Capital Requirements of Rural Banks in the Philippines

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1. Introduction

The efficiency of rural financial markets, which serves to improve income levels and reduce poverty, is a crucial objective in the formulation of monetary policy (see, e.g., Yaron, Benjamin, & Charitonenko, 1998). Capital is a major source of loan-based funds for rural banks and it is necessary to strengthen bank capital in order to stabilize the rural banking system by improving institutional resilience in the face of negative shocks. For this purpose, a growing number of emerging economies have adopted rules for capital adequacy that are based on the 1988 Capital Accord initiated by the Basel Committee on Banking Supervision. Following in the spirit of the Accord, the central bank of the Philippines, the Bangko Sentral ng Pilipinas (BSP), made meeting the capital regulation requirements of rural banks an important item on its stabilization policy agenda.[1] In this study, we address the crucial issue of the influence of capital regulation on the lending behavior of rural banks, which helps to determine the course of rural development through the use of available credits.

Many theoretical and empirical studies have addressed the ways in which capital regulations influence banking behavior in the context of portfolio selection, moral hazard and adverse selection problems, and bank heterogeneities (see VanHoose, 2007, for a review). Empirical studies, such as Bernanke and Lown (1991), Berger and Udell (1994), and Peek and Rosengren (1995a, b), discuss the capital or credit crunch of the early 1990s' recession in the United States by examining a possible link between the Basel Committee's newly introduced capital adequacy rule and contraction in bank lending. With respect to the case of Japan, Kim and Moreno (1994), Peek and Rosengren (1997), Ito and Sasaki (1998), and Honda (2002) evaluate how negative shocks on capital affected the availability of bank credit. Additionally, Ediz, Michael, and Perraudin (1998) and Rime (2001) assess the relation between capital regulation and bank behavior by focusing on the UK and Switzerland, respectively. These studies focus, however, on relatively large commercial banks in developed economies; they do not examine how these issues affect rural banks in developing economies like the Philippines.[2]

[1] See the speech by Governor Rafael Buenaventura of BSP, "Rural Banks: Pillars in the Development of Local Economies," on 31 August 2001 (Speech Archives, BSP).

[2] One exception includes the work of Chiuri, Ferri, & Majnoni (2002). Their study shows that the capital crunch associated with strict capital regulations is more pervasive in emerging economies where alternatives to bank credit are less developed, although their focus is not on rural banks.

To understand the role of capital requirements in Philippine rural banking, this study attempts to empirically assess how banks change their lending behavior in response to shocks to their capital associated with changing economic conditions, partly following the analysis of Peek and Rosengren (1995a, b). In particular, we examine the effect of prompt corrective action (PCA) on the rural banking system. To establish a statutory framework for bank supervision in 1998, the BSP initiated early intervention and corrective action by bank regulators to address problems facing troubled rural banks. The PCA framework is related to under-capitalized banks and it encompasses such specific actions as the implementation of capital restoration plans, business improvement plans, and corporate governance reforms, affording little discretion to prudential regulators to avoid the costly and painful exercise of bank closures. Several studies pertain to PCA issues but focus mainly on the case of the United States (see, e.g., Benston & Kaufman, 1997; Aggarwal & Jacques, 2001).[3] This paper extends the line of analysis in a new direction by examining the effect of PCA in a developing economy, which we accomplish with our focus on the Philippine rural banking system.

Banking data are obtained from the database of the BSP at the individual bank level for the period 2001 (Q3) to 2006 (Q4), covering nearly two-thirds of all banks that comprise the entire Philippine rural banking system. The model employs panel data estimation techniques using instrumental variables. The estimated results prove that the behavior of under-capitalized rural banks is different from that of well-capitalized rural banks in terms of their lending activities in response to capital changes. First, under-capitalized banks are relatively more sensitive to changes in capital compared with well-capitalized banks. This observation supports the conventional argument that capital regulation provides under-capitalized banks with a strong motivation to meet the requirement to avoid possible closure.

Second, as the capital adequacy ratio rises, well-capitalized banks are less sensitive to capital shocks while under-capitalized banks are more sensitive. The result for well-capitalized banks is consistent with the findings of various studies, such as Peek and Rosengren (1995a,b), regarding the effect of capital requirements on bank behavior. In contrast, the result for under-capitalized banks is the opposite and subject to debate and further examination. We conjecture that under-capitalized rural banks with lower capital adequacy ratios have a weaker incentive to achieve the minimum capital requirement.

