

The Philippine Review of Economics

Editor-in-Chief

EMMANUEL F. ESGUERRA

Editorial Advisory Board

EMMANUEL DE DIOS

RAUL V. FABELLA

HAL CHRISTOPHER HILL

CHARLES Y. HORIOKA

KIAN GUAN LIM

ROBERTO S. MARIANO

JOHN VINCENT C. NYE

GERARDO P. SICAT

JEFFREY G. WILLIAMSON

Associate Editors

LAWRENCE B. DACUYCUY

FRANCISCO G. DAKILA JR.

JONNA P. ESTUDILLO

MARIA S. FLORO

GILBERTO M. LLANTO

Managing Editor

HONLANI RUTH R. RUFO

SPECIAL ISSUE ON MONETARY POLICY AND CENTRAL BANKING

Issue Editor

Faith Christian Q. Cacnio

ARTICLES IN THIS ISSUE

Nowcasting domestic liquidity in the Philippines using machine learning algorithms

Juan Rufino M. Reyes

Does bank competition affect bank risk-taking differently?

Veronica B. Bayangos

Insights on inflation expectations from a household survey

Faith Christian Q. Cacnio
Joselito R. Basilio

Heterogenous impact of monetary policy on the Philippine rural banking system

Eloisa T. Glindro
Jean Christine A. Armas
V. Bruce J. Tolentino
Lorna Dela Cruz-Sombe

How do exchange rates affect the Big One? An empirical analysis of the effect of exchange rates on RCEP exports using the gravity model

Jose Adlai M. Tancangco

The long and the short of it: revisiting the effects of microfinance-oriented banks on household welfare in the Philippines

Cherry Wyle G. Layaoen
Kazushi Takahashi



A joint publication of the
University of the Philippines
School of Economics
and the **Philippine Economic Society**





The Philippine Review of Economics

A joint publication of the UP School of Economics (UPSE)
and the Philippine Economic Society (PES)

EDITOR-IN-CHIEF

Emmanuel F. Esguerra
UP SCHOOL OF ECONOMICS

EDITORIAL ADVISORY BOARD

Emmanuel de Dios
UP SCHOOL OF ECONOMICS

Raul V. Fabella
UP SCHOOL OF ECONOMICS

Hal Christopher Hill
AUSTRALIAN NATIONAL UNIVERSITY

Charles Y. Horioka
KOBE UNIVERSITY

Kian Guan Lim
SINGAPORE MANAGEMENT UNIVERSITY

Roberto S. Mariano
UNIVERSITY OF PENNSYLVANIA

John Vincent C. Nye
GEORGE MASON UNIVERSITY

Gerardo P. Sicat
UP SCHOOL OF ECONOMICS

Jeffrey G. Williamson
HARVARD UNIVERSITY

ASSOCIATE EDITORS

Lawrence B. Dacuycuy
DE LA SALLE UNIVERSITY

Francisco G. Dakila Jr.
BANGKO SENTRAL NG PILIPINAS

Jonna P. Estudillo
UNIVERSITY OF THE PHILIPPINES

Maria S. Floro
AMERICAN UNIVERSITY (WASHINGTON D.C.)

Gilberto M. Llanto
PHILIPPINE INSTITUTE FOR DEVELOPMENT
STUDIES

MANAGING EDITOR

Honlani Ruth R. Rufó
UP SCHOOL OF ECONOMICS

Aims and Scope: The *Philippine Review of Economics* (PRE) invites theoretical and empirical articles on economics and economic development. Papers on the Philippines, Asian and other developing economies are especially welcome. Book reviews will also be considered.

The PRE is published jointly by the UP School of Economics and the Philippine Economic Society. Its contents are indexed in the *Journal of Economic Literature*, EconLit, and RePec. PRE's readership includes economists and other social scientists in academe, business, government, and development research institutions.

Publication Information: The PRE (ISSN 1655-1516) is a peer-reviewed journal published every June and December of each year. A searchable database of published articles and their abstracts is available at the PRE website (<http://pre.econ.upd.edu.ph>).

Subscription Information:

Subscription correspondence may be sent to the following addresses:

- css@pssc.org.ph
- PSSC Central Subscription Service,
PSSCenter, Commonwealth Avenue, 1101, Diliman,
Quezon City, Philippines.
P.O. Box 205, UP Post Office, Diliman, Quezon City,
Philippines 1101
PHONE: 922-9627, FAX: 924-4178/926-5179

Submissions: Authors may submit their manuscripts to the addresses below:

- pre.upd@up.edu.ph
- The Editor, The Philippine Review of Economics, Rm 237,
School of Economics, University of the Philippines, Diliman,
Quezon City, 1101.

Manuscripts must be written in English and in MS Word format. All graphs and tables must be in Excel format. Submission of a manuscript shall be understood by the PRE as indicating that the manuscript is not under consideration for publication in other journals. All submissions must include the title of the paper, author information, an abstract of no more than 150 words, and a list of 3–4 keywords. Complete guidelines can be viewed in the PRE's website.

Copyright: The *Philippine Review of Economics* is protected by Philippine copyright laws. Articles appearing herein may be reproduced for personal use but not for mass circulation. To reprint an article from PRE, permission from the editor must be sought.

Acknowledgements: The PRE gratefully acknowledges the financial support towards its publication provided by the Philippine Center for Economic Development (PCED). The Review nonetheless follows an independent editorial policy. The articles published reflect solely the editorial judgement of the editors and the views of their respective authors.



The Philippine Economic Society

Founded 1961

BOARD OF TRUSTEES 2022

PRESIDENT

Charlotte Justine Diokno-Sicat
PHILIPPINE INSTITUTE FOR DEVELOPMENT
STUDIES

VICE PRESIDENT

Philip Arnold P. Tuaño
ATENEO DE MANILA UNIVERSITY

SECRETARY

Ruben Carlo O. Asuncion
UNION BANK OF THE PHILIPPINES

TREASURER

Kevin C. Chua
WORLD BANK

BOARD MEMBERS

Agham C. Cuevas
UNIVERSITY OF THE PHILIPPINES-LOS BAÑOS

Jovi C. Dacanay
UNIVERSITY OF ASIA AND THE PACIFIC

Sarah Lynne S. Daway-Ducanes
UNIVERSITY OF THE PHILIPPINES-DILIMAN

Alice Joan G. Ferrer
UNIVERSITY OF THE PHILIPPINES-VISAYAS

Emilio S. Neri, Jr.
BANK OF THE PHILIPPINE ISLANDS

Majah-Leah V. Ravago
ATENEO DE MANILA UNIVERSITY

Marites M. Tiongco
DE LA SALLE UNIVERSITY

EX-OFFICIO BOARD MEMBERS

Faith Christian Q. Cacnio
BANGKO SENTRAL NG PILIPINAS
IMMEDIATE PAST PRESIDENT

Emmanuel F. Esguerra
UNIVERSITY OF THE PHILIPPINES-DILIMAN
EDITOR, *PHILIPPINE REVIEW OF ECONOMICS*

The Philippine Economic Society (PES) was established in August 1962 as a nonstock, nonprofit professional organization of economists.

Over the years, the PES has served as one of the strongest networks of economists in the academe, government, and business sector.

Recognized in the international community of professional economic associations and a founding member of the Federation of ASEAN Economic Associations (FAEA), the PES continuously provides a venue for open and free discussions of a wide range of policy issues through its conferences and symposia.

Through its journal, the *Philippine Review of Economics* (PRE), which is jointly published with the UP School of Economics, the Society performs a major role in improving the standard of economic research in the country and in disseminating new research findings.

At present the society enjoys the membership of some 800 economists and professionals from the academe, government, and private sector.

- **Lifetime Membership** - Any regular member who pays the lifetime membership dues shall be granted lifetime membership and shall have the rights, privileges, and responsibilities of a regular member, except for the payment of the annual dues.
- **Regular Membership** - Limited to individuals 21 years of age or older who have obtained at least a bachelor's degree in economics, or who, in the opinion of the Board of Directors, have shown sufficient familiarity and understanding of the science of economics to warrant admission to the Society. Candidates who have been accepted shall become members of the Society only upon payment of annual dues for the current year.
- **Junior Membership** - This is reserved for full-time college or graduate students majoring in economics. Affiliation for junior membership is coursed through the Junior Philippine Economic Society (JPES).

For more information, visit: www.phileconsociety.org.

