changes in monetary policy actions using data on the BSP's overnight policy rate, monetary operations rates under the Interest Rate Corridor (IRC) system such as the new Term Deposit Facility rates.

The third database used data from the quarterly bank reports on the RREPI from the first quarter of 2014 to the fourth quarter of 2017. This database compiles and records the volume or number of loans granted for new purchases of 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. The focus of this database is the average acquisition cost of residential property as indicator of the commitment of banks to grant loans based on the acquisition cost of the property. This report and database is a first in the Philippines and is expected to provide a valuable tool in assessing the real estate and credit market conditions in the country. The RREPI is computed as weighted chain-linked index based on the average appraised value per square meter weighted by the share of floor area of new housing units.

This study used these three sets of database to examine the effectiveness of both tightening and easing of domestic macroprudential policies to growth of real bank loan commitments and consequent risk-taking activities of banks using panel data regression from the first quarter of 2014 to the fourth quarter of 2017. The study then examined the interaction between monetary policy reaction, business and financial cycles and domestic prudential policies in addressing changes in real bank loan commitments and bank risk.

Following diagnostic and robustness checks, the results revealed important findings. First, tightening of domestic prudential policies, particularly those tightening measures that are meant to preserve resilience of the banking system are effective in curbing growth of real bank loan commitments to borrowers for acquiring new residential properties. Second, this study highlights the bigger negative impact of tightening measures on real bank loan commitments by universal and commercial banks compared to thrift banks. Third, the share of bank deposits relative to total liabilities, liquidity position and capital adequacy gap are important drivers of growth in real bank loan commitments to borrowers. Fourth, restricting both instruments meant to promote resilience of banking system and to address cyclical movements limits risk-taking activities by banks, with the latter type instruments having bigger negative impact. Fifth, tightening of domestic prudential policies varies with monetary policy conditions and over the business and financial cycles in the Philippines.

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 aging of non-performing loans of universal/commercial and thrift banks in assessing the extent of the 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-difference analysis

to check the robustness of results and to assess the effects of domestic macroprudential policies on the supply of loan (credit) in greater detail. The study also intends to compile a more comprehensive dataset to include loans granted by top 20 rural banks to individuals for the purchase of property.

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. 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 comprehensive, centralized and reliable credit information system is indeed a significant development.

The CIC is created as a government-owned and controlled corporation with sixty (60) percent shares held by the national government and forty (40) percent of which are held by industry associations namely; Rural Bankers Association of the Philippines, Bankers Association of the Philippines, Chamber of Thrift Banks, Philippine Cooperative Center and Credit Cards Association of the Philippines. Contrary to other credit registries usually supervised and managed by central banks, the CIC is regulated by the Securities and Exchange Commission serving ex-officio Chairman along with other Board of Directors, seven (7) of which appointed by the President of the Philippines including President of the Corporation, five (5) elected from qualified private sector investors, and two (2) independent directors respectively. The main purpose of the Corporation is to strengthen the submission of basic credit data, both positive[33] and negative[34] credit information in the entire data subject[35] provided by submitting entities.

In the Philippines there are five credit rating agencies bureaus authorized by the CIC to operate in the country, namely, the CIBI Information Corporation, Compuscan Philippines, Inc., CRIF Philippines and the Trans Union Philippines, and the Credit Bureau Singapore. The CIC launched a second boarding phase last August 2017 which gave the chance to those financial firms that are not been able to submit their credit data. Amidst difficulties in documentary requirements, the CIC anticipates around 170-200 companies will able to participate on the nine-month pilot phase that started on 8 May 2017.

Nevertheless, the study's findings have important policy implications. First, the finding that tightening domestic macroprudential policies are effective in reducing 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

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[33] Positive Credit Information refers to information/data concerning the credit performance of a borrower, such as, but not limited to, information on timely repayments of non-delinquency (see IRR of Credit Information System Act (CISA) of RA 9510).

[34] Negative Credit Information refers to information or data concerning the poor credit performance of borrowers, such as, but not limited to, defaults on loans, adverse course judgements relating to debts and reports on bankruptcy, insolvency, petitions or orders on suspension of payments and corporate rehabilitation (see IRR of Credit Information System Act (CISA) of RA 9510).