Our proposition about under-capitalized banks relates to the implicit and explicit costs faced by rural banks and their managers. These costs include additional bureaucratic documentation and fear of regulatory intervention associated with PCA. Specifically, when the capital adequacy ratio is close to the minimum capital requirement, the marginal cost in response to a change in capital is relatively large; this may incentivize rural banks to adjust their lending behavior. In contrast, when the capital adequacy ratio is far below the minimum capital requirement, the marginal cost is relatively low. In this case, rural banks have a little incentive to adjust their lending behavior. That is,

[3] For a sophisticated dynamic model of PCA, see Shim (2006).

managers of under-capitalized rural banks tend to abandon the effort to meet capital requirements as the capital adequacy ratio declines. This phenomenon can be explained partly by the relation between the regulatory pressure of PCA and the capital adequacy ratio.

The remainder of the paper is organized as follows. Section 2 illustrates the evolution of capital regulations in the Philippine rural banking system. Section 3 explains data and the empirical model as well as evaluates the estimated results of the regression. In section 4, we offer some concluding remarks.

2. The Philippine Rural Banking System

Philippine financial institutions, each of which has its own purpose, include (1) commercial banks, (2) thrift banks, (3) rural banks, (4) offshore banks, (5) specialized government banks, and (6) non-bank financial institutions (see Torreja, 2003, for a review of the Philippine financial system). Rural banks operate in many ways in a different universe from that of commercial banks. Although rural banks' assets comprised just 2.2 percent of total assets in the Philippine financial system in 2006, their role is significant in promoting and expanding the rural economy and providing basic financial services to rural communities that are not served to any significant extent by commercial banks. In particular, the primary objective of rural banks is to meet the credit needs of farmers and fishermen as well as of cooperatives and merchants in rural areas. Moreover, rural banks are locally based with relatively few resources, deposits, and equity capital; they are typically run by private individuals with shareholders and management residing in the region and these individuals often behave like monopolists (see, e.g., Wehnert, 1999).

In the early 1950s, the government vigorously promoted the establishment of rural banks to serve as a conduit for its credit program as it sought to make loans widely available across the countryside. Additionally, since the rural poor are generally unable to save and cannot afford the cost of credit offered by large commercial banks, the government along with several international donors frequently offered incentives, such as loan subsidy funds, to private individuals to create rural banks (Owens & Agabin, 2006). The Philippine rural banking system was established through the Rural Banking Act of 1952 which was later amended by the Rural Banking Act of 1992. The new law empowers the Monetary Board of the BSP with greater flexibility to formulate regulations governing rural banks. With the Act of 1992, the BSP encouraged proactive competition by liberalizing the establishment of new banks and branches.

The rural banking industry, as noted, comprises a small portion of the Philippine financial system as a whole and may seem insignificant from a monetary and financial policy perspective. However, the rural banking industry has a wide reach and is an integral component of the government's strategy to increase global competitiveness by strengthening rural economies. Given this strategic significance, rural bank failures are a major concern. During the period 1970–2007, around 400 rural banks were placed under liquidation or receivership by the Philippine Deposit Insurance Corporation. Failures are attributed to various factors, such as misguided government policies and programs that subsidize credit initiatives (see Florendo, 2007).[4] Thus, several financial policy

[4] One of the largest government programs was a targeted and subsidized credit initiative to achieve self-sufficiency in rice production, which was called Masagana 99 (see Owens & Agabin, 2006).

reforms have been initiated to stabilize the rural banking system. Among them is a tightening of minimum capital regulations, under which there is a buffer that is sufficient to protect bank depositors in the event of normal adversity and reversals.