The Philippine Review of Economics

Vol. LIX No. 2

ISSN 1655-1516

December 2022

DOI: 10.37907/ERP2202D

- 1 Nowcasting domestic liquidity in the Philippines using
machine learning algorithms
Juan Rufino M. Reyes
- 41 Does bank competition affect bank risk-taking differently?
Veronica B. Bayangos
- 81 Insights on inflation expectations from a household survey
Faith Christian Q. Cacnio
Joselito R. Basilio
- 111 Heterogenous impact of monetary policy on the Philippine
rural banking system
Eloisa T. Glindro
Jean Christine A. Armas
V. Bruce J. Tolentino
Lorna Dela Cruz-Sombe
- 135 How do exchange rates affect the Big One? An empirical
analysis of the effect of exchange rates on RCEP exports using
the gravity model
Jose Adlai M. Tancangco
- 166 The long and the short of it: revisiting the effects of
microfinance-oriented banks on household welfare in the
Philippines
Cherry Wyle G. Layaoen
Kazushi Takahashi

Heterogenous impact of monetary policy on the Philippine rural banking system

Eloisa T. Glindro*
Jean Christine A. Armas
V. Bruce J. Tolentino
Lorna Dela Cruz-Sombe
Bangko Sentral ng Pilipinas**

This paper shows the differential impact of monetary policy on the lending behavior of rural banks, with the bank lending channel being operational in small rural banks. While big rural banks are able to protect their lending portfolio from contractionary monetary policy by the size of their balance sheet, small rural banks with less diversified funding portfolio cannot. Moreover, highly capitalized rural banks are more inclined to protect their capital than expand their lending portfolio, following monetary tightening and higher capital requirement. The insignificance of gross domestic product (GDP) growth may reflect weakness in effective loan demand and lack of diversification that could have also impinged on the earning capacity of rural banks, as supported by initial estimates on the drivers of rural bank profitability. The finding on heterogeneous effects of monetary policy on rural banks has a secondary implication of lending credence to the principle of proportionality embodied in the BSP's bank regulatory framework.

JEL classification: B23, C55, E52, E58

Keywords: rural bank, bank lending channel, monetary policy

1. Introduction

The creation of the Philippine rural banking system through Republic Act 720 or the Rural Bank Act 1952 was a step towards fulfilling the vision of social and financial inclusion of small farm households in the post-war era. It has been recognized as an important mechanism for enabling economic and social integration of small farm households.

* Address all correspondence to eglindro@bsp.gov.ph and ArmasJA@bsp.gov.ph.

**The views expressed in this paper are those of the authors and do not necessarily reflect those of Bangko Sentral ng Pilipinas. Any errors and omissions are solely of the authors.

The network of rural banks in the Philippines has similarities with the community banking industry in the US and the *Sparkassen* in Germany. Corner [2010] observes that the emergence of thousands of community banks in the US is a legacy from an era when competition was curtailed. He notes that much of the community banks' cost and revenue advantages have been significantly diminished in an environment of heightened competition and financial technological advancement. Perhaps, the same can be said for the Philippine rural banks that have to carve out a niche market for their products and services as they face stronger competition with significantly bigger and more technologically agile universal and commercial banks.

Rural finance research in the Philippines typically ranges from farm-level assessment of credit efficiency to the broader question of rural financial market efficiency (Geron et al. [2016], Llanto [2005]). In all of these, the rural banking system, by virtue of its mandate, plays an important function in credit intermediation. Over time, the general views on the role of rural banks have significantly changed from a credit conduit to farmers to a more dynamic, profit-maximizing producer of financial services (Von Pischke [1978] as cited by Tolentino [1987]). At the same time, the policy and regulatory environment within which small, rural banks operate has non-neutral effects on the profit maximization objective of banks.

The significance of the bank-lending channel is premised on the extent of bank-dependent borrowers and the quantitative impact of monetary policy on the supply of bank loans. In jurisdictions with limited alternative sources of financing other than bank credit, this channel is likely to be more important. Whether as wholesaler or retailer of credit, rural banks play an important role in credit facilitation. Familiarity with local cultural norms works to their advantage because monitoring and compliance with know-your-customer (KYC) protocols for small depositors/borrowers may be relatively easier. This, however, does not discount the possibility that KYC requirements are shunned because of difficulties of small depositors and borrowers in complying with documentary requirements. However, the effect of market imperfections on rural banks' ability to generate marginal sources of financing may be more evident in the loan supply portfolio of smaller banks.

By far, there are very few studies that examine the rural banking system in the Philippines, more so on strength or even the presence or absence of bank lending channel due to the relative smallness of the asset size and deposit base of rural banks. This is the gap in the literature that our research intends to fill. It is equally important to understand the transmission of monetary policy through the lending behavior of rural banks since they cater to smaller borrowers in underserved areas. At the same time, rural banks are particularly niche players in countryside lending. In some areas, a rural bank, regardless of the asset size or loan portfolio, is the sole provider of financial services.

The study seeks to empirically determine if bank lending channel operates in the least studied class of banks in the Philippines, i.e., rural banks. Specifically, the study examines if monetary policy adjustments have a differential impact on rural banks' loan supply based on their balance sheet-specific characteristics such as size, liquidity and capitalization. In this way, the study also analyzes whether these rural banks' balance sheet indicators absorb or amplify the effects of monetary policy adjustments.

The paper is outlined as follows: Section 2 reviews the theoretical and empirical underpinnings of the bank lending channel of monetary policy and provides some perspectives from the literature on the Philippine banking system. Section 3 presents the data and profile of the rural banks under study. Section 4 elaborates on the model specification, methodology used in this study, and the robustness of the model. Section 5 provides an analysis of the results. Section 6 concludes.

2. Review of related literature

The credit market creates value through the activities generated from the use of loans [Swinnen and Gow 1997]. At the same time, the credit market is characterized by asymmetric information and incentive compatibility problems. Lenders earn from financial intermediation by mobilizing short-term and demandable deposit liabilities to fund longer-term financing requirements of borrowers. To attenuate information asymmetry, lenders screen borrowers, stipulate terms of the loan contract, and monitor payment streams to ensure repayment and full recovery of capital throughout the life of the contract. An external finance premium is charged on the loan to cover the monitoring costs and uncertainty arising from the risk profile of the borrowers.

Expected profits of banks depend not only on interest income but also on the probability of default. On one hand, higher rates lead to higher expected returns for banks. On the other hand, higher rates also affect the riskiness of the total loan portfolio and hence, the probability of default. Since banks cannot distinguish good borrowers from bad borrowers, they may also resort to credit rationing, which could adversely affect credit-worthy but riskier entrepreneurial borrowers with relatively smaller business scale. Borrowers, in need of funds, enter into loan covenant defined by lenders' standards. They could default in payment, not necessarily because of bad intentions but due to inadequate returns that impair their capacity to repay the loan [Stiglitz and Weiss 1981].

2.1. The bank lending channel revisited

The policy actions of the central bank impact the lending operations of financial institutions like banks. The traditional view of the bank lending channel of monetary policy works through the effect of monetary policy on reservable deposits that could expand or contract the supply of bank loans and consequently,

affect the real spending of borrowers. Two conditions must be satisfied for the bank lending channel to hold: first, the banks cannot fully insulate their loan portfolio from monetary policy actions by central banks and second, borrowers cannot protect their spending from the changes in loan availability [Oliner and Rudebusch 1995], or more commonly referred to as the broad credit channel.

Other than the impact of monetary policy on reservable deposits, Disyatat [2010] posits a bank lending channel that works primarily through the impact of monetary policy on banks' balance sheet strength and risk perception. Banks, in general, have access to other funding sources like commercial paper and borrowings. As such, bank characteristics like size, liquidity, and capitalization could help shield their lending portfolio from monetary policy action by the central bank.

Many of the studies that utilize bank-level data looked into the lending behavior of commercial banks in response to monetary policy. Kashyap and Stein [1995] as well as Kishan and Opiela [2000] utilized US bank-level data and found evidence of bank lending channel by looking into cross-sectional differences in the responses to monetary policy shocks by different classes of banks. Lui [2012] used bank size and loans and concluded that monetary policy in Australia has distributional effects on bank loans, depending on asset size and industry. Worms [2001] did the same for Germany and found that lower ratio of short-term interbank deposits-to-total assets leads to stronger reaction of lending to contractionary monetary policy. Others looked into distance effect using gravity model of bank lending. Gudmundsdottir et al. [2017] found that negative relationship between lending and distance in the European Union, which they largely ascribed to information costs, combined with other factors such as capital requirements, local competition, and cross-border trade, imply constraints to full European financial integration. Carling and Lundberg [2005], on the other hand, found no evidence of geographical credit rationing in Sweden in the face of restrictive monetary policy.