[35] Data Subject refers to existing borrower or loan application or anyone who in any way applies for or avails of a credit facility (see IRR of Credit Information System Act (CISA) of RA 9510).

supervision of the financial sector. In the future, more in-depth research on the microeconomic impact of prudential limits and bank regulations on financial market developments and economic growth may be insightful.

Second, given the influence of 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, its impact on the economy and the effectiveness of policy instruments, both in the short and longer term. More importantly, more analysis on the risk-taking channel of currency appreciation that is associated with an increase in both the likelihood of future financial crisis is crucially relevant.

Third, an important point to consider that is related to the previous point is the role of domestic macroprudential measures on 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. Cross-border effects can be negative, particularly if these effects induce regulatory arbitrage. Prudential measures in a particular country can end up shifting some of the risks to other countries. This is an issue even within a country, when tighter restrictions on banks may result in risks shifting to less regulated non-banks

Moreover, there is evidence of sizeable cross-border spillovers to emerging market economies. In Bayangos (2017) for instance, Chilean banks responded to higher capital requirements abroad by increasing their domestic lending. Singapore experienced cross-border spillovers when foreign demand from countries implementing tighter macroprudential policies on residential real estate purchases contributed to an increase in property prices in Singapore. To this end, the BSP-Financial Supervision Sector (FSS) has constructed a vulnerability index of banks' exposure to cross-border flows. The index is now part of the analytical tools in the Quarterly Banking Sector Risk Analysis of the FSS. Given the influence of exchange rates on real bank loan commitments, it is equally useful to examine the relationship between banks' cross-border exposure, exchange rate dynamics and real bank loan commitments. This study takes this as a future research area.

Fourth, the finding that tightening of domestic macroprudential policies restricts risk-taking activities by banks underscores the role of bank supervision and the resulting microprudential policy in managing risks to banking stability in the Philippines. Capital, liquidity, and asset quality ratios feed into the BSP's supervisory continuum. These are factored in when a supervisor undertakes an assessment of the condition of a bank and the banking system as well as the choice of enforcement action or preemptive policy measure which shall subsequently be deployed. In particular, the measure typically covers the adoption of tools that could provide indicators of vulnerabilities of the banking industry and those that will facilitate surveillance of emerging risks outside the banking sector.

Importantly, the BSP, cognizant 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. It is the BSP's view that the approach to banking regulation

and supervision should be calibrated in such a way that such an approach could address the peculiarities of different types of financial institutions without compromising regulatory objective.

Moving forward, the BSP intends to construct a Banking Sector Resilience Index which will serve as a comprehensive measure of banking sector resilience over time, a Composite Vulnerability Index of Banks, which will serve as a comprehensive assessment of sources of vulnerabilities of different banking groups over time, and to use a High-Frequency (Market-Based) Metrics to Assess Banking Sector Resilience. Market-based indicators are quantitative tools that can be used to gauge the market's assessment of the resilience of the Philippine banking system. These indicators are based on information from financial markets and are thus timely, reflect expectations of future performance of the banking system and will offer good comparability across countries and through time.

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Technical Appendix 1

Table 1. Philippines: Use of Domestic Macroprudential Instruments
(March 2002-December 2017)

Type of Instrument (1)	Total Measures (2=4+5+6)	Relative Frequency of Use (3=2/Total)	Tightening Measures (4)	Loosening Measures (5)	Neutral Measures (6)
a. Capital-based Instruments (include capital requirement/risk weight, provisioning requirement)	72	29.5	31	20	21
b. Liquidity-based instruments (include liquidity coverage ratio (LCR) requirement, intraday liquidity regulations and rediscounting facility requirements)	32	13.1	23	9	0
c. Interconnectedness instruments (include additional loss-absorbing capacity for systemically important financial institutions and interbank exposure limits)	3	1.2	2	1	0
d. Resilience –based Instruments (d = a + b + c)	**107**	**43.9**	**56**	**30**	**21**
e. Asset-side instruments (include credit growth, maximum debt-service-to-income ratio, maximum loan-to-value ratio, limit on banks' exposure to housing sector)	15	6.1	9	4	2
f. Bank reserve requirements	20	8.2	15	5	0
g. Currency instruments (include net open position, foreign currency limit)	102	41.8	28	63	11
h. Cyclical – based Instruments (h = e + f + g)	**137**	**56.1**	**52**	**72**	**13**
i. TOTAL (i=d+h)	**244**	**100.0**	**108**	**102**	**34**