Similar to other financial institutions, rural banks currently observe capital requirements based on the Basel Accord.[5] In July 2001, the BSP adopted a risk-based capital adequacy ratio patterned after the standards set under the International Convergence of Capital Measurement and Capital Standards, otherwise known as Basel I. The ratio accounts for the heterogeneity of risk exposures across different sets of bank assets.[6] Under this framework, the capital adequacy ratio is expressed as a percentage of qualifying capital to risk-weighted assets. Qualifying capital is the sum of a bank's Tier 1 (core) capital and Tier 2 (supplementary) capital less required deductions. Tier 2 capital is the sum of upper Tier 2 and lower Tier 2 capital; while risk-weighted assets are the bank's assets with corresponding risk weights, depending on the level of risk exposures that characterize the assets.[7] The rural banking industry is now subject to this new risk-sensitive capital regulation despite the absence of derivative products and other financial instruments traded in financial markets from its current portfolio.[8]

By and large, rural banks are limited to the traditional services of deposits and lending activities, although recently several have ventured into fee-based products such as fund transfers, remittances, management training, software development, and have acted as service provider for other allowable financial and non-financial undertakings. Interestingly, rural banks have exhibited a burgeoning interest in microfinance. Microfinancing is typically provided by non-government organizations, non-bank cooperatives, and other kinds of banks, including cooperative banks. Given the argument that microfinance is a tool for poverty alleviation, the rural banking industry is now attracting greater public attention.

Since rural banks are government partners in countryside development, these banks fill an important niche in the rural economy with rural borrowers forming the grassroots of the social class. These banks help stimulate rural development by catering to the needs of local communities where access to

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[5] Capital requirements are based mainly on the risk-based capital adequacy framework as well as on a bank's geographical location, according to the Manual of Regulation for Banks (2009 Revised Edition). Although these two frameworks serve as benchmarks in assessing bank solvency, this study is limited to the review/analysis of capital requirements that address risk-based capital adequacy because figures on minimum capitalization of each bank based on geographical location are not available in the dataset.

[6] See BSP Circular 280 dated 29 March 2001 and subsequent amendment, BSP Circular 360 dated 3 December 2002, to incorporate market risks. Basel I was issued in 1988 to standardize the computation of risk-based capital across banks and across countries by the Basel Committee on Banking Supervision, a group of banking supervisors whose secretariat is based at the Bank for International Settlements in Basel, Switzerland. It had credit risk as the main risk-weight factor with minimum capital requirement as its sole pillar. This was subsequently amended in 1996 and 1999 to incorporate market risks. On 26 June 2004, the Committee issued the Revised International Convergence of Capital Measurement and Capital Standards (Basel II). Basel II had a three-pillared approach consisting of minimum capital requirements, supervisory review, and market discipline.

[7] See BSP Circular 280 dated 29 March 2001 for details on the composition of qualifying capital and risk- weighted assets.

[8] This is because a rural bank can now carry products and services offered by commercial banks if its total capital accounts reach that of the minimum capital accounts required of commercial banks. The capital requirement of a commercial bank, however, is prohibitively high for rural banks; thus, no Philippine rural bank has offered derivative products or other services allowable to banks with capital accounts equivalent to what is required from commercial banks.

credit through commercial banks seems impossible. To ensure the viability of the rural banking industry as a catalyst for countryside development, rural banks need to have adequate capital stocks, superior asset quality, sound management, improved profitability, and suitable levels of liquidity. The BSP aims to stabilize the rural banking industry by providing measures to detect problematic banks and take appropriate corrective actions to prevent collapse. The PCA, initiated by the BSP in 1998, is required along with the adoption of other regulations to reduce bank failures in rural economies.

3. Empirical Analysis

3.1. Data

Since the early 1990s, the Philippine rural banking system has improved significantly, even avoiding the serious impact of the 1997 Asian financial crisis. At the end of 2006, the rural banking system had total assets of PhP126.6 billion, comprising 2.2 percent of the total assets of the Philippine financial system as well as 1,964 operating units. The operating units include main and branch offices, comprising 26 percent of all operating units in the banking industry.

In this study, the banking data is obtained from a BSP database at the individual rural bank level, for the sample period of 2001 (Q3) to 2006 (Q4). The observation covers 603 of the 923 rural banks in the entire Philippine rural banking system.[9] To better understand the overall picture of Philippine rural banking, Table 1 compares the balance sheet structures of well-capitalized and under-capitalized rural banks as of 2006. The regulator imposes a 10 percent capital adequacy ratio (qualifying capital divided by risk-weighted assets) as the minimum capital requirement under the framework of the Basel Accord. Banks that meet this requirement are classified as well-capitalized, while those that do not meet this requirement are classified as under-capitalized. Under-capitalized banks are typically subject to the PCA framework implemented by the BSP. The average capital adequacy ratio for the group of well-capitalized banks is 26 percent, while that for the group of under-capitalized banks is seven percent. Moreover, a significant portion of rural banks (18 percent) are under-capitalized. This is in sharp contrast to the typical ratio of commercial banks.