The preponderance of studies that examine the nexus between commercial bank lending behavior and monetary policy may have been partly motivated by relatively easier access to data. The same can be said for the Philippines where there are a few studies on the bank lending channel, ranging from the assessment of the quantitative importance of capital adequacy of banks in channel at a macroeconomic level to the use of universal and commercial bank-level data.

Bayangos [2010], using a macroeconomic model, found that the aggregate measure of capital adequacy of commercial and universal banks is an important factor in banks' ability to sustain their lending activities after monetary policy adjustment. Aban [2012; 2013], using asset size data of commercial and universal banks, found that loan growth from smaller banks is sensitive to movements in monetary policy. Glindro et al. [2016] expanded the set of universal and commercial bank characteristics to include asset size, capitalization, and liquidity

in understanding the bank lending channel of monetary policy in the Philippines. The study found that capital-to-asset ratio is the most statistically significant bank-specific indicator that helps shield universal and commercial banks' loan portfolio from the impact of contractionary monetary policy. Moreover, a significantly negative interaction term was obtained only after controlling for interbank deposits, possibly indicating higher risk aversion and greater concern for preserving capital and meeting liquidity requirements in times of contractionary monetary policy.

Meanwhile, Austria and Bondoc [2018] and Armas [2021] find very little or weak evidence of bank lending channel in the Philippines using a larger sample size of banks and longer period. Austria and Bondoc [2018] highlighted that their results could be due to loan portfolio rebalancing where banks do not reduce their lending but rather reallocate their loan provision to different economic sectors (e.g., drop in consumer loans but an increase in industrial loans). Similarly, Armas [2021] showed that the bank lending channel of monetary policy in the Philippines is quite weak as highly liquid banks tend to react more to monetary tightening than less liquid banks. More liquid banks would rather hold their stock of liquid assets as buffers against crises than sustain or expand their lending activity amid monetary tightening. Banks are also risk-sensitive in their lending behavior as the increase in the cost of borrowing following tighter monetary policy could increase the likelihood of loan default.

Unlike universal and commercial banks that have a large and more diverse corporate client base and wider access to alternative funding sources, the asset-liability profile of rural banks is simpler. Notwithstanding the relative smallness of the collective asset base of rural banks compared to bigger and highly diversified universal and commercial banks, there is also huge variation across the spectrum of rural banks, ranging from stand-alone rural banks to those with extensive branch networks. Thus, even within their ranks, the impact of central bank policy actions on their lending behavior would differ.

2.2. Perspectives from the literature on Philippine rural banking system

There are fewer studies on the Philippine rural banking system. The study by Aragon et al. [2011] analyzed lending behavior of rural banks under capital regulation with prompt corrective action (PCA). The study found that the effectiveness of the combined capital regulations and PCA diminishes in the case of undercapitalized banks. A capital shock in the presence of more risk-sensitive capital reduces loans for undercapitalized banks, contributing to a credit crunch in the rural area. Mendoza and Rivera [2017], on the other hand, looked at the determinants of bank profitability. They found that credit risk, measured by the loan loss reserves-to-total loan portfolio, better explains the profitability of rural banks than capital adequacy requirement.

Meslier-Crouzille et al. [2012] studied the contribution of rural banks to regional economic development for the period 1993–2005. They generally found no clear evidence of a banking-led economic development for the Philippines. However, when they specifically accounted for the presence of rural banks, their estimates showed positive impact on the economic development of intermediate and less developed regions, with a stronger impact for intermediate regions. Their findings lend credence to the important function of rural banks in fostering regional economic development.

For a central bank like the *Bangko Sentral ng Pilipinas* (BSP) that is responsible for both monetary policy and regulatory supervision of the banking system, understanding the lending response of banks to its policy actions is vital. Over time, significant macroeconomic and regulatory developments may have either supported or constrained rural banks from fulfilling their mandate to be agents of rural growth through credit facilitation. The encompassing reforms in the regulatory milieu such as the introduction of Basel regulatory standards, the Consolidation Program for Rural Banks (CPRB), the establishment of microfinance business offices, and branch lite concept in banking, among others, may have spawned differential effects of monetary policy on the credit intermediation function of rural banks. Given that banking supervision is about safeguarding prudential soundness, the BSP follows the principle of proportionality, in which supervisory practices are adapted to the risk profile, business model and size of the bank.¹

Overall, the empirical evidence on the existence of bank lending channel across different jurisdictions underlines the significance of bank-specific characteristics in determining the existence and relative strength of the bank lending channel.

3. Data

The study uses comprehensive quarterly dataset balance sheet indicators of rural banks in the Philippines, which are sourced from the Department of Supervisory Analytics-Financial Supervision Sector of the BSP. The dataset has an unbalanced panel data structure due to closures, mergers of some banks, upgrading of some rural banks into thrift banks, and establishment of new rural banks over time.

The dataset includes accounts of 609 head offices of rural banks. This is in view of the consolidated approach to supervisory examination of rural banks that encompasses the bank's branch network. The period covered by the study spans 40 quarters, i.e., 2010Q1–2018Q2, for which risk-weighted capital adequacy

¹ The goal of prudential regulation is to internalize the externalities from the distress or failure of individual banks and the banking system. Since externalities depend on the risk profile of each bank, proportionality is defined as setting prudential standards that are tailored to the bank's risk profile, business model, cross-border activity, and systemic importance (Basel Committee on Banking Supervision [2019]; Hakkarainen [2019]).

ratio (CAR) is available. The dataset covers 16,606 observations for balance sheet indicators and 16,588 observations for profitability indicators, which include income statement indicators such as return on assets (ROA) and net interest margin (NIM).²

The variables used for the empirical estimation of the bank lending channel have been log transformed since the base form, in level, tends to increase or grow exponentially as in the case of stock variables like balance sheet indicators. The selection of most of the variables used in this paper was largely based on widely-referenced bank lending literature (Kashyap and Stein [1995], Zulkhibri [2013], Ananchotikul and Seneviratne [2015], and Ehrmann et al. [2001]). Table 1 describes the variables in the dataset used for the empirical estimation of the bank lending channel.

TABLE 1. Description of variables

Variables		Definition	Reference
<i>response variable</i>	Total loan portfolio	Sum of (i) loans to BSP, (ii) loans to other banks, (iii) loans and receivables-others, and, (iv) loans and receivables arising from repurchase agreements/certificate of assignment/participation with recourse/securities lending and borrowing transactions, net of amortization.	Bangko Sentral ng Pilipinas (BSP)
	<i>monetary policy indicator</i>	Overnight reverse repurchase rate	Borrowing rate of the Bangko Sentral ng Pilipinas' (central bank of the Philippines). It is the central bank's main monetary policy tool in absorbing excess liquidity from the banking system.
<i>bank-specific variables</i>	Total assets	Sum of total assets, net of due to head office/branches/agencies and non-performing assets cover.	BSP
	Liquid assets	Sum of cash and cash items, due from banks, and financial assets (net of amortisation, accumulated market gains/losses, allowance for credit losses excluding equity investment in subsidiaries/associates/joint ventures).	BSP
	Size	Measured as log of total assets of bank <i>i</i> at time <i>t</i> .	
	Liquidity	Liquid asset ratio, i.e., liquid assets divided by total assets of bank <i>i</i> at time <i>t</i> .*	BSP
	Capitalization	Capital adequacy ratio, i.e., ratio of qualified capital to risk-weighted assets of bank <i>i</i> at time <i>t</i> .	
<i>control variables</i>	Real GDP	GDP at constant prices (2000-based).	Philippine Statistics Authority (PSA)
	Consumer Price Index (CPI)	CPI measured using 2006 prices as the base year.	BSP

* Another definition of liquidity used in bank examination is liquid assets-to-total liabilities.