Memo item:
1st Quarter 2014 – 4th Quarter 2017

Type of Instrument (1)	Total Measures (2=4+5+6)	Relative Frequency of Use (3=2/Total)	Tightening Measures (4)	Loosening Measures (5)	Neutral Measures (6)
a. Capital- based Instruments	17	35.4	6	8	3
b. Liquidity-based instruments	8	16.7	6	2	0
c. Interconnectedness instruments	2	4.2	2	0	0
d. Resilience –based Instruments (d = a + b + c)	**27**	**56.3**	**14**	**10**	**3**
e. Asset-side instruments	9	18.8	6	2	1
f. Bank reserve requirements	2	4.2	2	0	0
g. Currency instruments	10	20.8	1	9	0
h. Cyclical – based Instruments (h = e + f + g)	**21**	**43.7**	**9**	**11**	**1**
i. TOTAL (i=d+h)	**48**	**100.0**	**23**	**21**	**4**

Sources of database: Authors' compilation from Bayangos (2017), Updates from the Office of Supervisory Policy Development, Banking Regulations Reports, Circulars, various BSP Annual Reports.

Table 2a. Philippines: Description and Descriptive Statistics of Variables

Variable name	Description of Variable	Formula Used
Cost	Real Average Acquisition Cost	(acqcost/ipin_fin00)x100
Val	Real Appraised Value of Housing Unit	(houseval/ipin_fin00)x100
Lot	Real Appraised Value of Lot	(lotval/ipin_fin00)x100
CET1	Common Equity Tier 1	Consists of: (1) paid up common stock issued by the bank; (2) common stock dividends distributable; (3) additional paid-in capital resulting from the issuance of common stock included in CET1 capital; (4) deposit for common stock subscription; (5) retained earnings; (6) undivided profits; (7) other comprehensive income; and (8) Minority interest in subsidiary banks which are less than wholly-owned (see BSP Circular No. 781 dated 15 January 2013).
CET1_6	Gap of actual CET1 ratio from 6.0%	
CAR	Capital adequacy ratio of banks	Qualifying capital (Tier 1 Capital plus Tier 2 Capital) must be at least 10 percent of risk weighted assets.
CAR_10	Gap of actual CAR from 10%	
CGAP	Credit to GDP ratio	Bank loan portfolio/nominal Gross Domestic Product
LCR	Liquidity coverage ratio	Ratio of unencumbered high-quality liquid assets (HQLAs) to total net cash outflows. HQLAs consist of cash or assets that can be converted into a cash at little or no loss of value in private markets (see Circular No. 905 dated 10 March 2016).
NPL	Non-performing loan ratio of banks	Ratio of gross non-performing loans (NPL) to gross total loan portfolio.
CONS	NPL of consumer loans	Ratio of non-performing consumer loans to gross NPL.
RREL	NPL of residential real estate loans	Ratio of non-performing residential real estate loans to total residential real estate loans.
NPA	Non-performing assets of banks (refer to the sum of NPL and ROPA, gross and non-current assets held for sale)	Ratio of non-performing assets to total assets
COV	Non-performing coverage ratio	Ratio of allowance for credit losses of total loan portfolio to gross NPL.

Variable name	Description of Variable	Formula Used
DEPO	Outstanding real deposit liabilities	
DEPOR	Ratio of outstanding real deposit liabilities to total liabilities	
ASSET	Outstanding real total assets	
NII	Outstanding real net interest income of Philippine banks	
MON	Average real monetary operations rate (Overnight RRP Rate)	
LENDR	Average real bank lending rate	
FX	Nominal peso-dollar rate	
REER	Real effective exchange rate (overall)	
INF	Average inflation, 2012=100	
RGDP	Real gross domestic product (annualized year-on-year growth)	

Dummy Variables

Variable name	Description of Variable
TCAP	Tightening capital-based instruments
LCAP	Loosening capital-based instruments
NCAP	Net intensity capital-based instruments
TLIQ	Tightening liquidity-based instruments
LLIQ	Loosening liquidity-based instruments
NLIQ	Net intensity liquidity-based instruments
REST	Resilience-based tightening instruments
RESL	Resilience-based loosening instruments
RESN	Resilience-based net intensity instruments
TASS	Tightening asset-based instruments
LASS	Loosening asset-based instruments
NASS	Net intensity asset-based instruments