3.2. Model

Our empirical analysis of rural banks examines how banking behavior is influenced by external capital shocks under capital regulation. Since such regulation takes the form of a minimum capital adequacy ratio, the behavior of rural banks may depend on their current capital adequacy ratio. Furthermore, the PCA framework associated with capital regulation may also affect banking behavior of under-capitalized banks. If the BSP adopts the regulation strictly,

[9] Two sets of rural banks are omitted from the total of 923 rural banks, namely: (1) liquidated or closed banks and (2) newly established banks. The zero-end balances of liquidated or closed banks at the time of bank closure would generate negatively biased results in measuring the impact of capital requirements. The newly established banks, on the other hand, would generate positively biased results as fresh capital can quickly expand the newly established bank's portfolio. In cases of bank mergers or consolidation, banks were treated as if the mergers or consolidation processes were consummated at the beginning of the sample period.

there will likely be few under-capitalized rural banks. However, because a significant portion of rural banks does not meet this requirement, we question the effectiveness of the regulation in the form of PCA. Thus, we evaluate this issue as part of our empirical analysis.

To analyze rural bank lending activities under capital regulation with PCA, we specify a lending equation based on a modification of the analysis of Peek and Rosengren (1995a, b). Lending is assumed to depend on the capital adequacy ratio of the previous period, the current capital stock, and a dummy variable for PCA that will be explained later:

$$L_{i,t} = \delta_{0,i} + \left(\delta_1 + \delta_2 \frac{K_{i,t-1}}{A_{i,t-1}}\right) K_{i,t} PCA_{i,t} + \left(\delta_3 + \delta_4 \frac{K_{i,t-1}}{A_{i,t-1}}\right) K_{i,t}(1 - PCA_{i,t}) \quad (1)$$

$$+ \delta_5 Log(A_{i,t-1}) + \delta_6 NIM_{i,t-1} + \varepsilon_{i,t} \quad ,$$

where $L_{i,t}$ is a loan issued by bank i at time t, $K_{i,t}$ is bank i's capital at time t, $Log(A_{i,t-1})$ is the log of assets at time t-1, $NIM_{i,t-1}$ is the lending-borrowing margin at time t-1, and $\varepsilon_{i,t}$ the mean zero error term. The parameters, signified by the δ_i's, capture the effect of capital fluctuation on lending. A change in capital affects the level of lending directly or indirectly through interaction with the capital adequacy ratio. And $\delta_{0,i}$ is a dummy variable for bank i, capturing the time-invariant, bank-specific individual effect on each bank's lending activity. Given that banking behavior is regulated under the Basel Accord during the sample period, the assets variable (A) represents risk-weighted assets, while the capital variable (K) represents qualifying capital.[10] The capital adequacy ratio (K/A) is calculated as the ratio of risk-weighted assets to qualifying capital.

To explicitly differentiate the lending behaviors of under- and well-capitalized banks, the rural banks are divided into two groups: (1) banks subject to PCA and (2) banks not subject to PCA. In this study, an under-capitalized bank is defined simply as one whose capital adequacy ratio (K/A) does not meet the minimum capital requirement, while a well-capitalized bank is one whose capital adequacy ratio meets the minimum requirement. The variable PCA is unity if a bank is under-capitalized and zero if a bank is well-capitalized.

Our model specification of the capital adequacy ratio and PCA captures regulatory pressure in the context of capital requirements. Several studies, such as Shrieves and Dahl (1992), Jacques and Nigro (1997), Aggarwal and Jacques (1998), Ediz, Michael, and Perraudin (1998), and Rime (2001), examine this issue by considering various factors such as adjustment costs and capital buffers. In particular, both Aggarwal and Jacques (2001) and Rime (2001) capture the effect of regulatory pressure through the classification of banks as well- or under-capitalized. Our model also follows their specification to examine the effectiveness of PCA implemented by the BSP.