It is difficult to isolate the monetary policy-induced loan supply effects using macro data since there are two confounding channels—the money demand channel works through deposit liabilities while the bank lending channel operates through the asset side. In a nutshell, when a central bank undertakes monetary policy (MP)

² Annex 1 provides the complete list of indicators used for the profitability regression.

tightening, it drains deposits from the system through the conduct of open market operations whereby bonds are swapped with reserve deposits (liability side). This means lesser money available for lending by banks, which implies a shift in the banks' loan schedule. The study by Kashyap and Stein [1995]³ made reference to the work of Bernanke and Blinder [1992] that empirically shows the negative relationship between monetary policy and bank lending using aggregate data. Kashyap and Stein [1995] noted that there are alternative interpretations, which Bernanke and Blinder [1992] recognized. One plausible interpretation is that MP-induced hike in interest rates does not only raise the cost of borrowing but also erodes the value of collateral of firms (particularly small firms), both of which affect firms' demand for credit.

In view of this identification problem with aggregate data, bank-specific balance sheet information would help to clearly distill the loan supply effects of monetary policy. Hence, this study applies panel econometric techniques on bank-level data to determine bank-specific balance sheet information that affects credit intermediation function of banks.

The bank indicators used in the study specifically pertain to size, liquidity, and capitalization. Larger asset size may indicate more diverse sources of funds and bigger client base, thus, helping banks accommodate contractionary monetary policy. Capitalization, which is measured as total qualifying capital relative to risk-weighted assets, provides funding flexibility and accords lower external finance premium. While it represents a cost to the bank, it also signals the adequacy of standby capital to cover losses to avert insolvency risk. Lastly, the liquidity position of the bank lends additional cushion to insulate rural banks' lending portfolio in the face of contractionary monetary policy. The specification also controls for macroeconomic factors that influence loan demand, i.e., GDP growth and inflation.

However, higher capitalization and higher liquid assets could also imply limited funding sources and higher risk aversion of rural banks, which could eventually constrain their lending to the public, especially during periods of financial stress. When they fall short of the regulatory minimum, banks would be subjected to more intense supervisory actions. These would include prohibition or limits on the distribution of net profits. There may be times that they may be required to allocate a portion or all of net profits to prop up capital until the minimum requirements are fulfilled. With equity being more expensive than debt, additional capital is seen to reduce the ability to expand lending activities.

3.1. Profile of the financial condition of the rural banking system

On average, rural banks maintain capital adequacy ratio (CAR) in excess of the 10 percent prudential limit set by the BSP. Liquid assets account for an average of 32.5 percent of total assets. The average total loan portfolio-to-asset ratio is 56 percent while the deposit-to-asset ratio is 69 percent (see Table 2).

³ Kashyap and Stein [1995] extensively discussed the identification problem with aggregate data.

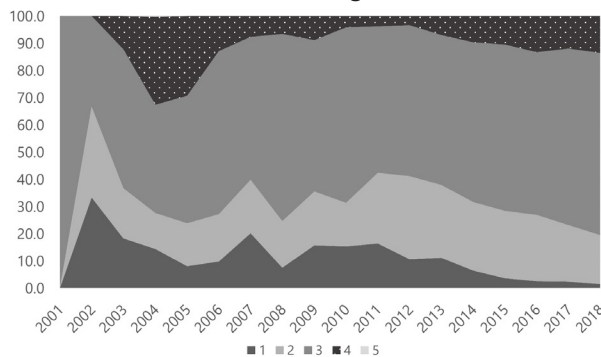
TABLE 2. Selected performance indicators

Variables	(1)	(2)	(3)	(4)	(5)
	Number of observations	Mean	Std. Dev.	Min	Max
Total assets (log)	16606	11.84	1.22	4.11	17.23
Liquid assets (log)	16598	10.51	1.41	2.92	16.36
Total Loan Portfolio (log)	16592	11.19	1.28	2.26	16.93
Capital Adequacy Ratio (log)	16045	2.99	0.57	-3.14	6.36
Total loan-to-total asset ratio	16591	56.37	20.44	3.17	235.50
Liquid asset-to-total asset ratio	16597	32.52	18.54	0.12	93.37
Deposit-to-asset ratio	16595	69.18	17.58	0.28	256.88

Note: Authors' estimates based on quarterly data from 2010Q1 to 2018Q2
 Source of basic data: Department of Supervisory Analytics, Financial Supervision Sector, Bangko Sentral ng Pilipinas.

Based on confidential reports of examination for the period 2001–2018 that employs CAMELS rating system, there has been a notable decline in the number of rural banks with critically deficient rating that requires strong remedial measures (Figure 1). Annex 2 shows that the largest decline in the number of rural banks with critically deficient rating has been observed for liquidity (L) and sensitivity to market risks (S). It must be noted that smaller rural banks have low exposure to market risks such as repricing risk since their activities are limited to deposit taking and lending, with mostly fixed rates to maturity. However, asset quality (A), management (M), and earning capacity (E) are still largely constrained, with a larger proportion having less satisfactory rating and below. This is possibly symptomatic of high-risk aversion and lack of diversification among rural banks.

FIGURE 1. Overall CAMELS rating of rural banks, 2001-2018



Note. Authors' estimates. Graph depicts proportion of rural banks with a specific rating. BSP CAMELS rating scale ranges from 1–5, with 5 being the highest.⁴
 Source of basic data: BSP's Department of Supervisory Analytics, Financial Supervision Sector.

⁴ The rating scale is defined as follows: 1 – critically-deficient and inadequate risk management practices; 2 – serious financial and management deficiencies that warrant close supervision; 3 – some degree of supervisory concern but the magnitude of deficiencies will not cause any component to be rated more severely than 2; 4 – fundamentally sound with none of the component ratings falling below 3; 5 – sound in every respect with component ratings between 4 and 5 (BSP-Financial Supervision Sector).

4. Empirical methodology

The empirical analysis follows the influential works of Gambacorta [2005], Kashyap and Stein [2000], Zulkhibri [2013], and Ananchotikul and Seneviratne [2015]. The baseline specification of the paper is as follows:⁵

$$\begin{aligned} \Delta L_{it} = & \alpha \Delta L_{it-1} + \sum_{j=0}^1 \beta_j \Delta MP_{t-j} + \sum_{k=1}^3 \omega_k X_{i,t-1} + \sum_{k=1}^3 \tau_k X_{i,t-1} * \Delta MP_{t-1} \\ & + \theta \Delta Y_t + \delta \Delta P_t + \Delta \vartheta_i + \Delta \mu_{it} \end{aligned} \quad (1)$$

The first difference operator is given by Δ ; $i=1,2,\dots,N$ and $t=1,2,\dots,T$, N is the total number of banks while T is the number of time series observations. The response variable is the change in the logarithm of total loan portfolio of bank i in period t (ΔL_{it}). Among the regressors, MP is the monetary policy indicator used in this paper to test for the contemporaneous (at $t=0$) and delayed (at $t=1$) effects of policy rate shocks on bank loans. This is measured by the overnight reverse repurchase rate (RRP), which is the monetary policy rate of the BSP. The vector X_{it} represents the three bank-specific characteristics (k): (i) size, (ii) liquidity, and (iii) capitalization. The interaction term between the monetary policy indicator and bank-specific factors ($MP * X$) captures the bank lending channel of monetary policy where the impact of monetary policy adjustment differs with bank-specific features.

The model also includes real GDP (Y) and consumer price index (P) to control for the demand-side impact on loans as well as to capture the cyclical movements in the economy [Hernando and Martínez-Pagés 2003]. These control variables for the demand aspect of loans are independent of bank-specific features and are dependent on macroeconomic factors only.

The total error term, e_{it} , is categorised into: (i) ϑ_i which captures the unobserved bank-specific fixed effects; and (ii) μ_{it} which are the observation specific errors (time varying unobservables). Both ϑ_i and μ_{it} follow an independent, identical distribution (IID), with zero mean and constant variance $\sim IID(0, \sigma^2)$.

