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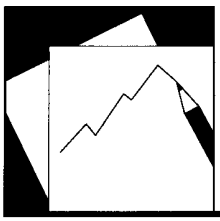

IMF Working Paper

Bank Efficiency and Market Structure: What Determines Banking Spreads in Armenia?

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Middle East and Central Asia

Bank Efficiency and Market Structure: What Determines Banking Spreads in Armenia?

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Abstract

Despite far-reaching banking sector reforms and a prolonged period of macroeconomic stability and strong economic growth, financial intermediation in Armenia has lagged behind other transition countries, and interest rate spreads have remained higher than in most Central and Eastern European transition countries. This paper examines the determinants of interest rate spreads and margins in Armenia using a bank-level panel dataset for the period 2002 to 2006. We find that bank-specific factors, such as bank size, liquidity, and market power, as well as the market structure within which banks operate, explain a large proportion of cross-bank, cross-time variation in spreads and margins. The results suggest that there is a large potential to increase cost efficiency and competition in the banking system.

JEL Classification Numbers: E43, G21, C13

Keywords: Banking system, interest rate spreads, Armenia

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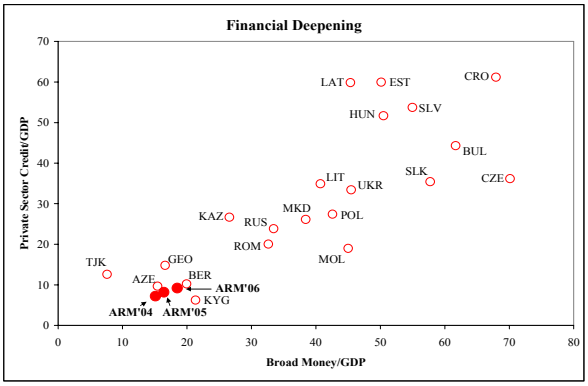
I. INTRODUCTION

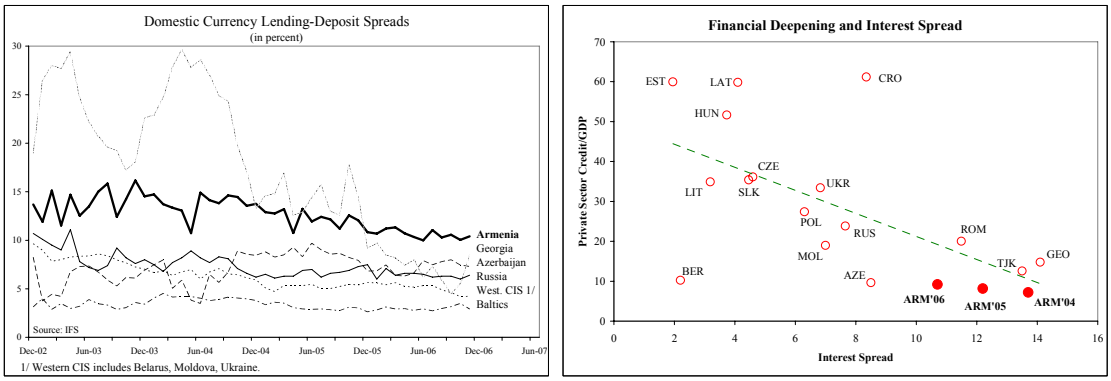
As in other transition countries, the structure of Armenia's banking system has undergone significant changes over the past decade. Bank restructuring and privatization has been accompanied by consolidation, market entry of new foreign banks, an overhaul of the legal framework, and a strengthening of prudential regulation and supervision. However, despite these reforms and a prolonged period of macroeconomic stability and economic growth, financial intermediation remains low by regional standards (Figure 1).

Figure 1: Regional Comparison of Financial Sector Development, 2005



Armenia lags behind most CIS countries and the Baltics in private sector lending, banking system assets and deposits, and financial depth, as measured by monetization. At the same time, interest rate spreads have remained persistently high and well above those in most transition countries, averaging over 12 percent since 2003 (Figure 2).

Figure 2: Regional Comparison of Interest Rate Spreads, 2005



The spread between lending and deposit rates is widely regarded as an indicator of the efficiency of financial intermediation. High interest rate spreads are an impediment to financial intermediation, as they discourage potential savers with low returns on deposits and increase financing costs for borrowers, thus reducing investment and growth opportunities. This is of particular concern for developing and transition countries where financial systems are largely bank-based, as is the case in Armenia, and tend to exhibit high and persistent

spreads.[1] Understanding the determinants of these high spreads is, therefore, important to inform policy for improving banking efficiency and achieving financial deepening.

This paper analyzes the determinants of banking sector efficiency, as measured by interest rate spreads and net interest margins, in the Armenian banking system over the period 2002-2006.[2] Specifically, it examines the role of bank characteristics, market structure, and macroeconomic factors in determining spreads and margins using a bank-level panel dataset. The dataset also includes information on banks' loan portfolio composition which allows us to assess whether varying risk premiums across sectors and variations in market segments account for differences in spreads and margins across banks. We also investigate whether foreign banks operate with lower spreads and margins, and whether there is a spill-over effect of foreign bank entry on the banking system, differentiated by the origin of the foreign bank.

Our results show the importance of bank-specific characteristics in explaining the variation of interest rate spreads and margins across banks and across time. We find that larger and more liquid banks with less exposure to agricultural and consumer loans are associated with lower spreads. Banks exhibiting higher market power, as measured by individual market shares, are associated with higher spreads but with lower margins. More profitable banks are associated with higher margins, while higher capital adequacy and liquidity ratios are associated with lower margins. Higher concentration in loan and deposit markets has a positive and economically significant effect on both spreads and margins.

In contrast to the experience of other transition countries, the presence of foreign banks does not directly seem to have contributed to lower spreads and margins, reflecting the limited presence of first-tier international banks in the Armenian banking sector. However, we find that foreign bank origin matters for banking efficiency, with first-tier (western) foreign banks having a spill-over effect on interest rate spreads. The presence of banks from other countries, however, is associated with higher spreads. Finally, macroeconomic variables were found to have only a minimal impact on both spreads and margins.

This paper contributes to the literature on the determinants of interest rate spreads and margins in developing and transition countries.[3] Most studies on the determinants of banking efficiency in transition countries have focused on the more advanced Central and Eastern European (CEE) countries. There is scant empirical evidence on the effect of financial sector reforms and changes in market structure on banking system efficiency in the CIS countries of the Caucasus and Central Asia. This paper sheds light on the behavior of bank spreads in one such relatively financially underdeveloped CIS country.

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[1] Commercial banks are the central pillars of the Armenian financial sector, with banking sector assets accounting for more than 90 percent of total financial sector assets.

[2] Ex post interest rate spreads are the difference between the implicit interest rates charged to borrowers and paid to depositors, while net interest margins capture the difference between bank's total interest income and total interest expenses.

[3] There are many country-level studies from different regions that examine the effects on spread of financial sector reforms (Chirwa and Mlachila (2004) for Malawi, Barajas and others (1999) for Colombia) and foreign entry (Beck and Hesse (2006) for Uganda).

The remainder of the paper is organized as follows. Section II provides a brief review of the related literature. Section III gives an overview of the Armenian banking sector and provides a regional comparison. Section IV discusses methodology and data. Section V presents the main results and discusses robustness tests. Section VI concludes and discusses policy implications.

II. Determinants of Interest Spreads: Related Literature

Interest rate spreads and net interest margins are widely considered as proxies for the efficiency of financial intermediation. High interest spreads are the result of market frictions such as transaction costs and information asymmetries (Stiglitz and Weiss, 1981). Intermediation costs associated with screening and monitoring borrowers and processing savings and payment services, and information asymmetries resulting in agency costs, create a wedge between the interest rate paid to savers and the interest rate charged to borrowers. The larger banking inefficiencies are, the higher spreads will be, which reduces the demand for and the benefits of financial intermediation.

The extensive literature on bank behavior suggests that a variety of factors are likely to influence the cost of financial intermediation. Bank-specific factors, such as managerial capabilities, overhead costs, bank size, risk assessment capacity, and investment management, influence banking efficiency (Demirgüç-Kunt and Huizinga, 1999; Dell'Arriccia and Márquez, 2004). The legal and institutional environment also contributes to the efficiency of intermediation through its impact on loan recovery rates, enforceability of foreclosures, and collateral collection, as well as market transparency and information sharing on borrowers (Demirgüç-Kunt and others, 2004). At the same time, the market structure within which banks operate (ownership structure, market concentration, competition) can have important implications for the incentives of banks to overcome market frictions and efficiently intermediate the economy's savings to borrowers.