In addition, Ediz, Michael, and Perraudin (1998) and Rime (2001) adopt the method of regulatory pressure that reflects the relation between the fluctuation of the capital adequacy ratio and the probability of failing to meet the regulation. This approach captures the banks' incentive to maintain a capital buffer as they attempt to reduce the probability of under-capitalization when their capital adequacy ratio is not high enough compared with the minimum requirement level. In our model specification, the capital adequacy ratio in parentheses

[10] Qualifying capital (QK) is, as previously noted, the sum of a bank's Tier 1 (core) capital and Tier 2 (supplementary) capital, less required deductions. Tier 2 capital is the sum of upper Tier 2 and lower Tier 2 capital. Details on the composition of qualifying capital and risk-weighted assets can be seen in BSP Circular 280, dated 29 March 2001.

differentiates lending behavior through the regulatory pressure associated with PCA. The important distinction between our model and those of previous studies is that a significant portion of rural banks are indeed under-capitalized in the Philippines. This fact calls for careful examination of the effectiveness of PCA associated with capital regulation in the Philippine rural banking industry.

Additional control variables in the model include the log of the initial asset (A) at the beginning of the current period (at the end of the previous period), $Log(A)$, and the net interest margin in the previous period, NIM, which applies to the spread between two banking activities: (1) fund generation (borrowing) and (2) fund application (lending). The first variable captures the scale effect of lending capacity, insofar as bank size might affect lending behavior due to relationships between lending behavior and borrowers' size, risk diversion, investment opportunity, and various government regulations. The second control variable, NIM, captures the operational efficiency of banks, which could also affect loan activity. The model also includes time dummies to control for countrywide, time-specific aggregate shocks.

From equation (1), lending sensitivity in response to a change in capital is then represented as follows:

$$\frac{dL_{i,t}}{dK_{i,t}} = \left(\delta_1 + \delta_2 \frac{K_{i,t-1}}{A_{i,t-1}}\right) PCA_{i,t} + \left(\delta_3 + \delta_4 \frac{K_{i,t-1}}{A_{i,t-1}}\right)(1 - PCA_{i,t}) \quad (2)$$

In equation (2), the value of $\delta_1 + \delta_2 K/A$ represents the slope of the lending function or the lending sensitivity of an under-capitalized bank; the value of $\delta_3 + \delta_4 K/A$ represents the lending sensitivity of a well-capitalized bank.[11] The lines of the slope, $\delta_1 + \delta_2 K/A$ and $\delta_3 + \delta_4 K/A$ may not be continuous at the threshold of the capital adequacy ratio, which differentiates the value of PCA. In this paper, however, we assume that they are connected at the threshold capital adequacy ratio, t^*. In fact, equation (2) is a spline function that connects different segments of lending sensitivity. To make the piecewise function continuous, the following restriction is imposed:

$$\delta_1 + \delta_2 .t^* = \delta_3 + \delta_4 .t^* . \quad (3)$$

The threshold value in equation (3) is called a knot in the spline function (see, e.g., Green, 2003, p. 121).

Following the above procedure, the sensitivity of lending activity with respect

$$\frac{dL_{i,t}}{dK_{i,t}} = \left(\left(\frac{K_{i,t-1}}{A_{i,t-1}} - t^*\right) PCA_{i,t}\right)\delta_2 + \delta_3 + \left(\frac{K_{i,t-1}}{A_{i,t-1}}(1 - PCA_{i,t}) + t^* PCA_{i,t}\right)\delta_4 , \quad (4)$$

and the lending equation will be represented as follows:

$$L_{i,t} = \delta_{0,i} + \delta_2 \left(\frac{K_{i,t-1}}{A_{i,t-1}} - t^*\right) K_{i,t} PCA_{i,t} + \delta_3 K_{i,t} + \delta_4 \left(t^* K_{i,t} PCA + K_{i,t}(1 - PCA)\frac{K_{i,t-1}}{A_{i,t-1}}\right) + \delta_5 Log(A_{i,t-1}) + \delta_6 NIM_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

[11] Peek & Rosengren (1995b) show that the sensitivity of poorly capitalized banks is relatively high compared with that of better-capitalized banks. Our model extends their model to cover banks that are subject to PCA since the presence of under-capitalized banks in the Philippine banking system cannot be ignored.

