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## Determinants of Banks' Net Interest Margins in Honduras

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**Abstract**

This paper analyzes the determinants of banks' net interest margins in Honduras during 1998 to 2013—a period characterized by increasing banks' net interest margins, foreign bank participation and consolidation. In line with findings in the previous literature, we find that operating costs are the most important drivers of banks' net interest margins. We also find that competition among banks has led to higher concentration and that funding by parent banks positively impacts foreign banks' net interest margins. Together, these results suggest that banks, particularly foreign banks, are under pressure to consolidate and reduce operating costs in order to offer competitive interest margins. We conclude that further structural reforms and consolidation may lower banks' net interest margins.

JEL Classification Numbers: E43; E44; D43

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## I. INTRODUCTION<sup>1</sup>

Over the last two decades, Honduras has implemented banking sector reforms and liberalization. Key areas of the reform have included strengthening the legal and regulatory framework, granting greater independence to the supervisory agency, broadening the range of corrective actions, and revamping the financial safety net. Progress has also been made in putting in place risk-based banking supervision. While these reforms have contributed to financial deepening, banks' net interest margins have increased in recent years. On the one hand, high interest margins can contribute to strengthening bank capitalization, through transfer of profits earned by banks to their capital base. On the other hand, high interest margins are usually interpreted as an indicator of inefficiency, which adversely affects domestic real savings and investment (Brock and Rojas-Suarez; 2000). Honduras may particularly be at risk because, like all developing countries, its financial system is less developed and bank loans are the main sources of funding.

This paper examines the determinants of banks' net interest margins. There are many reasons for this study. First, anemic growth following the 2008 global financial crisis and 2009 internal political crisis has revived debate about the efficiency of financial intermediation in Honduras. Second, policymakers care about banks' interest margins because they reflect the cost of financial intermediation. Third, it is commonly thought that international banks bring new capital and best managerial expertise, and promote efficient and competitive banking practices. Therefore, policymakers expect that, through liberalization and integration, banks' interest margins will converge to international levels. Against this background, this paper analyzes the impact of foreign bank participation.

The empirical literature on the determinants of interest margins has primarily focused on the impact of bank specific factors and macroeconomic/policy variables. Bank specific characteristics that are found to be significant determinants of banks' interest margins include: operating costs, credit activity, capital adequacy, liquidity, loan quality, credit risk, interest risk, opportunity cost of bank reserves, bank size and ownership structure. Among macroeconomic variables, inflation and real GDP growth are found to be the most important determinants. However, while there is a broad consensus that higher inflation contributes to higher interest margins, the impact of real GDP growth remains ambiguous. On the one hand, there can be a negative effect of real GDP growth on banks' interest margins due to the fact that (i) borrowers' creditworthiness and net worth deteriorates during recessions and so loan rates increase (Bernanke and Gertler; 1989) and (ii) good economic performance lowers bank defaults (Tan; 2012). On the other hand, there can be a positive effect of real GDP growth on interest margins due to the fact that demand for loans increases during cyclical upswings. For Honduras, Pineda (2010) finds operational costs and inflation as the most important bank specific and macroeconomic determinants, respectively.

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In recent years, however, there has been an increased focus on the impact of foreign bank participation on banks' interest margins. These studies include: Claessens, Demirguc-Kunt, and Huizinga (2000), Barajas, Steiner, and Salazar (2000), Martinez and Mody (2004), Fungacova and Poghosyan (2009), Poghosyan (2010), Domicic and Ridzak (2012) and Tan (2012). The contribution of this paper is threefold. First, it builds on the previous study by Pineda (2010) and covers more recent data. Second, it controls for bank ownership. Third, it uses Beck and Katz's (1995, 1996) OLS-based panel corrected standard errors (PCSE) approach, which is more appropriate, given the structure of the panel dataset, than the feasible generalized least squares (FGLS) procedure used by Pineda (2010).<sup>2</sup>

In this paper, we estimate a modified version of the cost function model by Klein (1971) and Monti (1972). We find that operating costs are the most important driver of banks' net interest margins. In addition, we find that more efficient banks have lower costs, serve the best-quality borrowers and garner greater market share. We also find that high and increasing funding by parent banks positively impacts foreign banks' net interest margins. Together, these results suggest that banks, particularly subsidiaries of foreign banks, are under pressure to consolidate and reduce operating costs in order to offer competitive interest margins. We conclude that further structural reforms and consolidation may lower banks' net interest margins.