4.1. Accounting for bank-specific characteristics

To assess the impact of each bank-specific characteristic on rural banks' loan supply growth, the following models, with simplified notations, are estimated independently:

$$\begin{aligned} \Delta L_{it} = & \alpha_1 \Delta L_{it-1} + \sum_{j=0}^1 \beta_{1j} \Delta MP_{t-j} + \varphi Size_{it-1} + \phi \Delta MP_{t-1} * Size_{it-1} \\ & + \theta_1 \Delta Y_t + \delta_1 \Delta P_t + \Delta \vartheta_i + \Delta \mu_{it} \end{aligned} \quad (2)$$

⁵ This full model specification is the difference Generalized Method of Moments (GMM) transformation (as shown by the first difference operator).

$$\Delta L_{it} = \alpha_2 \Delta L_{it-1} + \sum_{j=0}^1 \beta_{2j} \Delta MP_{t-j} + \eta Liquidity_{it-1} + \psi \Delta MP_{t-1} * Lqd_{it-1} \quad (3)$$

$$+ \theta_2 \Delta Y_t + \delta_2 \Delta P_t + \Delta \vartheta_i + \Delta \mu_{it}$$

$$\Delta L_{it} = \alpha_3 \Delta L_{it-1} + \sum_{j=0}^1 \beta_{3j} \Delta MP_{t-j} + \lambda Capital_{it-1} + \rho \Delta MP_{t-1} * Cap_{it-1} \quad (4)$$

$$+ \theta_3 \Delta Y_t + \delta_3 \Delta P_t + \Delta \vartheta_i + \Delta \mu_{it}$$

If any of the parameters ϕ , ψ , and ρ are negative, it can be concluded that the bank lending channel (BLC) of monetary policy is functioning in the country through the rural banks. If the same parameters are positive, it can be concluded that bank-specific characteristics help shield rural bank lending from the contractionary effect of monetary policy.

The above equations (2 to 4) are also estimated to test for the following alternative hypotheses:

- a. larger banks are less vulnerable to changes in policy interest rate vis-à-vis smaller banks.
- b. more liquid banks react less to monetary tightening than less liquid banks.
- c. adequately capitalized banks are less sensitive to monetary policy shocks than less-capitalized banks.

4.2. Estimation method

In estimating the model, this study accounts for the persistence of bank loans by employing a linear dynamic panel Generalized Method of Moments (GMM) technique.⁶ Hence, the lagged dependent variable is included as one of the regressors. The GMM technique, which was initially proposed by Arellano and Bond [1991], Arellano and Bover [1995], and later extended by Blundell and Bond [1998], was chosen due to some econometric and specification problems that can potentially arise from the untransformed version of model Equation 5, as shown below:

$$L_{it} = \alpha L_{it-1} + \sum_{j=0}^1 \beta_j \Delta MP_{t-j} + \sum_{k=1}^3 \omega_k X_{i,t-1} + \sum_{k=1}^3 \tau_k X_{i,t-1} * MP_{t-1} \quad (5)$$

$$+ \theta Y_t + \delta P_t + \vartheta_i + e_{it}$$

Estimating Equation 5 instead of the baseline model given by Equation 1 will result in biased and inconsistent coefficient estimates due to problem of reverse causality or simultaneity bias.⁷ This is because bank-specific determinants are not

⁶ The panel regression is undertaken using Stata 16.

⁷ Reverse causality or simultaneity occurs when changes in the explanatory variables cause the variations in dependent variable and vice-versa.

strictly exogenous and are likely to be correlated with the composite error process given by $\vartheta_i + \mu_{it}$. Moreover, the inclusion of lagged dependent variables (L_{it-1}) as one of the regressors in Equation 5 gives rise to Nickell bias [Nickell 1981]. This bias arises in Equation 5 since the lagged value of loans is correlated with e_{it-1} , which is a function of the unobserved bank-specific fixed effects, ϑ_i . Thus, the “*resulting correlation creates a large-sample bias in the estimate of the coefficient of the lagged dependent variable, and which is not mitigated by increasing the number of N*” [Baum 2006: 236]. If the regressors are correlated with the lagged dependent variable, their coefficients will be biased as well. This bias arises even if the error process is identically independently distributed (IID). While getting the first difference of the untransformed version of the model removes the constant term and individual effects, there is still correlation between the lagged dependent variable and the disturbance process.

In order to address the aforementioned econometric issues, the dynamic panel GMM will be used. The estimation procedure uses “internal” instruments, i.e., lagged differences of endogenous variables in the model to solve the endogeneity problem associated with the endogenous regressors. These instruments must be strongly correlated with the endogenous variables but uncorrelated with the error term, hence, exogenous. The exogeneity condition will be examined using the Hansen test for a two-step difference GMM, given its known property of generating consistent coefficient estimates and robust standard errors [Roodman 2006, 2009]. Moreover, the Hansen test ensures that the number of internal instruments used in the regression is limited by using one to four lags only.⁸ To detect whether or not there is autocorrelation, second order autocorrelation test, AR (2), is also carried out.

4.3. Robustness of the model

There are two types of difference-GMM technique that are used as the yardsticks for assessing robustness of estimates in this study. These are (i) standard difference-GMM and the (ii) difference-GMM with orthogonal deviations. The latter, proposed by Arellano and Bover [1995], is a type of GMM procedure that preserves the sample size especially with strong unbalanced panel data structure because it subtracts the past observation from the average of all *available* observations [Roodman 2006]. As a reiteration, interaction terms between the monetary policy indicator represented by the RRP and bank-specific characteristics are included in testing the existence of bank lending channel in the Philippine rural banking system.

To account for possible differential impact of monetary policy across the spectrum of rural banks, rural banks are categorized into several quantiles based on asset size, liquidity, and capitalization, for which separate regressions were undertaken. The categorization is structured such that the bottom 25 percentiles

⁸ Referred to as collapsing the instruments.

of the distribution constitute the “small, less liquid and less capitalized” rural banks while “big, highly liquid and well-capitalized” rural banks comprise those that fall in the upper 75 percentiles of the distribution [Zulkhibri 2013]. For each bank-specific regression, a dummy variable is created, which assumes a value of 0 is classified as small and 1 if classified as big.

5. Empirical results

The baseline model of this paper, as specified in Equation 1 under Section 4, is tested first for robustness by estimating it using the dynamic data panel (DPD) models. Based on the estimates, the orthogonal deviation difference-GMM model is selected as the best DPD technique (See Annex 3).

5.1. Baseline model

The estimation results affirm the appropriateness of GMM as shown by the statistical significance of the lagged dependent variable. The results of the baseline model indicate presence of bank lending channel in the Philippine rural banking system, with asset size providing a cushion against contractionary monetary policy (Equation 1). The results, however, may be skewed by the big rural banks. Thus, different regressions that separate each of the bank characteristics were conducted.

5.2. Alternative specifications

Unlike the baseline specification, asset size becomes insignificant and the interaction term between monetary policy rate and asset size turns out to be negative and statistically insignificant (Table 3). Partial elasticities show that the delayed effect of monetary policy (ΔMP_{t-1}) causes the growth of loan supply to react positively while the contemporaneous impact of policy rate (ΔMP_t) affects growth negatively, albeit statistically insignificant (Equation 2). Consistent with theory and most of the empirical studies, the availability of more liquid assets leads to higher growth in rural banks' loan supply (Equation 3). Quite interesting is the significant and negative interaction term between liquid asset ratio and monetary policy. This may signify that rural banks prefer to preserve their liquid assets more than their lending portfolio in the presence of contractionary monetary policy. In all specifications, demand condition, as proxied by GDP growth, is not a significant factor in determining loan supply growth. This could also broadly suggest insufficient effective demand that may also be a limiting factor.⁹

⁹ In a separate regression, non-performing asset as proxy for demand condition was insignificant. Nonetheless, the main narrative of the results remains. The signs and size of the estimated coefficients did not materially change.

TABLE 3. Results of baseline model and bank indicator regressions

Dependent variable: first difference log of total loan portfolio				
	ALL (Eq. 1)	SIZE (Eq. 2)	LIQUIDITY (Eq. 3)	CAPITAL (Eq. 4)
ΔL_{it-1}	-3.26*** (1.85)	-1.73*** (0.98)	0.08** (0.04)	-0.60* (0.14)
ΔMP_t	1.01 (0.85)	1.33 (0.88)	0.40 (0.43)	0.22 (0.42)
ΔMP_{t-1}	-21.39 (18.82)	2.34 (16.03)	6.93* (3.42)	2.67 (6.19)
Impact of bank-specific characteristics				
$Size_{it-1}$	0.65 (2.08)	2.43 (2.00)		
$Liquidity_{it-1}$	-2.16 (3.75)		2.96** (1.48)	
$Capital_{it-1}$	1.82 (3.54)			1.23 (2.81)
Existence of bank lending channel of monetary policy				
$\Delta MP_{t-1} * Size_{it-1}$	2.07** (0.98)	-0.30 (1.30)		
$\Delta MP_{t-1} * Lqd_{it-1}$	0.46 (2.13)		-2.25* (0.97)	
$\Delta MP_{t-1} * Cap_{it-1}$	-2.01 (2.41)			-1.02 (2.00)
Control variables				
ΔY_t	-0.02 (0.34)	-0.13 (0.30)	-0.15 (0.28)	0.11 (0.36)
ΔP_t	0.88 (1.13)	-1.31 (1.20)	-0.96 (0.83)	0.09 (0.80)
No. of IV	23	12	13	13
Hansen p -value	0.92	0.42	0.16	0.65
AR (2) p -value	0.35	0.50	0.16	0.00
No. of banks	609	609	609	609
No. of observations	14,640	14,999	14,999	14,640

Note: Robust standard errors in parentheses; ***, **, * denote significance at the 10 percent, 5 percent and 1 percent level, respectively. The Hansen and AR (2) tests show that the instruments are valid and there is no autocorrelation, respectively (p -value is greater than 0.10, 0.05, and 0.01).