Variable name	Description of Variable	Formula Used
TRR	Tightening reserve requirements	
LRR	Loosening reserve requirements	
NRR	Net intensity reserve requirements	
CYCT	Cyclical-based tightening instruments	
CYCL	Cyclical-based loosening instruments	
CYCN	Cyclical-based net intensity instruments	
TOT	Total tightening resilience-based and cyclical-based instruments	
TOL	Total loosening resilience-based and cyclical-based instruments	
TON	Total net intensity resilience-based and cyclical-based instruments	

Table 2b: Descriptive statistics of variables used in the regressions

No.	Variables	Definition	Observations	Minimum	25th percentile	Median	Average	75th percentile	Maximum
1	ASSET	Outstanding real total assets	530	1,839,584.00	2,743,692.28	38,516,817.00	187,000,000.00	372,269,158.80	461,000,000.00
2	CAR_10	Gap of actual CAR from 10%, solo basis	530	-0.10	0.04	0.05	0.06	0.09	0.13
3	CAR_10_CONSO	Gap of actual CAR from 10%, consolidated basis	531	-0.10	0.05	0.05	0.04	0.09	0.13
4	CET1_6	Gap of actual CET1 ratio from 6.0%	530	-0.06	0.06	0.07	0.07	0.09	0.15
5	CGAP	Credit to GDP ratio	550	0.001	0.003	0.005	0.006	0.008	0.024
6	CONS	NPL of consumer loans	530	0.00	0.04	0.05	0.06	0.09	0.11
7	COST	Real Average Acquisition Cost	530	101,620.30	1,112,463.23	1,522,459.00	1,735,161.00	1,920,975.51	12,027,330.00
8	COV	Non-performing coverage ratio of banks	530	0.00	0.49	0.97	1.01	1.46	1.58
9	DEPO	Outstanding real deposit liabilities	530	1,337,902.00	2,058,230.96	31,989,401.00	154,000,000.00	311,796,669.63	373,000,000.00
10	DEPOR	Bank outstanding deposit liabilities/total deposit liabilities	530	89.13	92.46	95.57	94.58	96.98	97.94

No.	Variables	Definition	Observations	Minimum	25th percentile	Median	Average	75th percentile	Maximum
11	FX	Nominal peso-dollar rate	529	43.82	44.98	47.23	47.47	49.85	51.01
12	GRANT	Number of residential property loans granted	530	1.00	7.00	28.50	226.78	159.00	3,476.00
13	INF	Average inflation, 2012=100	529	0.00	0.02	0.03	0.03	0.03	0.04
14	LCR	Liquid assets over total assets	530	0.00	0.26	0.34	0.35	0.43	0.52
15	LENDR	Average real bank lending rate	530	0.01	0.02	0.03	0.03	0.04	0.05
16	LOT	Real Appraised Value of Lot	530	0.00	2,570.78	3,581.24	5,143.36	5,529.10	153,825.20
17	MON	Average real monetary operations rate	530	-0.01	0.00	0.01	0.01	0.03	0.04
18	NPL	Non-performing loan ratio of banks	530	0.00	0.01	0.03	0.04	0.07	0.09
19	NII	Outstanding real net interest income of Philippine banks	530	27,688.23	143,341.16	1,550,391.00	424,000,000.00	6,329,034.48	13,100,000,000.00
20	OGAP	Average output gap based on four approac1hes	531	0.00	0.01	0.02	0.01	0.02	0.02

No.	Variables	Definition	Observations	Minimum	25th percentile	Median	Average	75th percentile	Maximum
21	REER	Real effective exchange rate (overall)	529	81.91	86.19	87.29	87.85	89.74	94.28
22	RGDP	Real gross domestic product (annualized year-on-year growth)	530	0.05	0.06	0.07	0.07	0.07	0.07
23	RREL	NPL of residential real estate loans	530	0.00	0.03	0.03	0.04	0.06	0.09
24	RREPI	Real residential property price index RREPI (2014=100)	530	100.02	104.47	105.29	105.52	106.46	108.89
25	TAY	Neutral rate of interest rate based on Taylor rule	530	-0.04	-0.04	-0.02	-0.02	-0.01	0.01
26	VAL	Real Appraised Value of Housing Unit	530	7,836.38	10,132.20	18,430.46	21,266.33	29,201.38	62,401.61