Intermediation costs contain a fixed cost element at the bank and financial system level, suggesting the importance of economies of scale (Bossone, et al., 2002). The underlying idea is that the inability of creditors to diversify risks due to market failures or small market size can result in a risk premium in the lending interest rate. Consistent with this, previous studies have found a negative relationship between bank size and operating costs, and between bank size and interest rate spreads and margins (see, for instance, Beck and Hesse, 2006).

A number of recent papers have also examined the relationship between ownership and market structure on lending-deposit spreads and interest margins using cross-country evidence for a large number of developed and developing countries. Demirgüç-Kunt and others (2004), and Martinez Peria and Mody (2004) find a positive relationship between foreign bank entry and intermediation efficiency, consistent with the hypothesis that foreign bank entry imposes competitive pressure resulting in efficiency gains. However, Claessens and others (2001) report that foreign banks tend to have higher net interest margins, while Detragiache and others (2005) find that in poor countries, a larger foreign bank presence is associated with shallower credit markets. Van Horen (2007) notes that bank origin matters for banking efficiency and profitability, with developing country foreign banks exhibiting higher interest margins and lower profitability than foreign banks from high-income countries.

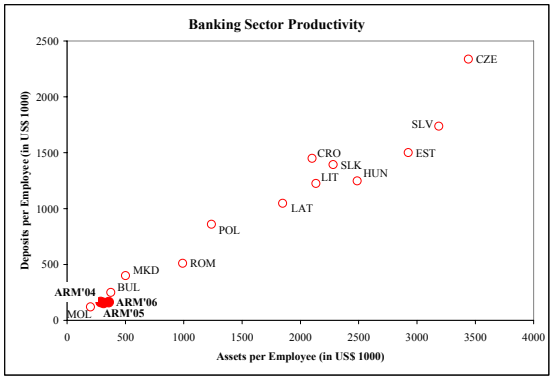
The empirical evidence on the relationship between banking system concentration and spreads and margins is mixed. Demirgüç-Kunt and others (2004) do not find a robust correlation between measures of concentration and net interest margins. Martinez Peria and Mody (2004), on the other hand, find a positive relationship between bank concentration and spreads.

Previous studies on transition countries have focused on the importance of financial reforms, ownership, and competition in determining the depth of financial intermediation. Fries et al. (2002) find that for countries that have made significant progress on financial reforms, banks have reasonable margins on loans and offer competitive rates on deposits. Drakos (2003) examines net interest margins from 1993 to 1999 in eleven transition countries and finds that interest margins decrease significantly for the entire group of banks over the period, and that foreign entry matters for banking performance. Bonin and others (2005) show that majority foreign-owned banks tend to be more efficient and have a positive impact on bank competition in transition countries.

III. THE ARMENIAN BANKING SYSTEM

The Armenian banking system has experienced substantial consolidation over the past decade. As in other transition countries, liberal licensing and regulation policies led to the creation of a large number of banks during the early 1990s. The gradual tightening of prudential regulations since the mid-1990s and a number of bank failures between 2000 and 2002 reduced the number of banks from 74 in 1994 to 21 currently. Strengthening of the regulatory and supervisory framework also resulted in improvements in system-wide asset quality, capitalization, and profitability, which are high in comparison with other transition countries (Floerkemeier, 2006). However, most banks are still very small, exhibiting low indicators of banking productivity, such as the amount of deposits and assets per employee (Figure 3).

Figure 3: Regional Comparison of Bank Productivity, 2005

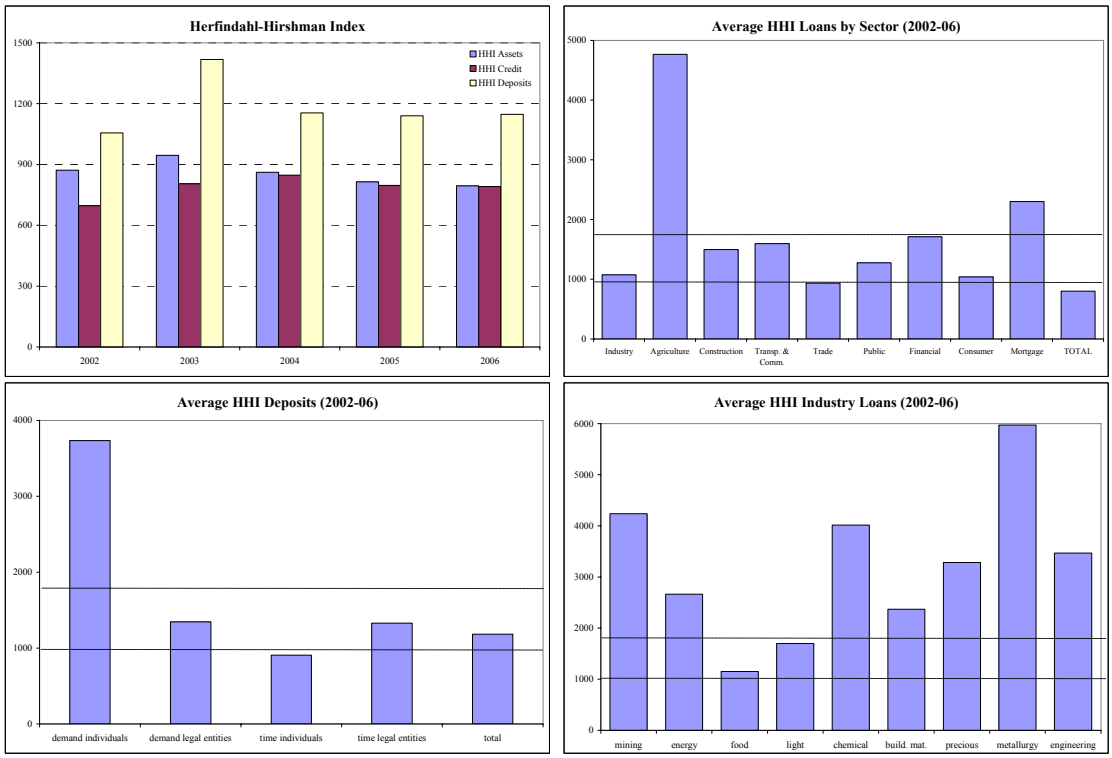


As a result of financial sector reforms, the Armenian banking system has undergone significant changes in its market structure. Since the privatization of Armsavingsbank in 2001, all banks have been privately owned. Foreign participation in the banking system increased following the removal of limits on foreign ownership in the mid-1990s. Foreign banks now account for 60 percent and 70 percent of system-wide loans and deposits, respectively. However, with one key exception, foreign investors were mainly Armenian Diaspora individuals without the benefit of international banking expertise and reputation.

Some banks from other CIS countries have also entered the Armenian market by taking over local banks, but until mid-2006, only one first-tier international bank operated in Armenia.

Market concentration, as measured by the Herfindahl-Hirshman Index (HHI) and concentration ratios (share of the top three banks) in loans and deposits, has been low or moderate.[4] The top three banks account for about 35-40 percent of the system's assets and loans. Market concentration as measured by the HHI for deposits, however, is higher than that for loans (Figure 4) mainly due to the dominant position of the only first-tier international bank in demand deposits, with a market share in this segment of more than 50 percent.

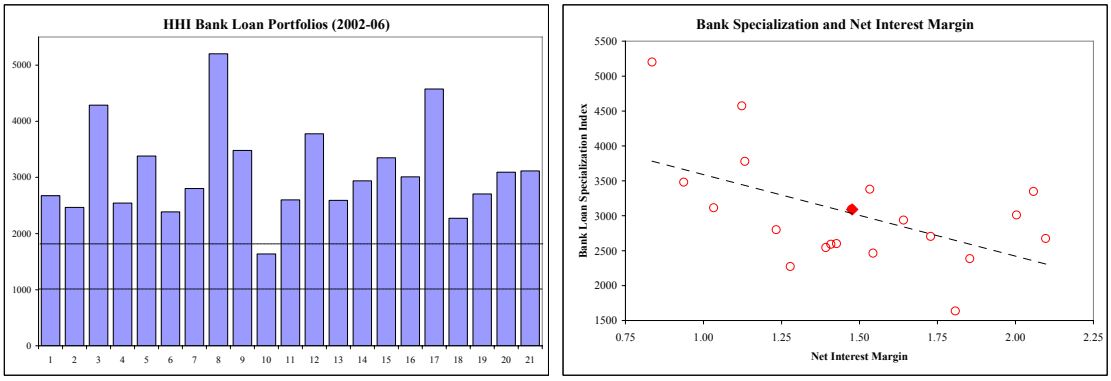
Figure 4: Banking Sector Concentration, 2002–06



As a result of market segmentation, concentration of credit on individual economic sectors and on demand deposits is significantly higher than the overall concentration measures suggest. Market concentration is high in agricultural and mortgage loans and moderate in lending to the transport and communication, and construction sectors. Most banks are only active in two to four of the nine main economic sectors, resulting in generally high HHI credit portfolio specialization indices (Figure 5).