5.3. Differential impact of monetary policy

To account for potential differential impact of monetary policy, rural banks are categorized into “small, less liquid, and less-capitalized” and “big, highly liquid, and well capitalized” rural banks, as shown in Table 4. The categorization of the banks was based on Zulkhibri [2013], and is intended to draw further insights on the heterogeneous lending responses of banks to monetary policy shock.

Banks are categorized as *small_{it}* or *big_{it}* if bank *i*'s total assets at time *t* falls at the bottom or upper 25 percentiles of the distribution, respectively. Less and high liquid banks are classified as *less liquid_{it}* or *highly liquid_{it}* if bank *i*'s ratio of liquid assets to total assets is at the bottom or upper 25 percentiles of the distribution, respectively. Banks are either less-capitalized or well-capitalized if bank *i*'s ratio of capital and reserves to total assets falls at the bottom or upper 25 percentiles of the distribution, respectively.

Table 5 summarizes the results of tests on the differential impact of monetary policy. Whereas monetary policy rate is insignificant on its own in the baseline specification (Equation 1), the new results (eq 1.a) show that a one percentage point increase in lagged monetary policy rate (ΔMP_{t-1}) leads to a reduction in rural bank lending growth by 0.71 ppt. This result is consistent with the standard impact of monetary tightening on bank lending.

Moreover, the regression that has only asset size as bank characteristic shows that lending of rural banks with smaller asset base is adversely affected during periods of contractionary monetary policy whereas higher asset base of larger banks enables them to insulate their bank lending activity from the impact of contractionary monetary policy (eq. 2a). This is not surprising since smaller rural banks also presumably face tougher competition from branch network and branch-lite operations of bigger universal and commercial banks as well as from government lending programs.

TABLE 4. Bank-specific characteristic by category (in logs)¹⁰

Percentiles	Size		Liquidity		Capitalization	
	small	large	less liquid	highly-liquid	poorly capitalized	well-capitalized
1%	9.26		0.91		1.39	
5%	9.91		1.91		2.18	
10%	10.35		2.33		2.36	
25%	11.03		2.85		2.65	
50%	11.79		3.40		2.96	
75%		12.60		3.82		3.34
90%		13.35		4.08		3.72
95%		13.89		4.20		3.93
99%		15.04		4.34		4.31

Note. Authors' estimates.

Meanwhile, the interaction between policy rate and capital ($\Delta MP_{t-1} * HCAP$) reveals that highly capitalized banks are more inclined to protect their capital than their lending portfolio in the face of contractionary monetary policy and higher capital requirement (eq. 4a). This may possibly indicate that regulatory compliance and its concomitant reputational effect may be a factor.

¹⁰ Interpretation: The 25th percentile of rural banks has an asset size equivalent to 11.03 in logs.

Similar to findings in Equations 1 to 4, demand condition, as proxied by GDP growth, is of the wrong sign and not a significant factor in determining loan supply growth.

The preceding findings may also be ascribed to the limited sources of funds, which could also affect the profitability and ability of rural banks to intermediate credit whenever there is a contractionary monetary policy alongside risk-focused regulatory requirements. Thus, a separate robustness test on rural bank profitability was also undertaken. With available data on ROA for earlier periods, regressions corresponding to the global financial crisis (GFC) and pre-GFC periods were also estimated.¹¹

TABLE 5. Differential impact of monetary policy

Dependent variable: first difference log of total loan portfolio				
	ALL (Eq. 1)	SIZE (Eq. 2)	LIQUIDITY (Eq. 3)	CAPITAL (Eq. 4)
ΔL_{it-1}	0.14** (0.07)	0.13* (0.04)	0.20** (0.11)	0.18** (0.10)
ΔMP_t	0.43 (0.28)	0.84* (0.24)	15.09 (12.91)	0.19 (0.53)
ΔMP_{t-1}	-0.71* (0.33)*	-1.08* (0.26)	-15.37 (12.69)	-0.30 (0.58)
Impact of bank-specific characteristics				
$Size_{it-1}$	-0.12 (0.08)	-0.10* (0.04)		
$Liquidity_{it-1}$	0.05*** (0.03)		0.01 (0.05)	
$Capital_{it-1}$	-0.01 (0.03)			0.88 (0.81)
Existence of bank lending channel of monetary policy				
$\Delta MP_{t-1} * SMALL$	-0.83* (0.18)	-0.75* (0.17)		
$\Delta MP_{t-1} * LARGE$	1.21* (0.21)	0.94* (0.17)		
$\Delta MP_{t-1} * LLIQUID$	0.38* (0.15)		0.35 (0.44)	
$\Delta MP_{t-1} * HLIQUID$	-0.05 (0.22)		2.10 (1.50)	
$\Delta MP_{t-1} * LCAP$	0.16 (0.17)			1.08 (0.71)
$\Delta MP_{t-1} * HCAP$	-0.06 (0.24)			-1.14** (0.63)

¹¹ Refer to Annex 1 for the indicators used in the profitability regression. The indicator return on asset (ROA) from income statement of rural banks is available over a longer period, i.e., 2001–2018. However, comparable dataset for balance sheet indicator "CAR" used in the bank lending regression is not available for earlier periods.

TABLE 5. Differential impact of monetary policy (continued)

	ALL (Eq. 1)	SIZE (Eq. 2)	LIQUIDITY (Eq. 3)	CAPITAL (Eq. 4)
Control variables				
ΔY_t	-0.13 (0.14)	-0.243*** (0.15)	-4.10 (3.61)	-0.05 (0.37)
ΔP_t	0.36 (0.40)	0.12 (0.33)	7.73 (6.20)	0.99 (0.84)
No. of IV	31	21	13	18
Hansen p -value	0.33	0.17	0.36	0.15
AR (2) p -value	0.93	0.22	0.29	0.21
No. of banks	609	609	609	609
No. of observations	14,640	14,999	14,999	14,640

Note. Robust standard errors in parentheses; ***, **, * denote significance at the 10 percent, 5 percent and 1 percent level, respectively. The Hansen and AR (2) tests show that the instruments are valid and there is no autocorrelation, respectively (p -value is greater than 0.10, 0.05, and 0.01).

For the comparable estimation period i.e., 2010–2018Q2, capital to risk-weighted assets (CAR) and liquid asset-to-total assets are the key drivers of profitability, whereby higher CAR enhances profitability while higher liquid asset-to-total assets leads to lower profitability (Table 6). This is in stark contrast to the pre-GFC period wherein asset size, credit risk, and inflation were the principal determinants of profitability. During the GFC, however, both credit risk and liquidity risk had a dampening effect on profitability, possibly reflecting propensity to maximize cost efficiency by reducing expenditures on credit investigation of borrowers though possibly leading to higher credit exposures in the future (the “skimping” hypothesis by Berger and de Young [1997]).

TABLE 6. Drivers of profitability

Variables	Dependent variable: Return on Assets (ΔROA_{it})		
	Pre-GFC (2001Q4-2007Q2)	GFC (2007Q3-2009Q4)	Post-GFC (2010Q1-2018Q2)
ΔROA_{it-1}	0.21* (0.03)	-0.31** (0.15)	0.06** (0.02)
Bank-specific variables			
$\Delta Bank\ Size_{it}$	0.54* (0.21)	0.17 (0.24)	-0.30 (0.28)
ΔCAR_{it}^{12}		-0.50 (0.41)	1.63** (0.76)

¹²For the periods covering Q4 2001 to Q2 2007, the variable “CAR” was dropped in the regression due to data unavailability.