Technical Appendix 2

Philippines: Technical Equations

Table 1: Effects of Macroprudential policies on real bank loan commitments to households: aggregate macroprudential index (March 2014-December 2017)				
	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j \Delta log\ Loans_{b,t-j}$	-0.360	(0.000)***	-0.424	(0.000)***
LCR_{t-1}	0.093	(0.512)	0.752	(0.054)**
CAR_10_{t-1}	-0.157	(0.082)*	0.108	(0.007)***
$DEPOR_{t-1}$	-0.649	(0.066)*	0.312	(0.052)**
$\sum_{j=1}^{4} \beta_j \Delta MaP_{t-j}$	-0.108	(0.037)***	-0.050	(0.162)*
$\sum_{j=1}^{4} \beta_j \Delta MaP_{t-j} * LCR_{t-1}$			-0.006	(0.005)***
$\sum_{j=1}^{4} \beta_j \Delta MaP_{t-j} * CAR\_10_{t-1}$			-0.451	(0.112)*
$\sum_{j=1}^{4} \beta_j \Delta MaP_{t-j} * DEPOR_{t-1}$			-0.588	(0.052)**
Macroeconomic controls[3]	Yes [3]		Yes [3]	
Other bank-specific Characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q1 2014-Q4 2017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank level		Bank level	
Observations	530		530	
Serial correlation test[1]	0.205		0.125	
Hansen test[2]	0.001		0.000	
*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*				

Table 2: Effects of Macroprudential policies on real bank loan commitments to households: Cyclical vs Resilience macroprudential tools

	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j \Delta log\ Loans_{b,t-j}$	-0.439	(0.000)***	-0.447	(0.000)***
LCR_{t-1}	-0.090	(0.079)*	0.417	(0.008)*
CAR_{t-1}	-0.409	(0.052)**	-0.225	(0.015)***
$DEPOR_{t-1}$	-0.175	(0.054)**	0.540	(0.066)*
$\sum_{j=1}^{4} \beta_j \Delta MaPCyc_{t-j}$	-0.266	(0.065)*	-0.193	(0.088)*
$\sum_{j=1}^{4} \beta_j \Delta MaPRes_{t-j}$	-0.350	(0.005)***	-0.642	(0.089)*
$\sum_{j=1}^{3} \beta_j \Delta MaP\_Cyc_{t-j} * LCR_{t-1}$			-0.246	(0.013)***
$\sum_{j=1}^{4} \beta_j \Delta MaP\_Cyc_{t-j} * CAR\_10_{t-1}$			-0.287	(0.048)***
$\sum_{j=1}^{4} \beta_j \Delta MaP\_Cyc_{t-j} * DEPOR_{t-1}$			0.788	0.173
$\sum_{j=1}^{4} \beta_j \Delta MaP\_Res_{t-j} * LCR_{t-1}$			-0.294	(0.098)*
$\sum_{j=1}^{3} \beta_j \Delta MaP\_Res_{t-j} * CAR\_10_{t-1}$			-0.817	(0.060)*
$\sum_{j=1}^{2} \beta_j \Delta MaP\_Res_{t-j} * DEPOR_{t-1}$			-0.165	(0.045)**
Macroeconomic controls	Yes [3]		Yes [3]	
Other bank-specific Characteristics	No [4]		No [4]	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.111		0.287	
Hansen test[2]	0.020		0.007	

Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate. [4] Indicator on bank resources was included in the initial estimation, but this proved insignificant.