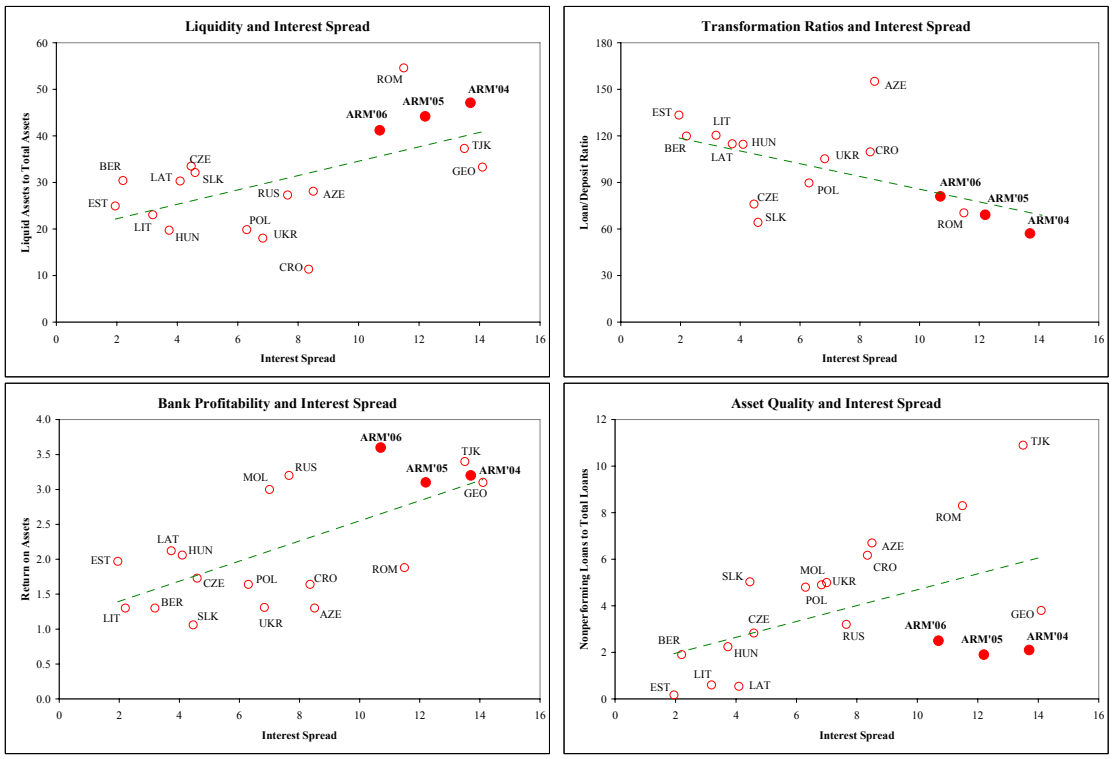
[4] The U.S. Department of Justice considers markets in which the HHI is between 1000 and 1800 points to be moderately concentrated, and those in which the HHI is in excess of 1800 points concentrated.

Figure 5: Bank Specialization in Loan Markets and Net Interest Margin, 2002–06



As mentioned earlier, interest rate spreads in Armenia are significantly higher than in other transition countries. One reason for this is the small size of the financial sector, suggesting unrealized economies of scale. Other factors explaining high spreads include low intermediation activity (as measured by loan-to-deposit ratios) in the Armenian banking sector, which points to lack of investment opportunities, low risk appetite of commercial banks, and the relative attractiveness of government and central bank securities. Competitive pressures appear to be limited, which possibly allows banks to charge above-market spreads, resulting in internationally high returns on assets.[5] Problems with asset quality, on the other hand, are less likely to play an important role, as nonperforming loan ratios are low by regional comparison.

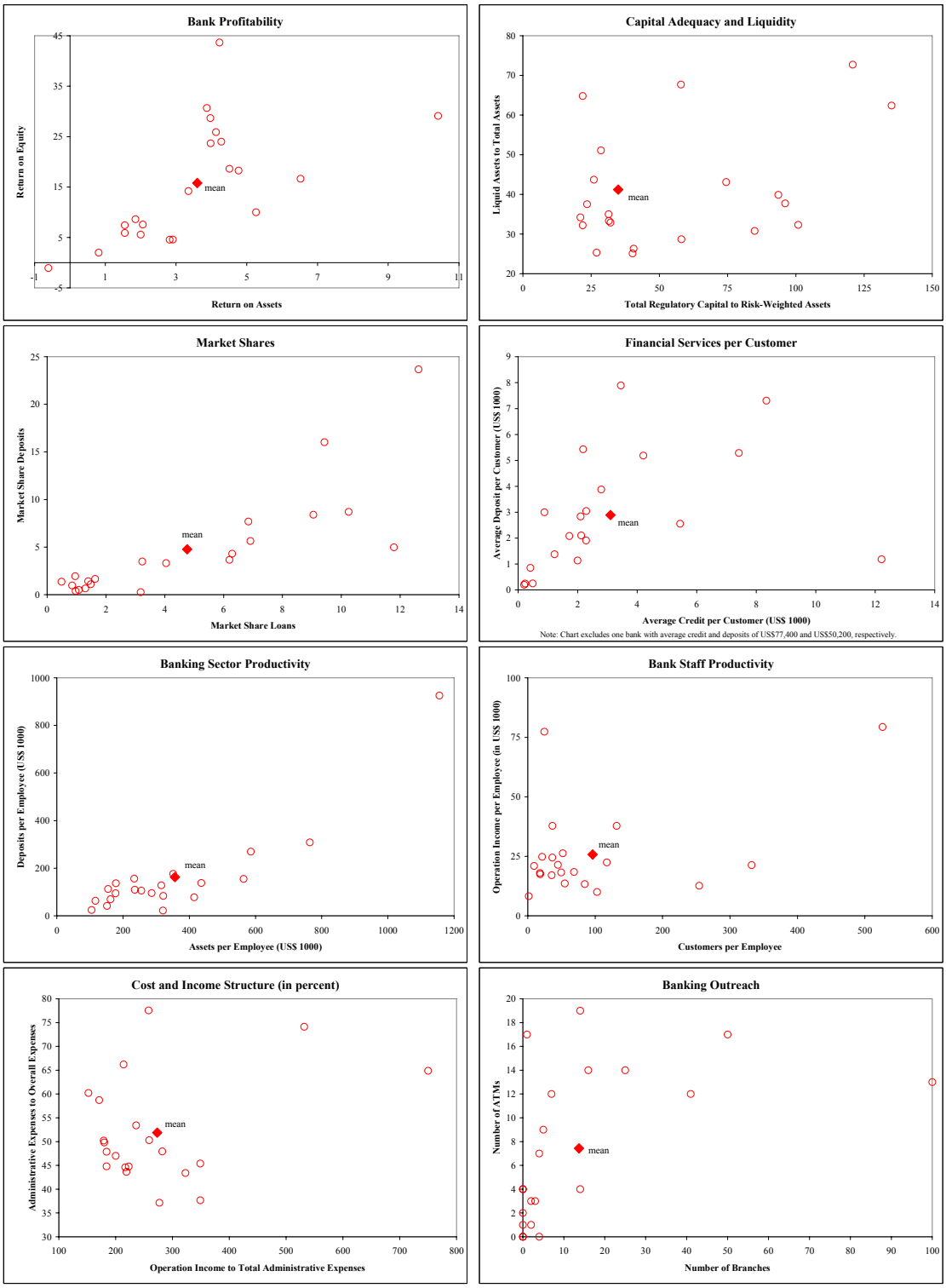
Figure 6: Regional Comparison of Determinants of Interest Rate Spreads, 2005



[5] Mkrtchyan (2004) uses the Panzar and Ross (1987) approach to assess competitive conditions in the Armenian banking system. The paper finds that the Armenian banking system is characterized by monopolistic competition and that competition intensity weakened over the 1996–2003 period.

Focusing solely on the aggregate banking sector indicators may, however, be misleading as bank activities, market shares, banking productivity, outreach efforts, profitability, and financial soundness indicators vary greatly among individual banks (Figure 7). While almost all Armenian banks are profitable and satisfy prudential norms, profitability, capital adequacy, and liquidity indicators vary widely across banks, and individual outliers have a significant impact on sectoral averages.

Figure 7: Performance and Structure of the Armenian Banking Sector, 2006



Banks differ greatly in size, outreach effort, and customer base. Around half of all Armenian banks are very small with negligible market shares in deposits and loans, which contributes to the sector's overall low banking productivity. A number of these banks concentrate their activities in trade financing, money transfers, and private banking, rather than in deposit-taking and loan-making.[6] Other banks serve a large number of small scale depositors and borrowers. While they may have comparatively large shares of the overall deposit and credit markets, the size of financial service per customer can be extremely small, with some banks having average loans and deposits as low as US$200 per customer.