The rest of the paper is organized as follows. Sections II and III provide a review of the related literature and the institutional background of the banking sector, respectively. Section IV presents the methodology and data. Section V discusses the empirical results. Conclusions and policy implications are presented in Section VI.

## II. LITERATURE REVIEW

The starting point for analyzing the determinants of banks' interest margins is the seminal model by Ho and Saunders (1981). In this pioneering study, banks are assumed to be mere intermediaries between lenders and borrowers and interest margins have two basic components: the degree of competition in the banking system and the interest rate risk to which banks are exposed. This model has been criticized for not taking into account the cost structure of banks. It has since been extended to incorporate money markets (McShare and Sharpe, 1985), different types of credits/deposits (Allen, 1988), credit and interest rate risks (Angbazo, 1997), and banks' operating costs (Maudos and Fernandez de Guevara, 2004).

While the extended model remains the workhorse of the theoretical literature, cross-country empirical verification has proven difficult due to different institutional and regulatory environments. To circumvent these problems, some empirical studies apply a two-step procedure by first isolating the impacts of bank specific variables before proceeding to model the "pure spread" as a function of various exogenous factors not taken into consideration in the theoretical model (McShane and Sharpe, 1985; Allen, 1988; Angbazo, 1997; Saunders

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<sup>2</sup> When comparing the performance of both estimators, the rule of thumb is that the OLS-PCSE estimator is preferable to its FGLS counterpart when  $\frac{1}{2}(N^2 + N) \geq T$  (Jönsson 2005). For this study,  $\frac{1}{2}(N^2 + N) = 153 \geq T = 61$ .

and Schumacher, 2000; and Brock and Rojas Suarez, 2000). On the one hand, empirical results of the two-step approach generally corroborate the theoretical predictions of the extended model for industrialized countries. This has been the case in Europe (e.g., Saunders and Schumacher, 2000; Maudos and Fernandez de Guevara, 2004), the US (Angbazo, 1997) and Australia (McShane and Sharpe, 1995; Williams, 2007).

On the other hand, empirical studies for developing countries have been more circumspect.<sup>3</sup> International comparison of determinants of interest margins (e.g., Demirguc-Kunt and Huizinga, 1998; Moore and Craigwell, 2000; Brock and Rojas-Suarez, 2000; Claessens, Demirguc-Kunt and Huizinga, 2001; and Gelos, 2006) go beyond the framework of the dealership model by considering a wide range of potential factors, including macroeconomic conditions, explicit and implicit bank taxation, deposit insurance regulations, financial structure, and legal and institutional indicators. More recently, Tennant and Folawewo (2009), using data for a group of 33 developing countries, find that the banking sector reserve requirement is a significant and positive determinant of interest margins. They also find that macroeconomic volatility, such as inflation, widens interest margins through its adverse impact on corporations' and households' balance sheets.

In recent years, studies have begun to explore the impact of the ownership structure of banks on interest margins.<sup>4</sup> For developing countries, Micco, Panizza and Yanez (2007), and Fungacova and Poghosyan (2009) show that the form of bank ownership has strong influence on bank performance; La Porta (2003), and Taboada (2011) observe that locally owned banks allocate a higher proportion of their loan portfolios to low quality industries; and Demirguc-Kunt and Huizinga (1999), Claessens, Demirguc and Huizinga (2001) and Martinez and Mody (2004) show that foreign-owned banks outperform locally owned banks. Overall, these findings suggest that foreign-owned banks play an important role in developing countries.