Table 3: Effects of Macroprudential policies on bank loan commitments to households: Tightening vs Easing episodes of macroprudential policies				
	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\ \Delta log\ Loans_{b,t-j}$	-0.629	(0.000)***	-0.341	(0.025)**
LCR_{t-1}	-0.175	(0.001)***	-0.664	(0.063)**
CAR_10_{t-1}	0.063	(0.038)**	-0.414	(0.006)***
$DEPOR_{t-1}$	-0.134	(0.000)***	0.114	(0.097)*
$\sum_{j=1}^{4} \beta_j\ \Delta MaP\_easy_{t-j}$	0.650	0.110	0.156	(0.014)**
$\sum_{j=1}^{4} \beta_j\ \Delta MaP\_tight_{t-j}$	-0.285	(0.015)**	-0.117	(0.013)***
$\sum_{j=1}^{3} \beta_j\ \Delta MaP\_easy_{t-j} * LCR_{t-1}$			0.156	(0.014)**
$\sum_{j=1}^{4} \beta_j\ \Delta MaP\_easy_{t-j} * CAR\_10_{t-1}$			0.639	(0.028)**
$\sum_{j=1}^{4} \beta_j\ \Delta MaP\_easy_{t-j} * DEPOR_{t-1}$			-0.473	(0.018)**
$\sum_{j=1}^{3} \beta_j\ \Delta MaP\_tight_{t-j} * LCR_{t-1}$			-0.122	(0.016)**
$\sum_{j=1}^{4} \beta_j\ \Delta MaP\_tight_{t-j} * CAR\_10_{t-1}$			-0.203	(0.013)**
$\sum_{j=1}^{2} \beta_j\ \Delta MaP\_tight_{t-j} * DEPOR_{t-1}$			0.127	(0.064)**
Macroeconomic controls	Yes [3]		Yes [3]	
Other bank-specific characteristics	No [4]		No [4]	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.181		0.169	
Hansen test[2]	0.011		0.043	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. . [3] Includes real effective exchange rate. [4] Indicator on bank resources was included in the initial estimation, but this proved insignificant.*

Table 4: Effects of Macroprudential policies on real bank loan commitments to households: Macroprudential policies and monetary policy conditions

	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		**(II)**	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\ \Delta log\ Loans_{b,t-j}$	-0.443	(0.000)***	-0.423	(0.000)***
LCR_{t-1}	0.482	(0.045)**	0.850	(0.001)***
CAR_10_{t-1}	0.223	(0.000)***	0.297	(0.080)*
$DEPOR_{t-1}$	-0.510	(0.076)*	-0.010	(0.011)
$\sum_{j=1}^{3} \beta_j\ \Delta MaP_{t-j}$	-0.054	(0.060)**	0.880	0.128
$\sum_{j=0}^{1} \vartheta_j\ \Delta r_{t-j}$	0.257	(0.040)**	0.374	0.158
$\sum_{j=0}^{3} \rho_j\ \Delta MaP_{t-j} * r_{t-j}$	-0.699	(0.037)**	0.003	0.060**
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.501		0.214	
Hansen test[2]	0.002		0.031	

Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.

Table 5: Effects of Macroprudential policies on real bank loan commitments to households: Macroeconomic policies and the business cycle

	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\ \Delta log\ Loans_{b,t-j}$	-0.455	(0.000)***	-0.406	(0.000)***
LCR_{t-1}	0.125	(0.015)**	0.365	0.372
CAR_10_{t-1}	0.364	(0.063)**	-0.119	(0.045)**
$DEPOR_{t-1}$	-0.119	(0.000)*	0.576	(0.068)*
$\sum_{j=1}^{3} \beta_j\ \Delta MaP_{t-j}$	-0.539	(0.004)***	-0.694	(0.059)**
$\sum_{j=0}^{1} \vartheta_j\ OGAP_{t-j}$	-0.144	(0.037)**	0.132	0.277
$\sum_{j=1}^{3} \rho_j\ \Delta MaP_{t-j} * OGAP_{t-j}$	-0.044	(0.003)***	-0.068	(0.086)*
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.256		0.138	
Hansen test[2]	0.148		0.000	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

Table 6: Effects of Macroprudential policies on real bank loan commitments to households: household loans: Macroeconomic policies and the financial cycle				
	Dependent variable: Quarterly change of bank loan commitments to households in real terms ($\Delta log\ Loans_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\ \Delta log\ Loans_{b,t-j}$	-0.446	(0.000)***	-0.421	(0.000)***
LCR_{t-1}	-0.042	(0.008)***	0.311	0.105
CAR_10_{t-1}	-0.633	(0.032)***	0.182	0.145
$DEPOR_{t-1}$	-0.004	(0.000)***	-0.053	(0.097)*
$\sum_{j=1}^{3} \beta_j\ \Delta MaP_{t-j}$	-0.213	(0.071)*	-0.452	(0.000)***
$\sum_{j=0}^{k} \vartheta_j\ CreditGAP_{t-j}$	-0.087	(0.012)***	-0.027	0.124
$\sum_{j=1}^{3} \rho_j\ \Delta MaP_{t-j} * CreditGAP_{t-j}$	-0.016	(0.007)***	-0.001	0.167
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.214		0.174	
Hansen test[2]	0.000		0.000	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