IV. METHODOLOGY AND DATA

We utilize a panel dataset of 20 commercial banks' spreads and interest margins to empirically investigate which bank-specific, market structure, and macroeconomic characteristics are the main determinants of banking spreads in Armenia.[7] As in Peria and Mody (2004) and Beck and Hesse (2006), we estimate a general class of regressions for spreads and net interest margin of the form:

$$I_{i,t} = \alpha + \beta_1 B_{i,t} + \beta_2 C_t + \beta_3 M_t + \varepsilon_{i,t}$$

I_{it} is the dependent variable (either spread or margin) for bank i at time t; $B_{i,t}$ is a vector of bank-specific variables for bank i and time t; C_t is a vector of time-varying, industry-specific variables such as measures of concentration and ownership structure in the banking system; M_t is a vector of time-varying macroeconomic variables; and $\varepsilon_{i,t}$ is the residual. We control for time effects by including quarterly and yearly time dummies. The spread and margin equations are estimated with both pooled OLS and fixed effects regression. The latter controls for time-invariant bank-specific effects. Table 1 provides summary statistics and correlations for the employed variables.

The two measures of intermediation efficiency used in the study are *spreads* and *net interest margins.*[8] *Spread* is the difference between the ex post implicit interest rate charged on loans and the implicit interest paid on deposits. This variable is calculated by taking the total interest received by banks on loans during one quarter divided by the average loans for that period and subtracting from it the total interest paid on deposits throughout the quarter divided by average deposits**.** *Net interest margin* equals total interest income minus total interest expense divided by average assets.[9] This variable measures the gap between the amount a bank pays the providers of funds and what it receives from users of bank credit. The average ex post interest spread in our sample is 3.6 percent, while the net interest margin

[6] Anecdotal evidence suggests that several small banks serve as "pocket banks" of enterprise groups or wealthy individuals, which use them for treasury operations, or as sources of cheap liquidity, and equity investment**.**

[7] We omit banks that were under central bank administration and/or went out of business during the sample period. Of the five banks that are excluded from the sample, two went out of business, one was acquired by another bank, one became a credit organization, and one emerged from temporary central bank administration under new ownership.

[8] In the robustness section, we consider an alternative measure of ex ante interest spreads – the difference between the weighted average lending and deposit rates for each bank, where the weights are the relative amounts of deposits or loans contracted at the specific interest rate. However, this data series is incomplete as it only includes information on deposits and loans made during the last week of each quarter.

[9] Due to limited data availability, we use average total assets instead of earning assets in the denominator.

is 1.5 percent, compared to an average ex ante interest rate spread of 12.7 percent. The variation of spreads and margins across banks is about twice as large as the variation over time.

Although the net interest margin can be interpreted as an indicator of bank efficiency, changes in the net interest margin may also be due to unrelated factors. A reduction in the net interest margin can, for example, reflect a reduction in bank taxation or, alternatively, a higher loan default rate.[10] In addition, cross-bank differences in net interest margins may reflect differences in bank activity, asset allocations, and risk tastes, rather than differences in efficiency. These issues emphasize the need to control for bank specific characteristics, to conduct robustness tests, and to use alternative measures of bank efficiency and performance. We use a variety of control variables and sensitivity checks to mitigate problems with interpreting the net interest margin variable.

We use a variety of bank-specific variables to explain the variation in interest margins and spreads. *Overhead costs* refer to the ratio of administrative expenses (including payroll and fixed assets) to total bank assets. We use this variable to capture cross-bank differences in the organization and operation of the bank. If banks incur high administrative costs in the process of providing their services as intermediaries, they are likely to increase their interest spreads. *Bank size* is the logarithm of total bank assets. Size may be an important determinant of net interest margins and spreads if there are economies of scale in banking. *Non-interest income* equals non-interest operating income divided by total assets. Typically banks have different product mixes, which may influence the pricing of loan products. Therefore, banks with well-developed non-interest income sources may have lower interest margins due to cross-subsidization of bank activities.

Capital adequacy is defined as the ratio of regulatory capital to risk-weighted assets. This variable captures banks' overall financial soundness. Banks with higher capital adequacy ratios may be able to withstand shocks to their balance sheets, but they also give up financial leverage which may lead to lower interest margins and returns on equity. *Return on assets* (ROA) is defined as profits over total assets. More profitable banks may be able to charge lower interest rate spreads, or the higher spreads and margins could themselves constitute a mechanism through which banks generate profits. *Current liquidity* is the ratio of highly liquid assets to demand liabilities and measures the extent to which deposit takers could meet a withdrawal of funds (IMF, 2006).[11] Banks with high levels of liquid assets (e.g. cash and government securities) may receive lower interest income than banks with less liquid assets

[10] In the first instance, the reduction in the net interest margin may reflect the improved functioning of the banking system, while in the second case the opposite may be true. Also, variation in an accounting ratio, such a the net interest margin, may reflect differences in net interest income (the numerator) or differences in, say, nonlending assets (a component of the denominator). See Demirgüç-Kunt and Huizinga, 1999.

[11] An alternative measure of liquidity is the ratio of liquid assets to total assets (liquid assets ratio). The measure of current liquidity, which is intended to capture possible liquidity mismatches between assets and liabilities, appears more relevant in the Armenian context, since the deposit base in smaller banks in particular tends to be volatile. In the robustness section we replace the current liquidity ratio with the liquid assets ratio.

(e.g. loans). If the market for deposits is reasonably competitive, greater liquidity will tend to be negatively associated with spreads and net interest margins.[12, 13]

Deposit market share is the ratio of individual banks' deposits to total banking system deposits. To the extent that market shares get translated into market power, banks with higher market shares may be able to charge higher spreads. Therefore, a bank that dominates the banking system may enjoy higher spreads and net interest margins than a smaller bank, after controlling for bank size-related economies of scale. We also distinguish between bank *portfolio shares of industry*, *agriculture, and consumer loans*. Lending rates and thus spreads could reflect risk premiums that may vary across sectors, while interest margins are affected by loan losses which could again vary across sectors. In addition, we include bank *market shares in industry, agriculture, and consumer loans*. These variables account for market segmentation and the potential for market power in specific sectors of the economy.

The dummy variable *foreign* indicates foreign ownership, where a bank is characterized as foreign if at least 50 percent of its capital is held by foreigners. By introducing this variable, we can test whether the average spreads and margins for foreign banks are significantly different from the average spread for domestically owned banks.

We include several measures of market structure, some of which do not vary significantly over time. *Foreign bank participation* is the share of loans or deposits in the hands of foreign banks. As in Martinez Peria and Mody (2004), this variable is included to test whether there is a spillover effect arising from the presence of foreign banks in the system.[14] We also study the impact of bank concentration on spreads and margins by including several measures of *market concentration* in our estimations. Specifically, we include the Herfindahl-Hirshman index for both the deposit and the lending market as well as the share of loans and deposits held by the top 3 largest banks. We interpret a positive association between concentration measures and the margin and spread variables as an indication of greater market power and less competition in the banking system.

Given that the level of bank spreads and margins can be affected by the macro environment in which banks operate, we control for variables such as *real GDP growth*, *inflation*, the *real money market rate* and the *change in the nominal exchange rate*. Inflation can affect spreads if monetary shocks are not passed through to the same extent to deposit and lending rates or if the adjustment occurs at different speeds. The short-term money market rate proxies for the marginal cost of funds faced by banks. Finally, exchange rate risk, as measured by changes in

[12] Alternatively, it could be argued that high liquidity ratios inflict a cost on banks since they have to give up holding higher yielding assets. To the extent that banks are able to transfer this cost to borrowers, spreads and margins will rise with liquidity ratios (Claessens and others, 2001).

[13] We also included the *share of nonperforming loans* as well as *loan loss provisions* in some specifications. However, these variables were found to have no impact on spreads and margins. Results are available from the authors upon request.

[14] For instance, it could be argued that foreign bank entry would force domestic banks to lower spreads, either because increased competition drives them to become more efficient or to relinquish some of the margins they were able to charge before. Alternatively, Dell'Ariccia and Marquez (2004) argue that when faced with foreign bank competition, domestic banks may redirect their lending to segments that are more opaque, where they have greater market power and an information advantage vis-à-vis foreign market entrants, allowing them to charge higher spreads.

the exchange rate, resulting from currency mismatches between dollar-denominated assets and liabilities could be important, as Armenia is a highly dollarized economy.