TABLE 6. Drivers of profitability (continued)

Variables	Dependent variable: Return on Assets (ΔROA_{it})		
	Pre-GFC (2001Q4-2007Q2)	GFC (2007Q3-2009Q4)	Post-GFC (2010Q1-2018Q2)
$\Delta Funding Risk_{it}$	0.70 (0.48)	-0.13 (0.66)	-0.73 (1.14)
$\Delta Credit Risk_{it}$	0.50** (0.23)	-0.93*** (0.52)	0.26 (1.91)
$\Delta Liquidity Risk_{it}$	-0.13 (0.11)	-0.60** (0.27)	-1.46** (0.84)
Macroeconomic determinants			
ΔY_t	-0.26 (0.38)	-0.25 (0.33)	0.05 (0.38)
ΔP_t	-4.04* (0.93)	1.73 (1.34)	-0.28 (1.96)
ΔR_t	-0.02 (0.03)	-0.07 (0.05)	0.13 (0.12)
No. of IV	18	23	24
Hansen p -value	0.28	0.75	0.15
AR (2) p -value	0.22	0.27	0.95
No. of banks	742	584	589
No. of observations	8,693	2,418	7,415

Note. Robust standard errors in parentheses; ***, **, * denote significance at the 10 percent, 5 percent and 1 percent level, respectively. The Hansen and AR (2) tests show that the instruments are valid and there is no autocorrelation, respectively (p -value is greater than 0.10, 0.05, and 0.01).

6. Conclusion

The empirical analysis has shown that bank lending channel, in general, operates in the Philippine rural banking system through rural banks' asset size. The heterogenous effects of monetary policy are more evident in the lending behavior of smaller rural banks. While big rural banks are able to protect their lending portfolio from contractionary monetary policy by the strength (size) of their balance sheet, small rural banks with less diversified funding portfolio cannot. Moreover, highly capitalized banks are more inclined to protect their capital than their lending portfolio with contractionary monetary policy and higher capital requirement, possibly indicating that regulatory compliance and its concomitant reputational effect may be a factor. The finding on heterogeneous effects of monetary policy on rural banks has a secondary implication of lending credence to the principle of proportionality embodied in the BSP's bank regulatory framework.

The weakness in effective and productive loan demand may reflect lack of diversification that could have also impinged on the earning capacity of rural

banks, as supported by initial estimates on the drivers of rural bank profitability. An interesting area for future study is one which would account for region-specific characteristics that may influence the lending behavior of rural banks.

Acknowledgements: The team is grateful to the BSP-Financial Supervision Sector's Deputy Governor Chuchi Fonacier, Assistant Governor Lyn Javier and the Department of Supervisory Analytics for the data support provided to the project, and to Mr. Ferdinand Co for assistance in data processing. The authors also wish to thank the anonymous referees from the Philippine Review of Economics for insightful comments and suggestions. The views expressed in this paper do not represent those of the BSP. All errors and omissions are of the authors.

References

- Aban, M.J.A. [2012] "Evidence of bank lending channel in the Philippines", *International Proceedings of Economics Development and Research (IPEDR)* 55(34).
- Aban, M.J.A. [2013] "Transmission of monetary policy through the bank lending channel in the Philippines", *International Journal of Trade, Economics and Finance* 4(1).
- Adusei, M. [2015] "The impact of bank size and funding risk on bank stability", *Cogent Economics & Finance* 3(1).
- Al-Homaidi, E., B. Tabash, N. Farhan, and F. Almaqtari [2018] "Bank-specific and macro-economic determinants of profitability of Indian commercial banks: a panel approach", *Cogent Economics and Finance* 6(1).
- Ananchotikul, N. and D. Seneviratne [2015] "Monetary policy transmission in emerging Asia: the role of banks and the effects of financial globalization", *IMF Working Papers* 5(207):1.
- Aragon, A., M. Kakinaka, and D. Kim [2011] "Capital requirements of rural banks in the Philippines", *Bangko Sentral Review* 2011.
- Arellano, M. and S. Bond [1991] "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies* 58:277-297.
- Arellano, M. and O. Bover [1995] "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics* 68(1): 29-51.
- Armas, J. [2021] "Is the bank lending channel of monetary policy evident in the Philippines? A dynamic panel data approach", *Asian Economic Journal* 35(3): 246-269.
- Austria, C. and B. Bondoc [2018] "The impact of monetary policy on bank lending activity in the Philippines", *Bangko Sentral Review* 2018:34
- Basel Committee on Banking Supervision [2019] "Proportionality in bank regulation and supervision: a survey on current practices", *Bank for International Settlements*.

- Baum, C. [2006] *An introduction to modern econometrics using Stata*. Texas: Stata Press Publication.
- Bayangos, V. [2010] “Tracing the bank credit channel of monetary policy in the Philippines”, *Bangko Sentral Review*.
- Berger, A. and R. De Young [1997] “Problem loans and cost efficiency in commercial banks”, *Journal of Banking and Finance* 21:849-870.
- Blundell, R. and S. Bond [1998] “Initial conditions and moment restrictions in dynamic panel data models”, *Journal of Econometrics* 87:115–143.
- Carling, K. and S. Lundberg [2005] “Asymmetric information and distance: an empirical assessment of geographical credit rationing”, *Journal of Economics and Business* 57:39-59.
- Corner, G. [2010] “The changing landscape of community banking”, *Central Banker: News and Views for Eighth District Bankers* (October 2010):1-9.
- Disyatat, P. [2010] “The bank lending channel revisited”, *Bank for International Settlements Working Paper* No. 297.
- Ehrmann, M., L. Gambacorta, J. Martínez-Pagés, P. Sevestre, and A. Worms [2001] “Financial systems and the role of banks in monetary policy transmission in the Euro area”, *ECB Working Paper Series*.
- Gambacorta, L. [2005] “Inside the bank lending channel”, *European Economic Review* 49(7):1737-1759.
- Glindro, E., R. Lemence, and I. Sabuga [2016] “Universal and commercial banks’ reaction to monetary policy in the Philippines”, *Bangko Sentral Review* 2016.
- Hakkarainen, P. [2019] “Proportionality in bank supervision”, *BIS-IMF Policy Implementation Meeting in Banking Regulation and Supervision*.
- Hernando, I. and J. Martínez-Pagés [2003] “Is there a bank-lending channel of monetary policy in Spain?”, in I. Angeloni, A.K. and B. Mojon (Eds.), *Monetary Policy Transmission in the Euro Area* (284–296), Cambridge: Cambridge University Press.
- Geron, M.P., G. Llanto, and J.A. Badiola [2016] “Comprehensive study on credit programs to smallholders”, *Philippine Institute for Development Studies Discussion Paper Series* No. 2016-48, <https://www.econstor.eu/handle/10419/173569>.
- Gudmundsdottir, S., O.G. Helgason, M. Leitner, C. McDonnel, and A. Schramm [2017] “Gravity in bank lending within the European Union”, *Barcelona Graduate School of Economics Master Project*.
- Kashyap, A. and J. Stein [1995] “The impact of monetary policy on balance sheets”, *Carnegie-Rochester Conference Series on Public Policy* 42:151-195.
- Kashyap, A.K. and J.C. Stein [2000] “What do a million observations on banks say about the transmission of monetary policy?”, *American Economic Review* 90(3):407-428.
- Kishan, R., and T. Opiela [2000] “Bank size, bank capital, and the bank lending channel”, *Journal of Money, Credit and Banking* 32(1):121-141.

- Llanto, G. [2005] “Rural finance in the Philippines: issues and challenges”, *Agricultural Credit Policy Council (ACPC) and Philippine Institute for Development Studies (PIDS)*.
- Lui, L. [2012] “Monetary policy, bank size and bank lending: evidence from Australia”, *MPRA Paper* 37489.
- Mendoza, R. and J.P. Rivera [2017] “The effect of credit risk and capital adequacy on the profitability of rural banks in the Philippines”, *Scientific Annals of Economics and Business* 64(1):83-96.
- Meslier-Crouzille, C., E. Nys, and A. Sauviat [2012] “Contribution of rural banks to regional economic development: evidence from the Philippines”, *Regional Studies* 46(6):775-91
- Nickell, S. [1981] “Biases in dynamic models with fixed effects”, *Journal of Econometrics* 49(6):1417–1426.
- Oliner, S. & Rudebusch, G. [1996] “Monetary policy and credit conditions: evidence from the composition of external finance: comment”, *The American Economic Review* 86(1):300-309.
- Roodman, D. [2006] “How to do xtabond2: an introduction to difference and system GMM in Stata”, *Center for Global Development Working Paper* No. 103.
- Roodman, D. [2009] “A note on the theme of too many instruments”, *Oxford Bulletin of Economics and Statistics* 71(1):135–158.
- Stiglitz, J. and A. Weiss [1981] “Credit rationing in markets with imperfect competition”, *The American Economic Review* 71(3):393-410.
- Swinnen, J. and H. Gow [1999] “Agricultural credit problems and policies during the transition to a market economy in Central and Eastern Europe”, *Food Policy* 24(1).
- Tolentino, B. [1987] “Credit policy and rent-seeking among small banks in developing countries”, *Journal of Philippine Development* 24(14):12-28.
- Zulhibri, M. [2013] “Bank-characteristics, lending channel and monetary policy in emerging markets: bank-level evidence from Malaysia”, *Applied Financial Economics* 23(5):347–362.
- Worms, A. [2001] “Monetary policy effects on bank loans in Germany: a panel-econometric analysis”, *Deutsche Bundesbank Discussion Paper* 17/01.