Table 7: Effects of Macroprudential policies on non-performing loans: Aggregate macroprudential index				
	Dependent variable: Non-performing loan ratio ($NPL_{b,t}$)			
	(I)		**(II)**	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\, NPL_{b,t-j}$	0.583	(0.000)***	0.603	(0.000)***
LCR_{t-1}	-0.036	(0.001)***	-0.184	(0.0005)***
CAR_10_{t-1}	-0.049	(0.000)***	0.105	(0.056)**
$DEPOR_{t-1}$	-0.185	(0.000)***	-0.567	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP_{t-j}$	-0.004	(0.000)***	-0.028	(0.001)***
$\sum_{j=1}^{3} \beta_j\, \Delta MaP_{t-j} * LCR_{t-1}$			-0.011	(0.021)***
$\sum_{j=1}^{k} \beta_j\, \Delta MaP_{t-j} * CAR\_10_{t-1}$			-0.128	(0.000)***
$\sum_{j=1}^{2} \beta_j\, \Delta MaP_{t-j} * DEPOR_{t-1}$			0.213	(0.000)***
Macroeconomic controls	Yes [3]		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.118		0.211	
Hansen test[2]	0.004		0.012	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

Table 8: Effects of Macroprudential policies on non-performing loans:
Cyclical vs Resilience macroprudential tools

	Dependent variable: Non-performing loan ratio ($NPL_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\, NPL_{b,t-j}$	-0.572	(0.035)***	-0.112	(0.103)*
LCR_{t-1}	-0.133	(0.000)***	-0.001	(0.000)***
CAR_10_{t-1}	0.170	(0.0002)***	0.170	(0.010)*
$DEPOR_{t-1}$	-0.574	(0.000)***	-0.007	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaPCyc_{t-j}$	-0.026	(0.000)***	-0.087	(0.002)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaPRes_{t-j}$	-0.009	(0.000)***	-0.009	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_Cyc_{t-j} * LCR_{t-1}$			-0.081	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_Cyc_{t-j} * CAR\_10_{t-1}$			-0.401	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_Cyc_{t-j} * DEPOR_{t-1}$			-0.012	(0.000)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_Res_{t-j} * LCR_{t-1}$			0.009	(0.002)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_Res_{t-j} * CAP\_10_{t-1}$			-0.005	(0.182)
$\sum_{j=1}^{3} \beta_j\, \Delta MaP\_Res_{t-j} * DEPOR_{t-1}$			-0.017	(0.000)***
Macroeconomic controls	Yes		Yes	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56		56	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.109		0.213	
Hansen test[2]	0.005		0.000	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

Table 9: Effects of Macroprudential policies on non-performing loans: Tightening vs easing episodes of macroprudential policies

| | Dependent variable: Non-performing loan ratio ($NPL_{b,t}$) | | | |
| | **(I)** | | **(II)** | |
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\, NPL_{b,t-j}$	0.017	(0.001)***	0.024	(0.001)***
$SIZE_{t-1}$	0.678	(0.019) ***	0.305	(0.022) ***
LCR_{t-1}	-0.037	(0.001)***	-0.019	(0.002) ***
CAR_10_{t-1}	0.306	(0.027)***	0.234	(0.006) ***
$DEPOR_{t-1}$	-0.144	(0.013)***	-0.087	(0.031) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_easy_{t-j}$	0.002	(0.001) ***	0.033	(0.001) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_tight_{t-j}$	-0.008	(0.003) ***	-0.014	(0.003) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_easy_{t-j} * LCR_{t-1}$			0.005	(0.005) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_easy_{t-j} * CAR\_10_{t-1}$			0.134	(0.017) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_easy_{t-j} * DEPOR_{t-1}$			-0.016	(0.023) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_tight_{t-j} * LCR_{t-1}$			-0.036	(0.009)***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_tight_{t-j} * CAR\_10_{t-1}$			-0.234	(0.018) ***
$\sum_{j=1}^{4} \beta_j\, \Delta MaP\_tight_{t-j} * DEPOR_{t-1}$			-0.139	(0.005) ***
Macroeconomic controls	Yes [3]		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56 banks		56 banks	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.278		0.128	
Hansen test[2]	0.021		0.000	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