Before model estimation, the threshold capital adequacy ratio, t^*, must be estimated. The Philippine government imposes a 10-percent capital adequacy ratio. With this in mind, t^* is set at 0.1. The PCA variable is then defined accordingly. However, the actual capital adequacy ratio that binds banks' lending behavior is conjectured to differ from the legally imposed figure. To determine the actual binding capital adequacy ratio, we estimate the regression function iteratively by incrementally changing the value of t^* in the neighborhood of 0.1. We then search for a figure for t^* that provides the best fit of the model. In our case, we find for t^* a figure that minimizes the residual sum of the square of the regression. This procedure, in fact, shows that the legally imposed capital adequacy ratio is binding as the minimum requirement. In other words, the estimated threshold t^* is consistent with the capital requirement actually imposed by the BSP.

3.3. Results

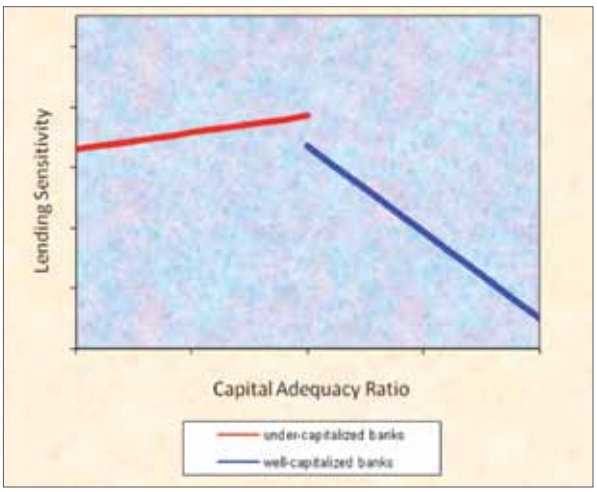
Table 2 shows the summary statistics for our sample, and Table 3 presents the estimated results for lending activity. Two issues concerning model estimation are noteworthy. First, we must address the correlation between the unobserved bank-specific effects and the independent variables. To evaluate this problem, we estimate fixed-effects (FE) and random-effects (RE) models and conduct the Hausman test. With a p-value of 0.00, we reject the null hypothesis that the parameter estimates from the FE and RE models are not systematically different. In this case, the pooled OLS estimates and RE estimates are biased and inconsistent. Therefore, we focus on the estimates of the FE models (models 2 and 4 in Table 3).

The second issue to be addressed is the endogeneity of the independent variables. We use the first and second lagged independent variables as instrumental variables (IVs) to control for the endogeneity (models 4 and 5 in Table 3). A comparison of model 2 and model 4 reveals that the parameters increase in size when the IVs are used. This may validate the IVs. The over-identification test also cannot reject the null hypothesis that the IVs are uncorrelated with the errors in the model (with a p-value of 0.4). To estimate the parameters, we use equation (4). Note that, in equation (4), we cannot estimate parameter δ_1. We recover δ_1 and its standard error from equation (3) using the delta method.

Our results indicate that the coefficients are consistently significant, with the same signs across all models. First, lending sensitivity is, on average, higher for under-capitalized banks than for well-capitalized banks as can be seen from the chart below. When there is a negative capital shock, under-capitalized banks must curtail their loan activity to a greater extent than well-capitalized banks in order to meet the required capital adequacy ratio. This finding suggests that, although many under-capitalized banks exist in the Philippine rural banking industry, the PCA framework of the BSP is, to a large extent, effective insofar as regulatory pressure may intensify the motivation of under-capitalized banks to meet the minimum capital requirement.

Second, more interestingly, when we compare the lending behavior of under-capitalized banks under the PCA constraint with those of well-capitalized banks that are free of the PCA constraint, we observe a significant difference in relation to the capital adequacy ratio. The results indicate that the coefficient on the interaction between the capital adequacy ratio and capital, δ_2, is significantly positive for under-capitalized banks while the coefficient, δ_4 is significantly negative for well-capitalized banks. Notice that the net effect of a capital increase on lending is still positive for both types of banks.[12] These results imply that lending sensitivity to capital changes increases with the capital adequacy ratio for under-capitalized banks, while it decreases with the capital adequacy ratio for well-capitalized banks. In other words, lending sensitivity is greatest when the capital adequacy ratio is near the minimum requirement level, while it decreases as the ratio deviates from the minimum level.

Lending Behavior of Rural Banks



Source: Regression results of Model 4 in Table 3

The logic behind the inverse V shape of lending sensitivity appears to be closely related to the relationship between the capital adequacy ratio and regulatory pressure from the BSP. Regulatory pressure causes rural banks' managers under the PCA constraints to incur additional management costs. For instance, these costs may include the implementation of a capital restoration plan through painful intervention by the BSP.