We use quarterly bank balance sheet and income statement data compiled by *ARKA News Agency* as well as additional bank-level data made available by the Central Bank of Armenia for the period between the last quarter of 2002 and the third quarter of 2006. Data on inflation, output growth, and the real short-term interest rate are from the IMF's IFS database. Appendix 1 contains a detailed description of the variables used in this paper.

V. EMPIRICAL RESULTS

The first section presents the main results for bank-specific variables using pooled OLS and fixed effects regressions. The next section discusses the impact of market structure and macroeconomic variables. Robustness tests are presented in the last section.[15]

A. Basic Results

Table 3 shows the relationship between bank-level characteristics and the variation of interest spreads and margins across banks and time. Columns 1–3 report regressions of interest rate spreads, while columns 4–6 report regressions of net interest margins. Column 1 presents a pooled OLS regression, while in columns 2 and 3 bank-level fixed effects are included. The contribution of bank-specific fixed effects is large, accounting for roughly 50 percent and 40 percent of the total explained variation in the spread and margin regressions, respectively.

Bank size and deposit market share are the main bank-level characteristics explaining variation in *ex post interest spreads*. Larger banks generally have lower interest rate spreads than smaller banks, reflecting economies of scale. At the same time, bank spreads increase with their market shares.[16] This suggests that while larger banks enjoy scale economies, to the extent that market shares get translated into market power, banks with higher shares of the market charge higher spreads. The impact of bank size and market shares on spreads is not only statistically significant, but also economically important. On average, a one standard deviation increase in bank size results in a reduction of spreads by about 0.8 percentage points, while a one standard deviation increase in the market share variable increases spreads by 0.5 percentage points.

The current liquidity ratio is found to be negatively and significantly associated with ex post spreads, reflecting the need of banks with a volatile funding base to hold more liquid assets. A one standard deviation increase in liquidity reduces spreads by 0.3 percentage points. Overhead costs, non-interest income, capital adequacy, and ROA are not significant once bank-specific fixed effects are included in the regressions.

The foreign ownership dummy does not have a statistically significant impact on spreads, suggesting that foreign-owned banks do not charge lower spreads than domestic banks. This

[15] In all tables, the standard errors shown are clustered by banks to allow for potential unobserved factors that cause a correlation of error-terms for individual banks across time, that is, we relax the condition that error terms of observations of the same bank are independent of each other. We also include but do not report quarterly and annual time dummies in most regressions.

[16] The market share of loans (results not reported), on the other hand, had no significant effect on either spreads or margins. Results are available from the authors upon request.

result contradicts the usual findings in the literature regarding the importance of foreign bank presence in lowering spreads. This might be due to the fact that, with one exception, the foreign banks operating in Armenia are not first-tier international banks that would provide the reputational benefits, international best practice, and competitive pressure needed to bring interest spreads down significantly.

Column 3 indicates that a higher share of agricultural and consumer loans in a bank's loan portfolio is associated with higher spreads, suggesting that these loans are perceived as being riskier. Regarding economic magnitudes, banks with a 10 percent higher loan portfolio share in agriculture and consumer loans charge 0.4 and 0.1 percentage points higher spreads relative to the average, respectively.

The main determinant of *net interest margins* is the deposit market share. In contrast to the spread regressions, the market share of banks enters negatively in the margin regressions. This result could possibly reflect individual banks' aggressive pricing strategies to gain market share in the deposit market. The effect of this variable is economically important, as a one standard deviation increase in market share reduces margins by 0.4 percentage points. In contrast to the spread regressions, the impact of bank size on margins is not significant.

As in the case of the spread regressions, overhead costs and non-interest income are insignificant once bank-specific fixed effects are included. Higher capital adequacy ratios lead to a significant reduction of margins, reflecting the trade-off between keeping greater safety cushions and reaching higher margins by increasing financial leverage and investing in longer-term assets. The association between margins and ROA is significant and positive. However, we also acknowledge the possibility of reverse causation, that is, banks that realize higher margins are likely to be more profitable. The liquidity variable is negatively and significantly associated with higher margins in the fixed effects regressions. The impact of capital adequacy and ROA is modest: one standard deviation increase in capital adequacy reduces spreads by about 0.2 percentage points, while variations in ROA of the same magnitude change margins only by 0.1 percentage point. In contrast to the spread regressions, the loan portfolio variables do not have a significant effect on margins. Finally, the foreign ownership dummy is insignificant with the inclusion of bank-specific fixed effects.

B. Market Structure and Macroeconomic Characteristics

Tables 4 and 5 report results for interest spreads and margins, respectively, including market structure and macroeconomic characteristics. Columns 1–7 in tables 4 and 5 examine the effect of bank concentration and foreign participation in the loan and deposit markets. Again, we employ clustered standard errors and fixed effects but quarterly and yearly time dummy variables are not included in all regressions because of multicollinearity issues. We continue to find that bank spreads decline with size and liquidity and increase with bank market shares, while margins decrease with bank market shares, liquidity, and capital adequacy, and increase with ROA.

We first examine whether changes in the market structure of the banking system in Armenia have had an impact on bank spreads and margins. As in the previous regressions, we do not find any direct and statistically significant effect that foreign banks on average have lower spreads or margins. However, we find that foreign banks have an indirect "spill-over effect" on the overall level of spreads and margins. Column 1 in Table 4 and 5 suggests that foreign

bank participation in the loan market (i.e., the share of loans held by banks that are at least 50 percent foreign-owned) does not have a statistically significant negative effect on interest spreads but results in lower margins. This latter result would imply that the presence of foreign banks creates pressure on other banks to lower their margins.

To examine this further, we include two interaction terms between the origin of the bank and foreign market share in loans in column 2.[17] The origin 1 variable is the interaction between the first-tier international bank and the foreign market share variable, while origin 2 is the interaction between other types of foreign banks and foreign market share. We find that the interaction term between the first-tier international bank and the foreign market share variable is negatively and significantly associated with interest spreads, while the interaction term between other foreign banks and foreign market share is positively and significantly associated with spreads.[18] Consistent with Van Horen (2007), this result suggests that bank origin could matter for banking efficiency, with only the first-tier western foreign bank having a spill-over effect in lowering interest rate spreads. However, the presence of other foreign banks is associated with higher spreads. In the margin regressions, this effect is found to be insignificant (column2, Table 5).

A similar result is obtained when we consider the foreign market share in deposits (column 3 of Tables 4 and 5). Foreign bank participation in the deposit market does not have a statistically significant effect on interest spreads but results in lower margins, again providing evidence of the spill-over effect. However, as before, the interaction terms between the bank origin and foreign market share variable are again significant in the spread regressions, suggesting that the presence of first-tier international banks is important for banking efficiency.

Higher bank concentration, as measured by the Herfindahl-Hirshman index (HHI) (columns 4 and 5 in Tables 4 and 5) in both the loan and deposit markets, raises spreads significantly, while a higher HHI in the deposit market is positively and significantly associated with margins.[19] One standard deviation increase in the HHI for loans results in an 0.2 percentage point increase in spreads, while one standard deviation increase in the HHI for deposits results in a 0.1 percentage point increase in spreads. Similar results are obtained when we consider the shares of loans and deposits held by the top 3 banks in the case of spreads, and the share of loans held by the top 3 banks in the case of margins.

Bank market shares in loans to the industrial sector are found to be significantly and negatively associated with lower spreads, consistent with the lower risks of loans to a sector with "easy" collateral. At the same time, industrial loan market shares are positively associated with margins (column 8 in Tables 4 and 5), possibly reflecting lack of competition

[17] We do not include the foreign bank dummy in the regressions in columns 2 and 3 due to potential multicollinearity with the origin variables.

[18] The correlation between the foreign market share in loans variable and origin 1 and origin 2 variables is 0.04 and 0.26, respectively.

[19] We do not include the HHI for loans and deposits variables with the relevant foreign participation variables simultaneously in the same regression as they are highly correlated with each other, with correlation coefficients of 0.9 for the loan market.

due to market segmentation within the industrial loan market. Finally, market shares in consumer loans are significantly and positively associated with higher margins. This could be an indication of market segmentation and high bank switching costs in a credit market that is characterized by relationship banking, resulting from low market transparency, and information asymmetries between borrowers and creditors.

Next, we extend the model specification with four key macroeconomic variables. The results in column 9 of Tables 4 and 5 indicate that higher real GDP growth is positively and significantly associated with higher margins, reflecting better investment opportunities and lower default risks in a high-growth environment, but this effect is insignificant in the spread regressions. The exchange rate enters positively and significantly in the margin regression, suggesting a narrowing of margins in periods of dram appreciation. The coefficient of the inflation-adjusted money market rate is significant and weakly positive in the spread regression, indicating some effect of funding costs. The inflation rate has no significant effect on spreads or margins. Overall, the economic effects of the macroeconomic characteristics are very small.