**Table 10: Effects of Macroprudential policies on non-performing loans:
Macroeconomic policies and monetary policy conditions**

	Dependent variable: Non-performing loan ratio ($NPL_{b,t}$)			
	(I)		**(II)**	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j \, NPL_{b,t-j}$	0.598	(0.020) ***	0.012	(0.041) ***
LCR_{t-1}	-0.057	(0.004) ***	-0.034	(0.002) ***
CAR_10_{t-1}	0.363	(0.049)***	0.635	(0.029)***
$DEPOR_{t-1}$	-0.124	(0.019)***	-0.060	(0.011)***
$\sum_{j=1}^{4} \beta_j \, \Delta MaP_{t-j}$	0.007	(0.001)***	-0.009	(0.005)***
$\sum_{j=0}^{1} \vartheta_j \, r_{t-j}$	0.002	(0.005)***	-0.134	(0.017)***
$\sum_{j=0}^{4} \rho_j \, \Delta MaP_{t-j} * r_{t-j}$	0.353	(0.001)*	-0.339	(0.057)**
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56 banks		56 banks	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.108		0.277	
Hansen test[2]	0.008		0.001	

*Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.*

Table 11: Effects of Macroprudential policies on non-performing loans: Macroeconomic policies and the business cycle				
	Dependent variable: Non-performing loan ratio ($NPL_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j \, NPL_{b,t-j}$	0.225	(0.068)**	0.315	(0.073)***
LCR_{t-1}	-0.066	(0.004)***	0.144	(0.051)***
CAR_10_{t-1}	0.801	(0.080)***	-0.254	(0.087)**
$DEPOR_{t-1}$	-0.224	(0.013)***	0.116	(0.036)**
$\sum_{j=1}^{4} \beta_j \, \Delta MaP_{t-j}$	-0.002	(0.004) ***	-0.166	(0.067)**
$\sum_{j=0}^{1} \vartheta_j \, OGAP_{t-j}$	0.147	(0.063)**	0.242	(0.057) ***
$\sum_{j=0}^{4} \rho_j \, \Delta MaP_{t-j} * OGAP_{t-j}$	-0.626	(0.095)***	-0.111	(0.035) ***
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56 banks		56 banks	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.211		0.109	
Hansen test[2]	0.000		0.000	
Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.				

Table 12: Effects of Macroprudential policies on non-performing loans:
Macroeconomic policies and the financial cycle

	Dependent variable: Non-performing loan ratio ($NPL_{b,t}$)			
	(I)		(II)	
	Coeff	Std err	Coeff	Std err
$\sum_{j=1}^{1} \gamma_j\, NPL_{b,t-j}$	0.097	(0.010)**	0.772	(0.037)**
LCR_{t-1}	-0.118	(0.015)***	0.198	(0.019)*
CAR_10_{t-1}	0.503	(0.025)***	-0.251	(0.048)**
$DEPOR_{t-1}$	-0.003	(0.000)***	0.101	(0.045)**
$\sum_{j=1}^{4} \beta_j\, \Delta MaP_{t-j}$	-0.010	(0.003)***	-0.872	(0.125)**
$\sum_{j=0}^{1} \vartheta_j\, CreditGAP_{t-j}$	0.304	(0.029)**	0.329	(0.015)*
$\sum_{j=0}^{4} \rho_j\, \Delta MaP_{t-j} * CreditGAP_{t-j}$	-0.359	(0.000) ***	-0.136	(0.144)**
Macroeconomic controls	No		Yes [3]	
Other bank-specific characteristics	No		No	
Country	Philippines		Philippines	
Sample period	Q12014-Q42017		Q12014-Q42017	
Banks	56 banks		56 banks	
Clustering	Bank-level		Bank-level	
Observations	530		530	
Serial correlation test[1]	0.213		0.311	
Hansen test[2]	0.010		0.003	

Notes: Robust standard errors are reported in brackets. The symbols *, **, and *** represent significance levels of 10%, 5% and 1% respectively. [1]Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. [2]Reports p-values for the null hypothesis that the instruments used are correlated with the residuals. [3] Includes real effective exchange rate.

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- 2010 Central Bank Macroeconomic Modeling Workshop, 19-20 October 2010
- BSP International Research Conference on Remittances, 30-31 March 2009
- Joint BSP-BIS High-Level Conference on Transparency and Communication in Monetary Policy, 01 February 2008