For 'well-capitalized' banks, regulatory pressure may reflect the relationship between future fluctuations in the capital adequacy ratio and the possibility of future failure to meet the minimum requirement. This implies that poorly capitalized banks that meet the capital requirement tend to be more vulnerable to negative capital shocks, which may cause them to fall under the PCA constraints. As a result, they are more sensitive to capital shocks. This is consistent with the conventional argument in the 'capital crunch' literature that poorly capitalized banks that incur negative shocks to their capital curtail their lending to a greater extent than better-capitalized banks (see, e.g., Bernanke and Lown, 1991; Peek and Rosengreen, 1995a, b; and Hancock, Laing, and Wilcox, 1995).

On the other hand, 'under-capitalized' banks exhibit different lending behavior with respect to the capital adequacy ratio. The positive slope of the lending function for under-capitalized banks under the PCA constraint indicates that

12 For example, if we evaluate lending sensitivity for a well-capitalized bank using model 4, it will be $4.49 - 5.68 \bullet K/A$. If we evaluate the term at the mean of K/A, which is 0.26, it will be 3.46.

the lending behavior of under-capitalized banks whose capital adequacy ratio is near the minimum requirement is more sensitive to changes in capital than that of those which are far below the requirement. One possible explanation may come from the conjecture that the degree of PCA regulatory pressure exerted by the BSP depends on the extent to which the capital adequacy ratio is below the required level.

If the capital adequacy ratio is close to the required level, under-capitalized banks can mitigate regulatory pressure by a sensitive adjustment of loan credit in response to a capital shock. If the capital adequacy ratio is far below the requirement, however, it may be difficult to reduce regulatory pressure by adjusting loan credit, so that there is little hope of meeting the requirement in the near future. Additionally, since the negative macroeconomic consequences of rural bank foreclosures on rural development are highly undesirable for regulators, bank managers may have a weaker incentive to meet the minimum requirement when the capital adequacy ratio is far below the requirement. This discussion suggests that lending sensitivity is high for relatively healthy under-capitalized banks. Conversely, it is low for relatively unhealthy under-capitalized banks. Given that policy effectiveness can be evaluated by lending sensitivity, the results for under-capitalized banks imply that the PCA framework becomes less effective with a decline in the capital adequacy ratio, although the level of effectiveness is relatively high, as previously noted.

Our finding of the inverse V shape of lending sensitivity can also be interpreted in light of the additional management cost associated with regulatory pressure ('regulatory cost'). For well-capitalized banks with adequacy ratio above the minimum requirement, the regulatory cost increases at an increasing rate as the capital adequacy ratio decreases and nears the minimum requirement, i.e., the marginal change in the regulatory cost decreases with a rise in the capital adequacy ratio. As a result, an incentive of well-capitalized banks to adjust loan credit in response to capital shocks is intensified with a decline in the capital adequacy ratio. In contrast, for under-capitalized banks with adequacy rate below the minimum requirement, the regulatory cost decreases at an increasing rate as the capital adequacy rate increases toward the minimum requirement, i.e., the marginal change in the regulatory cost increases with a rise in the capital adequacy ratio. As a result, an incentive of under-capitalized banks to adjust loan credit in response to capital shocks is intensified with a rise in the capital adequacy ratio.

Among the other independent variables that control for lending behavior, the coefficient on the log of the asset is significantly positive. This may suggest that economies of scale make a difference in lending activities. Large banks may be able to provide various types of loans more efficiently than small banks. Also, as in Peek and Rosengren (1995b), rural banks in the Philippines may be constrained not to lend more than some proportion of their capital to any one borrower. Such a constraint can prevent small banks from making large loans.

Meanwhile, the coefficient on the net interest margin is significantly negative. This suggests that, when the margin increases, lending literally shrinks. Even though we use the IVs to control for endogeneity, interpreting the result as a causal relationship is difficult. Still, we infer that there can be a negative correlation between the two variables. For example, instead of increasing capital, rural banks might generate more deposits by increasing deposit rates to fund the increase in the volume of lending; thus, reducing the net interest margin while holding the loan rate constant.