C. Robustness

In this section, we briefly discuss whether the reported findings are robust to an alternative definition of spreads, the treatment of outliers, and the inclusion of other variables. As discussed in footnote 9, *spread2* is the difference between ex ante contracted loan and deposit interest rates, and is computed as the difference between the weighted average lending and weighted average deposit rates. As can be seen from column 1 in Table 7, the results are consistent with those found for the ex post spread variable. We continue to find that larger banks have lower spreads, while greater market power, as measured by a higher market share of deposits, is positively and significantly associated with higher spreads. In contrast to the regressions for spreads and margins, the foreign ownership dummy is now significant and enters the equation with a negative sign, that is, majority foreign-owned banks appear to have lower ex ante spreads. However, this result is not robust in alternative specifications.

To test the sensitivity of our results to outliers, we estimate the basic fixed-effects regressions reported in Table 3 by excluding 3 of the 20 banks in our original sample. These institutions are among the smallest banks in the sector. In contrast to the majority of banks in Armenia, these banks focus on fee-generating investment and private banking activities rather than deposit taking and loan making. Columns 2, 3, and 4, report the results for all three independent variables.[20] The basic thrust of our results remains unchanged.

In columns 5 and 6, we replace the current liquidity ratio variable with the liquid asset ratio (ratio of liquid assets to total assets). In both equations, the coefficients have the expected negative sign, indicating that more liquid banks receive lower returns on holding cash or securities than banks that invest a higher share of their funds in loans. However, as opposed to the current liquidity variable, the liquid assets ratio has only a significant impact on margins, but not on spreads.

[20] We also ran regressions with other macroeconomic variables, but the results were largely unchanged from those reported in Tables 4 and 5. The results are not reported here, but are available upon request.

VI. CONCLUSIONS

In this paper, we use a bank-level panel dataset to examine the determinants of ex post interest rate spreads and net interest margins in Armenia over the period 2002–06. Our results provide evidence of the important role that bank-specific characteristics and market structure play in explaining the variation of interest rate spreads and margins. We find that *interest spreads* are influenced by bank size, the extent of market power as measured by market share in deposits, overall market concentration, ROA, and liquidity. Loan portfolios, in particular the share of agricultural and consumer loans in banks' loan portfolios, also tend to influence interest spreads. By contrast, *net interest margins* are negatively associated with deposit market shares, possibly indicating aggressive pricing strategies of individual banks to gain market share. Furthermore, margins are decreasing in banks' capital adequacy, and increasing in the return on assets. Macroeconomic variables have a negligible impact on interest spreads and margins. Finally, in contrast to findings from other transition and developing countries, foreign banks were not found to directly contribute to lower spreads and margins. However, we find evidence of a spill-over effect of foreign bank presence on interest spreads and margins. Specifically, we find that foreign bank origin matters for banking efficiency, with the presence of the first-tier western foreign bank having a spill-over effect in lowering spreads. Banks from developing countries or other types of foreign banks tend to charge higher spreads.

The empirical findings highlight the importance of bank size for realizing economies of scale. Armenian banking sector productivity is low by international comparison, which indicates that there is still room for consolidation, cost rationalization, and technological progress. In this respect, a competition policy that fosters bank growth and cost rationalization, for example through mergers and acquisitions and/or the entry of first-tier international banks, can help to reduce lending rates and spreads (Ross and Giustiniani, 2006).[21] Consolidation of the banking sector should, however, proceed through a market-driven process rather than through regulatory measures, such as further increases in minimum capital requirements, which are already comparatively high in relation to the current size of the banking system.[22] A successful competition policy should aim to reduce market segmentation, increase market transparency, and create a level playing field for all market participants.

The high liquidity ratios in the Armenian banking system and their significant impact on spreads and margins are an indication of market frictions on the deposit side. Larger banks with broader deposit bases tend to have lower ratios of high liquid assets to demand liabilities than smaller banks. Apparently, banks whose deposit base is concentrated in a small number of large and volatile deposit holdings need to keep high reserve funds to be prepared for

[21] The recent purchase of 28 percent of the shares of a local bank by Credit Agricole banking group and the announcement that Dutch-based Postfinance International will provide postal-banking services for Armpost will likely help in this regard. In addition, German-based ProCredit is expected to establish operations in 2007.

[22] Raising minimum capital requirements further could force some smaller banks to raise substantial capital to meet the new requirements, which would sharply reduce their return on equity and could in turn trigger excessive risk-taking as they attempt to rapidly expand the volume of loans to reverse this decline. Moreover, with the higher requirement, an adverse credit shock could push the capital of some banks below the minimum absolute requirement, triggering supervisory interventions that may be unwarranted if the banks have high capital adequacy ratios.

sudden large-scale deposit withdrawals. This observation may be an additional indication of the benefits of further market consolidation through mergers and acquisitions.

In contrast to the experience of many other transition and developing countries, foreign ownership of banks does not appear to have directly contributed to increased banking sector efficiency in Armenia. One reason for this could be that most foreign banks are not first-tier banks, while the only large international bank in Armenia may not feel sufficient competitive pressure as its high reputational standing sets it apart from the remaining competitors and gives it a distinct competitive advantage, particularly in the deposit-taking business. Moreover, it has only recently increased its activities in the credit market, and its loan/deposit ratio is still low compared to other banks. However, the evidence that foreign banks have a spillover effect on overall margins and spreads, the latter differentiated by country of origin of the foreign bank, suggests the entry of additional first-tier international banks, by establishing a more level playing field, would likely contribute to both increased competition and banking sector efficiency. In addition it could lead to higher depositor confidence in the banking system and provide increased stability to the financial system in general (Bossone et al., 2002).

The large explanatory power of time-invariant bank-level fixed effects in the panel analysis may be an indication of high market segmentation and low competition in the banking sector. Improving information on both sides of the market, that is, information about borrowers for banks and information about banks for depositors, is likely to contribute to a more competitive banking market and declining market segmentation. Empirical evidence from other countries suggests that information sharing through credit reporting is associated with better access to credit, higher levels of lending in relation to GDP as well as lower loan default rates (Fuentes and Maquieria, 1999; Galindo and Miller, 2001; and Jappelli and Pagano, 2003).

In the case of Armenia, anecdotal evidence suggests that many customers below the top tier of corporate and wealthy borrowers face a non-competitive banking market and are often effectively tied to one bank, with very high switching costs. In particular, first-time loan customers may face high credit costs, as debtor information develops only over the course of a banking relationship. Over time, this information transforms into ‘reputational collateral’ of good quality borrowers with their bank, lowering credit risk. However, such information is privately owned by the borrower’s bank. If the bank does not share it with alternative creditors, it can obtain rents from its good quality borrowers if the latter cannot otherwise distinguish themselves from lower quality clients (Miller, 2003). The introduction of a credit registry in 2003 and the establishment of a private credit bureau, which became operational in 2007, have been important steps towards improving information sharing on the creditworthiness of borrowers in Armenia. It will increase borrower discipline by reducing moral hazard, and at the same time mitigate the information monopoly that banks have over their existing clients, thus reducing bank switching costs.

Improving corporate accounting and disclosure remains a prerequisite for reaping the full benefits of information sharing, attaining financial deepening, and lowering the cost of financial intermediation (Levine and others, 2000). Pinheiro and Moura (2003) note that poor accounting, opaque ownership structures, and widespread tax evasion cause relationship banking to be the only way to gather relevant information about the creditworthiness of borrowers, making much of the relevant information about creditworthiness private to individual banks. International experience has, however, shown that reliance on relationship

banking leads to lending constraints for informationally opaque small businesses (Berger, et al., 2001). Foreign banks with less intimate knowledge of the domestic market may refrain from lending to small enterprises and concentrate on subsidiaries of foreign companies and other high quality borrowers. Cross-country experiences indicate that the role of a private credit bureau in such a segmented credit market is limited to supplying negative information about borrowers, where the main objective is fostering debt repayment, rather than ex ante evaluation of creditworthiness (Pinheiro and Moura, 2003).

The lack of market transparency is often not limited to the debtor side. Bank clients themselves may find it difficult to gather easily comparable information about lending and deposit rates, bank fees, loan conditions, financial soundness of deposit banks, etc. One important policy implication is that increased public information about banks as well as bank ratings by international rating companies in Armenia could contribute to improving market transparency, the functioning of market forces, and depositor confidence. Banks should improve provision of current bank services and pricing information, for example, on their websites, and regulations should require banks to regularly disseminate an appropriate set of relevant market information. The CBA could also publish regular nonmarket sensitive reports on banking supervision.