Annex

ANNEX 1. Indicators in the profitability regression

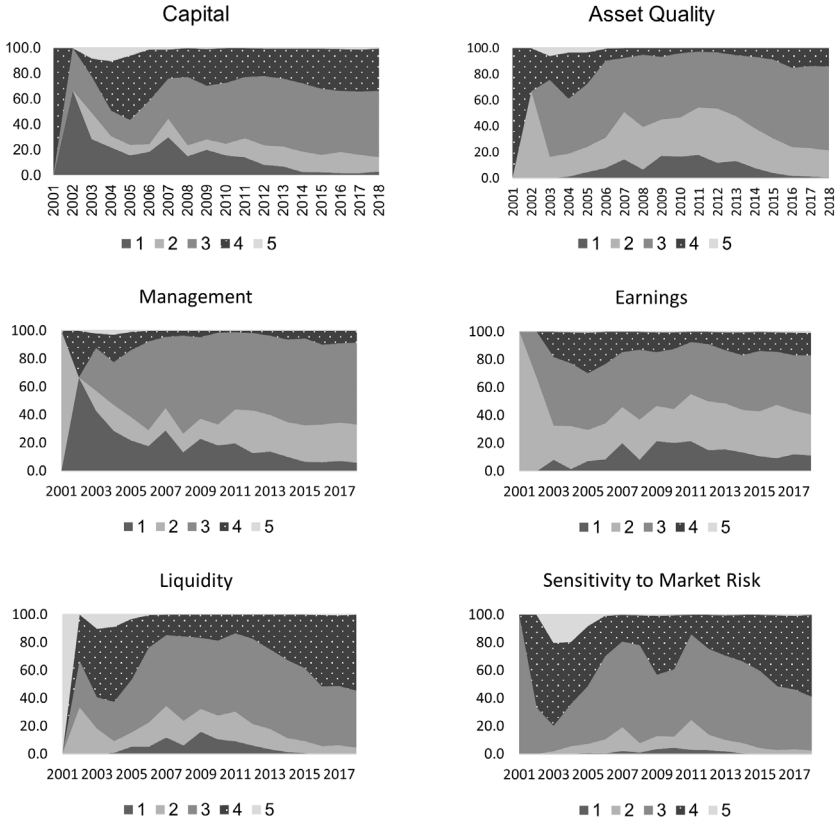
	Variables	Definition	Expected Sign	Reference
<i>Dependent variable</i>	Return on Assets (ROA)	Computed as net profit of bank <i>i</i> at time <i>t</i> divided by total assets of bank <i>i</i> at time <i>t</i> .		Al-Homaidi et al. [2018]
	Bank size (BS)	Bank size is measured as the log of total assets of bank <i>i</i> at time <i>t</i> . ¹³	±	Adusei [2015]
	Capital Adequacy Ratio (CAR)	Refers to the ratio of total qualifying capital to total risk weighted assets.	+	BSP
	Credit Risk (CR)	Computed as log of total loan portfolio of bank <i>i</i> at time <i>t</i> divided by the log of total assets of bank <i>i</i> at time <i>t</i> . ¹⁴	+	
	Liquidity Risk (LR)	Calculated as log of liquid assets of bank <i>i</i> at time <i>t</i> divided by log of total assets of bank <i>i</i> at time <i>t</i> . ¹⁵	-	
<i>Bank-specific variables</i>		Computed as deposit liabilities-to-assets ratio of bank <i>i</i> at time <i>t</i> plus equity-to-assets ratio of bank <i>i</i> at time <i>t</i> divided by the standard deviation of deposit liabilities-to-assets ratio of bank <i>i</i> at time <i>t</i> .		
	Funding Risk (FR Z-score)	$Funding\ Risk\ (Z - score)_t = \frac{\left(\frac{Deposits}{Assets} \right)_t + \left(\frac{Equity}{Assets} \right)_t}{\sigma \left(\frac{Deposits}{Assets} \right)_t}$	+	Adusei [2015]
		The funding risk z-score measures the extent to which a bank needs to recapitalize based on the extent of the needed reduction in the volatility of the bank's deposit liabilities (i.e., customer deposits). Thus, the stability of the bank's funding source is reflected in a higher z-score of a bank.		
<i>Macro-economic variables</i>	Real GDP growth (Y)	The estimates for the constant price of GDP are obtained by expressing the values in terms of a base period (i.e., 2000).	±	Philippine Statistics Authority (PSA)
	CPI inflation (P)	CPI is measured using 2006 prices as the base year.	+	
	Bank average lending interest rate (R)	Reflects the annual percentage equivalent of all commercial banks' actual interest income on their peso-denominated loans to the total outstanding levels of their peso-denominated loans, bills discounted, mortgage contract receivables and restructured loans.	+	BSP

¹³ Total assets (ta) refers to the sum of total assets, net of due to head office/branches/agencies and non-performing assets cover.

¹⁴ Total loan portfolio (tlp) refers to the sum of (i) loans to BSP, (ii) loans to other banks, (iii) loans and receivables-others, and, (iv) loans and receivables arising from repurchase agreements/certificate of assignment/participation with recourse/securities lending and borrowing transactions, net of amortization.

¹⁵ Liquid assets (la) are the sum of cash and cash items, due from banks, and financial assets (net of amortization, accumulated market gains/losses, allowance for credit losses excluding equity investment in subsidiaries/associates/joint ventures).

ANNEX 2. Evolution of CAMELS component ratings of rural banks



Note: Rating scale ranges from 1–5, with 5 being the highest.
 Source of basic data: BSP’s Department of Supervisory Analytics, Financial Supervision Sector.

ANNEX 3. Dynamic panel data model selection

The table below shows the estimates for Equation 1 under the two types of DPD models, namely, standard diff-GMM and orthogonal diff-GMM.

	Dependent variable: Total Loan Portfolio (ΔL_{it-1})	
	diff GMM orthogonal	diff GMM standard
ΔL_{it-1}	-3.26*** (1.85)	-2.21 (1.60)
ΔMP_t	1.01 (0.85)	0.97 (0.60)
ΔMP_{t-1}	-21.39 (18.82)	-5.34 (33.90)

ANNEX 3. Dynamic panel data model selection (continued)

	Dependent variable: Total Loan Portfolio (ΔL_{it-1})	
	diff GMM orthogonal	diff GMM standard
Impact of bank-specific characteristics		
$Size_{it-1}$	0.65 (2.08)	1.69 (3.17)
$Liquidity_{it-1}$	-2.16 (3.75)	-0.05 (5.55)
$Capital_{it-1}$	1.82 (3.54)	-3.14 (5.71)
Existence of bank lending channel of monetary policy		
$\Delta MP_{t-1} * Size_{it-1}$	2.07** (0.98)	0.34 (2.20)
$\Delta MP_{t-1} * Lqd_{it-1}$	0.46 (2.13)	-1.28 (3.57)
$\Delta MP_{t-1} * Cap_{it-1}$	-2.01 (2.41)	1.45 (4.29)
Control variables		
ΔY_t	-0.02 (0.34)	-0.31 (0.36)
ΔP_t	0.88 (1.13)	-0.17 (1.78)
No. of IV	23	23
Hansen p -value	0.92	0.60
AR (2) p -value	0.35	0.89
No. of banks	609	609
No. of observations	14,640	14,110

Note: Robust standard errors in parentheses; ***, **, * denote significance at the 10 percent, 5 percent and 1 percent level, respectively. The Hansen and AB autocorrelation tests show that the instruments are valid and there is no autocorrelation, respectively (p -value is greater than 0.10, 0.05, and 0.01).