4. Conclusion

This paper has studied the role of capital requirements on rural banks that serve as rural development catalysts in the Philippines over the sample period of 2001Q3 to 2006Q4. This period coincides with capital regulations based on the Basel Accord. Our results pertaining to lending behavior strongly suggest that capital regulations undertaken with PCA (based on the BSP) can be effective. However, their effectiveness with respect to under-capitalized banks declines as the banks' capital adequacy ratios drop below the minimum requirement level. The greater the drop, the less effective are the regulations.

The evidence from this study illustrates clearly that a capital crunch triggers a credit crunch. A capital shock in the presence of more risk-sensitive capital regulation will shrink loans faster for under-capitalized banks than for well-capitalized banks. Because every rural bank plays an important role as a catalyst for rural economic development, a reduction of available funds for lending triggered by a capital shock will, therefore, make it more difficult for rural banks to play such a role. By extension, this may have adverse consequences for rural development. On the other hand, rigid capital regulations stabilize the rural banking industry and ensure continued public trust and confidence in the financial system. With the rural bank at the center, balancing monetary and financial policy vis-à-vis countryside development through effective fiscal administration is necessary; although it represents a challenging task for policymakers.

The timely and dynamic formulation of responsive policies alongside effective implementation of rules and regulations is the ultimate key to stabilizing the rural banking industry. Admittedly, the present study does not examine all the crucial issues in rural banking systems; yet, our analysis serves as an initial step in better understanding the relationship between lending behavior and capital regulations in rural banking systems of developing countries.

Table 1

Summary Statistics (average, 2006)

	Well-capitalized banks	Under-capitalized banks
Risk-weighted Asset	169	329
Qualifying Capital	32.1	25.1
Capital Adequacy Ratio	0.26	0.07
Loan	117	173
# of rural banks	497	106

Note: The numbers, excepting the capital adequacy ratio, are in millions of Philippine pesos.

Table 2

Sample Statistics

Variable	Mean	Std. Dev.
$K_{i,t-1} / A_{i,t-1}$	0.204	0.258
$L_{i,t}$	8.48E+07	1.73E+08
$K_{i,t}$	2.05E+07	4.15E+07
$Nim_{i,t}$	0.065	0.051
$log(A_{i,t-1})$	16.315	1.141

Note: The total number of the sample is 13,228.

Table 3
Results of Regressions

Variables	Model 1 (OLS)	Model 2 (FE)	Mode 3 (RE)	Model 4 (Fixed effects IV estimation)	Model 5 (G2SLS Random effect IV Regression
PCA					
$K_{i,t}$	3.807 (17.08)*	3.268 (4.13)*	3.424 (8.85)*	4.359 (3.98)*	4.375 (5.13)*
$\frac{K_{i,t-1}}{A_{i,t-1}} \cdot K_{i,t}$	1.999 (2.64)*	1.043 (1.83)**	1.114 (2.55)*	1.105 (1.79)**	1.095 (1.97)*
Non-PCA					
$K_{i,t}$	4.800 (15.58)*	3.502 (3.49)*	3.855 (7.65)*	4.937 (4.39)*	5.119 (5.22)*
$\frac{K_{i,t-1}}{A_{i,t-1}} \cdot K_{i,t}$	-7.929 (11.17)*	-1.297 (2.55)*	-3.197 (-2.51)*	-5.679 (-1.83)**	-7.096 (-2.62)*
$\log(A_{i,t-1})$	2.47e+7 (6.83)*	7.43e+07 (2.89)*	4.39e+07 (6.67)*	4.08e+07 (1.91)**	2.85e+07 (2.29)*
NIM	-3.16e+8 (-11.17)*	-1.60e+08 (-4.60)*	-1.73e+08 (-6.85)*	-9.02e+07 (-2.27)*	-9.72e+07 (-2.60)*
R^2	0.779	0.718(within)	0.753(overall)	0.617(within)	0.766(overall)

Notes:

1. All regressions include time-specific dummy variables. The numbers in parentheses are t-values. For OLS, FE, and RE, heteroskedasticity-consistent standard errors are used. For IV estimations, bootstrap standard errors are used.
2. *: significant at the 5% level; **: significant at the 10% level.
3. The Hausman test rejects the null hypothesis that the coefficients from FE and RE are not systematically different at p-values of 0.00. For the IV estimations, we use the first and second lagged values of independent variables as the instrumental variables.

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