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Table 1: Summary Statistics

Variable	Observations	Mean	Median	Std Dev.	Min.	Max.
Spread	307	3.63	3.7	1.10	-0.10	7.70
Margin	307	1.48	1.4	0.69	-0.70	4.00
Spread2	279	12.58	12.7	4.18	-4.20	27.50
Overhead	307	6.71	5.5	4.89	0.3	36.48
Non-interest income	307	0.90	0.54	1.27	-0.18	9.80
Bank size	307	7.11	7.07	0.38	6.03	7.88
Market share deposits	307	5.04	3.2	6.02	0.1	32.20
Capital Adequacy	309	58.28	32.4	51.24	11.2	326.50
ROA	310	2.02	2.45	5.41	-38.6	24.20
Current liquidity	305	157.02	115	109.20	75.5	804.90
Liquid assets ratio	308	42.95	39.8	14.94	17	90.60
Portfolio industry	310	23.66	18.96	17.84	0	98.53
Portfolio agriculture	310	4.81	0.31	11.03	0	58.11
Portfolio consumer	310	23.55	21.14	17.18	0	84.20
Market share industry	310	5.13	4.10	5.47	0	32.65
Market share agriculture	310	5.16	0.13	14.78	0	73.65
Market share consumer	310	5.16	3.85	5.23	0	31.94
Foreign bank share loans	310	56.80	62.05	10.63	38.3	68.50
Foreign bank share deposits	310	69.87	71.45	6.95	58.4	78.30
Herfindahl loans	16	798.75	797.10	54.70	696.7	864.20
Herfindahl deposits	16	1182.61	1154.10	104.97	1055.8	1417.30
Concentration ratio (3) loans	16	0.35	0.35	0.02	0.33	0.38
Concentration ratio (3) deposits	16	0.48	0.49	0.03	0.43	0.52
Exchange rate	16	-2.54	-1.65	3.07	-8.9	1.30
Real GDP growth	16	12.46	11.7	3.44	7.5	18.40
Inflation	16	3.57	3.19	3.22	-1.05	8.76
Real money market rate	16	1.57	2.27	3.76	-4.57	11.20

Table 2: Correlation Matrix

	Spread	Margin	Spread2	Overhead	Non-interest income	Bank size	Market share deposits	Capital adequacy	ROA	Current liquidity	Foreign dummy	Portfolio industry	Portfolio agriculture	Portfolio consumer	Market share industry	Market share agriculture	Market share consumer
Spread	1																
Margin	0.527	1															
Spread2	0.444	0.361	1														
Overhead	0.217	0.189	0.122	1													
Non-interest income	0.177	0.097	0.097	0.814	1												
Bank size	0.062	-0.064	0.068	-0.166	-0.008	1											
Market share deposits	0.101	-0.176	0.167	-0.171	-0.036	0.777	1										
Capital adequacy	-0.325	-0.226	-0.209	-0.088	-0.207	-0.478	-0.273	1									
ROA	0.247	0.384	0.123	0.116	0.221	0.108	0.075	-0.036	1								
Current liquidity	-0.058	0.149	0.089	0.126	-0.062	-0.435	-0.346	0.392	0.001	1							
Foreign dummy	-0.247	-0.407	-0.205	-0.208	-0.266	0.037	0.225	0.297	-0.231	0.148	1						
Portfolio industry	-0.307	-0.196	-0.069	-0.085	0.021	0.247	0.271	0.200	0.006	0.011	0.203	1					
Portfolio agriculture	0.208	0.324	0.253	-0.070	-0.137	0.158	-0.102	-0.201	0.029	0.101	-0.227	-0.209	1				
Portfolio consumer	0.286	0.036	0.104	0.087	0.157	0.024	-0.002	-0.443	-0.047	-0.267	-0.173	-0.494	-0.116	1			
Market share industry	-0.174	-0.082	0.029	-0.050	0.031	0.616	0.487	-0.281	0.019	-0.249	0.215	0.628	-0.027	-0.177	1		
Market share agriculture	0.231	0.358	0.260	-0.028	-0.118	0.208	-0.076	-0.164	0.053	0.149	-0.246	-0.191	0.953	-0.121	0.010	1	
Market share consumer	0.195	0.132	0.135	0.056	0.159	0.361	0.234	-0.538	-0.044	-0.248	-0.014	-0.183	0.072	0.641	0.324	0.117	1

Observations: 303

	Foreign bank share loans	Foreign bank share deposits	Herfindahl loans	Herfindahl deposits	CR3 loans	CR3 deposits	Exchange rate	Real GDP growth	Inflation	Real money market rate
Foreign bank share loans	1									
Foreign bank share deposits	0.965	1								
Herfindahl loans	0.908	0.960	1							
Herfindahl deposits	0.220	0.418	0.461	1						
Top 3 banks loans	0.764	0.855	0.901	0.448	1					
Top 3 banks deposits	0.760	0.830	0.911	0.561	0.816	1				
Exchange rate	-0.405	-0.343	-0.365	0.031	-0.217	-0.270	1			
Real GDP growth	-0.507	-0.552	-0.604	-0.428	-0.582	-0.450	0.243	1		
Inflation	-0.209	-0.108	-0.097	0.547	-0.061	-0.108	-0.241	-0.156	1	
Real money market rate	-0.387	-0.459	-0.493	-0.632	-0.394	-0.412	0.440	0.537	-0.743	1

Observations: 16

Table 3: Determinants of Interest Rate Spreads and Margins: Bank Characteristics

	Ex post Interest Spread			Net Interest Margin		
	(1)	(2)	(3)	(1)	(2)	(3)
Overhead	0.079	0.000	-0.009	0.058	0.008	0.008
	(0.037)**	(0.030)	(0.025)	(0.022)**	(0.014)	(0.014)
Non-interest income	-0.199	-0.010	0.058	-0.236	-0.068	-0.079
	(0.148)	(0.097)	(0.093)	(0.084)**	(0.056)	(0.057)
Bank size	-1.657	-2.444	-1.909	0.365	-0.042	-0.201
	(0.853)*	(0.715)***	(0.676)**	(0.333)	(0.395)	(0.427)
Market share	0.070	0.100	0.058	-0.025	-0.078	-0.070
	(0.031)**	(0.042)**	(0.040)	(0.011)**	(0.017)***	(0.016)***
Capital adequacy	-0.011	-0.007	-0.005	-0.004	-0.003	-0.003
	(0.003)***	(0.005)	(0.004)	(0.001)***	(0.001)*	(0.001)**
ROA	0.047	0.025	0.028	0.064	0.025	0.024
	(0.019)**	(0.026)	(0.026)	(0.021)***	(0.012)**	(0.012)*
Liquidity	0.000	-0.003	-0.003	0.001	-0.0005	-0.0004
	(0.001)	(0.001)***	(0.001)***	(0.000)***	(0.000)**	(0.000)**
Foreign bank	-0.163	0.335	0.356	-0.364	-0.011	-0.005
	(0.306)	(0.293)	(0.276)	(0.163)**	(0.226)	(0.280)
Agriculture			0.043			-0.004
			(0.006)***			(0.003)
Industry			0.007			-0.005
			(0.012)			(0.004)
Consumer			0.014			-0.003
			(0.005)**			(0.006)
Constant	15.296	21.837	17.068	-0.820	3.037	4.492
	(5.905)**	(5.128)***	(4.834)***	(2.413)	(2.830)	(3.131)
Fixed effects	NO	YES	YES	NO	YES	YES
Observations	303	303	303	303	303	303
R-squared	0.284	0.605	0.648	0.481	0.777	0.781

Quarterly and annual time dummies are included but not reported. Clustered standard errors in parenthesis.
***, **, and * denotes significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Interest Rate Spread: Banking Structure and Macroeconomic Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Overhead	0.001	0.006	0.001	0.012	0.021	0.013	0.028	0.019	0.024
	(0.030)	(0.028)	(0.029)	(0.028)	(0.770)	(0.029)	(0.039)	(0.029)	(0.024)
Non-interest income	-0.005	0.000	0.005	-0.005	-0.017	-0.003	-0.004	-0.043	-0.047
	(0.100)	(0.108)	(0.102)	(0.101)	(0.063)	(0.101)	(0.100)	(0.105)	(0.078)
Bank size	-2.452	-2.562	-2.615	-1.742	-1.313	-1.732	-1.737	-1.597	-1.391
	(0.711)***	(0.676)***	(0.691)***	(0.673)**	(0.673)**	(0.677)**	(0.678)**	(0.688)**	(0.539)**
Market share deposits	0.099	0.078	0.092	0.072	0.043	0.073	0.069	0.074	0.052
	(0.041)**	(0.031)**	(0.038)**	(0.044)	(0.052)	(0.045)	(0.045)	(0.032)**	(0.045)
Capital adequacy	-0.007	-0.010	-0.009	-0.007	-0.005	-0.007	-0.006	-0.008	-0.004
	(0.005)*	(0.004)**	(0.004)**	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)*	(0.005)
ROA	0.025	0.026	0.025	0.027	0.026	0.027	0.027	0.033	0.026
	(0.027)	(0.025)	(0.026)	(0.027)	(0.025)	(0.028)	(0.028)	(0.029)	(0.025)
Liquidity	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)**	(0.001)***
Foreign bank	-0.348			0.332	0.313	0.339	0.321	0.523	0.299
	(0.283)			(0.285)	(0.262)	(0.281)	(0.297)	(0.340)	(0.314)
Foreign participation loans	0.039	0.041							
	(0.025)	(0.026)							
Foreign participation deposits			0.033						
			(0.023)						
Origin 1		-0.061	-0.087						
		(0.009)***	(0.015)***						
Origin 2		0.011	0.007						
		(0.006)*	(0.003)**						
HHI (loans)				0.003					
				(0.002)**					
HHI (deposits)					0.001				
					(0.000)**				
CR3 (loans)						7.016			
						(3.069)**			
CR3 (deposits)							5.547		
							(2.487)**		
Market share (industry)								-0.064	
								(0.027)**	
Market share (agriculture)								-0.009	
								(0.034)	
Market share (consumer)								-0.010	
								(0.028)	
Exchange rate									-0.004
									(0.022)
RGDP									0.000
									(0.011)
Inflation									0.018
									(0.029)
Money market rate									0.0004
									(0.000)**
Constant	21.520	22.354	22.339	15.755	17.154	15.733	15.615	19.193	15.253
	(5.335)***	(5.145)***	(5.380)***	(5.221)***	(5.058)***	(5.094)***	(5.078)***	(4.482)***	(3.921)***
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies 1/	YES	YES	YES	NO	NO	NO	NO	YES	NO
Observations	303	303	303	303	303	303	303	303	303
R-squared	0.608	0.632	0.625	0.593	0.567	0.591	0.594	0.602	0.557

Clustered standard errors in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.
1/ Time dummies not included in all equations because of multicollinearity problems.

Table 5: Net Interest Margin: Banking Structure and Macroeconomic Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Overhead	0.011	0.006	0.005	0.011	0.010	0.011	0.001	0.003	0.009
	(0.013)	(0.012)	(0.011)	(0.013)	(0.015)	(0.250)	(0.011)	(0.014)	(0.014)
Non-interest income	-0.072	-0.061	-0.044	-0.072	-0.064	-0.037	-0.025	-0.049	-0.051
	(0.051)	(0.054)	(0.045)	(0.051)	(0.055)	(0.042)	(0.043)	(0.056)	(0.048)
Bank size	0.095	-0.170	-0.340	0.080	0.069	-0.468	-0.504	-0.219	-0.209
	(0.373)	(0.384)	(0.398)	(0.368)	(0.366)	(0.386)	(0.393)	(0.448)	(0.375)
Market share deposits	-0.084	-0.077	-0.072	-0.083	-0.084	-0.068	-0.067	-0.094	-0.076
	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.016)***	(0.017)***	(0.022)***	(0.015)***
Capital adequacy	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.004	-0.003	-0.003
	(0.002)*	(0.002)	(0.002)*	(0.002)*	(0.002)*	(0.002)**	(0.002)**	(0.002)*	(0.002)**
ROA	0.025	0.022	0.021	0.025	0.025	0.021	0.021	0.022	0.024
	(0.011)**	(0.011)*	(0.011)*	(0.012)**	(0.012)**	(0.011)*	(0.011)*	(0.010)**	(0.012)*
Liquidity	-0.001	-0.001	-0.0005	-0.0004	-0.0003	-0.0004	-0.0004	-0.0004	0.000
	(0.000)**	(0.000)***	(0.000)**	(0.000)**	(0.000)**	(0.005)*	(0.005)*	(0.000)**	(0.000)
Foreign bank	-0.013			-0.011	-0.013	-0.060	-0.067	-0.009	-0.055
	(0.012)			(0.227)	(0.232)	(0.231)	(0.201)	(0.169)	(0.207)
Foreign participation loans	-0.007	-0.010							
	(0.012)	(0.003)**							
Foreign participation deposits			-0.009						
			(0.004)						
Origin 1		0.006	0.006						
		(0.004)	(0.005)						
Origin 2		0.000	-0.001						
		(0.003)	(0.003)						
HHI (loans)				0.000					
				(0.001)					
HHI (deposits)					0.0004				
					(0.000)*				
CR3 (loans)						-3.462			
						(1.331)**			
CR3 (deposits)							-0.624		
							(0.802)		
Market share (industry)								0.019	
								(0.006)***	
Market share (agriculture)								-0.002	
								(0.018)	
Market share (consumer)								0.032	
								(0.018)*	
Exchange rate									0.017
									(0.007)**
RGDP									0.017
									(0.007)**
Inflation									0.021
									(0.015)
Money market rate									-0.011
									(0.013)
Constant	2.818	4.623	1.869	2.513	2.167	7.635	2.135	4.623	4.243
	(2.754)	(3.774)	(3.151)	(2.960)	(2.710)	(2.572)**	(2.771)	(3.774)	(2.727)
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies 1/	YES	YES	YES	NO	NO	NO	NO	YES	NO
Observations	303	303	303	303	303	303	303	303	303
R-squared	0.777	0.775	0.776	0.786	0.777	0.749	0.741	0.786	0.760

Clustered standard errors in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.
1/ Time dummies not included in all equations because of multicollinearity problems.

Table 6: Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	*Spread2*	*Spread*	*Margin*	*Spread2*	*Spread*	*Margin*
Overhead	-0.054	-0.015	0.007	-0.015	0.000	0.007
	(0.089)	(0.075)	(0.021)	(0.160)	(0.033)	(0.013)
Non-interest income	0.069	-0.008	-0.024	0.113	0.029	-0.075
	(0.305)	(0.199)	(0.057)	(0.495)	(0.149)	(0.064)
Bank size	-7.585	-2.274	-0.423	-9.440	-2.278	-0.060
	(2.331)***	(1.073)**	(0.421)	(2.113)***	(0.709)***	(0.366)
Market share deposits	0.352	0.089	-0.062	0.419	0.100	-0.074
	(0.113)***	(0.052)*	(0.017)***	(0.114)***	(0.041)**	(0.016)***
Capital adequacy	-0.002	-0.008	-0.003	-0.004	-0.003	-0.001
	(0.018)	(0.005)	(0..002)*	(0.015)	(0.005)	(0.001)
ROA	0.025	0.058	0.036	0.051	0.008	0.017
	(0.042)	(0.015)***	(0.013)**	(0.028)*	(0.032)	(0.013)*
Current liquidity (LR2)	0.004	-0.006	-0.001	-0.011		
	(0.004)	(0.003)**	(0.001)	(0.013)		
Liquid assets ratio (LR1)					-0.005	-0.014
					(0.010)	(0.004)***
Foreign bank	-1.270	0.440	-0.006	-0.519	0.259	0.107
	(-0.668)*	(0.293)	(0.251)	(0.699)	(0.257)	(0.130)
Constant	71.474	21.815	5.934	88.202	20.381	3.415
	(17.71)***	(7.993)**	(3.058)*	(17.101)***	(5.055)***	(2.557)
Fixed effects	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Observations	274	269	269	249	307	307
R-squared	0.462	0.645	0.820	0.452	0.566	0.798

Clustered standard errors in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Appendix: Variable Definitions

Spread	Difference between total interest income received in quarter divided by average loans for the quarter and total interest expenses in quarter divided by average deposits for the quarter.
Margin	Difference between total interest income and expenses over average assets
Spread2	Difference between the weighted average lending rate and the weighted average deposit rate for each bank and each quarter where the weights are the relative amounts of deposits or loans contracted at specific interest rates.
Overhead	Administrative costs over total assets
Non-interest income	Non-interest operating income divided by total assets
Bank size	Log of total bank assets
Market share deposits	Bank deposits divided by total commercial bank deposits in economy
Capital adequacy	Ratio of regulatory capital to risk-weighted assets
ROA	Profits over total assets
Current liquidity	Liquid assets over demand liabilities
Portfolio (industry, agriculture, consumer)	Bank loans to sector over its total loan portfolio
Foreign	Equals 1 for foreign-owned bank; 0 otherwise
Foreign bank participation loans/deposits	Share of loans/deposits in the hands of foreign banks
Herfindahl index loans/deposits	Sum of squared loan/deposit market shares of banks
Concentration ratio (3) loans/deposits	Share of three largest banks in loans/deposits
Market share (industry, agriculture, consumer)	Bank loans to sector divided by total commercial bank loans to sector
GDP growth	Quarterly real GDP growth
Inflation	Quarterly change of the CPI index
Real money market rate	Quarterly money market rate adjusted for inflation
Change in the exchange rate	Quarterly change in Dram per US$