On Latin America, in particular, Martinez and Mody (2004) analyze the impact of increasing foreign bank participation and high concentration levels on bank's interest rate spreads using bank level data for Argentina, Chile, Colombia, Mexico, and Peru. They find that foreign banks are able to charge lower spreads relative to domestic banks, that the overall level of foreign bank participation seemed to influence spreads through its effect on administrative costs, and that banks concentration was positively and directly related to both higher spreads and higher administrative costs. To the best of our knowledge, no study has examined the impact of foreign banks on the efficiency of the banking sector in Honduras.

### **III. BACKGROUND: INSTITUTIONAL STRUCTURE OF THE BANKING SECTOR**

While commercial banking in Honduras started in 1889, the first foreign-owned bank (First National Citibank of New York) entered the market in 1965 through acquisition and merger (Táborá; 2007). Following financial sector reforms, including financial liberalization and

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<sup>3</sup> Brock and Rojas-Suarez (2000) caution against directly applying this model to developing countries with less developed financial markets.

<sup>4</sup> See Fungacova and Poghosyan (2009) and Tan (2012) for a comprehensive review of the literature.

international integration, in the 1990s, subsidiaries of international banks have entered the market through acquisition and mergers (none through *de novo* investment).<sup>5</sup> In the process, five banks either closed or merged, with the six largest banks accounting for 75 percent of total bank assets in 2013, compared with 10 banks in 1999. Partly as a result, despite the small size of the market in terms of population (about 7.8 million in 2011) and GDP (about US\$18.8 billion in 2013), the banking system remains moderately deep with diversified ownership. As at end-2013, 7 locally owned banks and 10 subsidiaries of foreign banks comprise the market. The subsidiaries of foreign banks have about 43 percent and 45 percent of the market in terms of deposits and loans, respectively.

The banking sector is relatively large, with total assets equivalent to 94 percent of GDP, credit to the private sector amounting to 51 percent of GDP, and broad money (M3) standing at 50 percent of GDP. The financial system comprises commercial banks, savings and loans, and finance corporations. The banking sector is the dominant player in the financial system, accounting for over 90 percent of total assets. Banks mobilize most of their resources onshore through retail and wholesale deposits—about 12 percent in demand deposit and the remainder in time and savings deposits. Dollarization of deposits is at about 31 percent of total deposits and the role of off-shore operations in financial intermediation is growing.

Honduras has a defined benefit national insurance system with total assets amounting to about 15 percent of the total financial system. About 50 percent of social security funds are placed in bank deposits—mainly in locally owned banks. These funds represent the most substantial body of long-term funds for the banking system.

Structural reforms in the banking sector, such as initiatives to improve the regulatory and supervisory framework, are ongoing. Prior to 2004, legislation allowed banks to engage in related lending to and equity participation in private companies up to the equivalent of 120 percent and 50 percent of Tier I capital, respectively. By 2007, these ratios were brought down to the limit consistent with international best practices (20-30 percent and 25 percent of Tier I capital, respectively). Overtime, solvency characteristics (Capital Adequacy Ratios) of the subsidiaries of foreign banks have also converged to their local counterparts. However, there is lack of a well-functioning interbank market, informality is a major problem, and resolution of legal cases remains slow.

#### **IV. METHODOLOGY AND DATA**

##### **A. A Basic Cost-Structure Empirical Model**

This paper estimates commercial banks' net interest margins using the cost function model developed by Klein (1971) and Monti (1972).<sup>6</sup> The model is based on the assumption that there is a cost function for running a bank that depends on the aggregate value of the assets being managed by the bank as well as other factors of production, such as capital and labor;

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<sup>5</sup> Four subsidiaries of foreign banks entered the market during 2007-08.

<sup>6</sup> See Freixas and Rochet (2008) for a full blown model.

i.e.  $Costs=C(A; K,L)$ . Assuming that the bank maximizes profits, the income accounting identity is depicted as:

$$Profits = (r_A - r_D) - C(A; K, L) - Provisions - NoninterestExpenses \quad (1)$$

In equation (1) profits are positive in interest earned on loans  $r_A$ , and negative in interest paid on deposits  $r_D$ , in cost of production, provisions and in noninterest expenses. In this setting, the first-order conditions for profit maximization by a competitive bank (where  $dD = dA$  at the margin) is obtained as:

$$(r_A - r_D) = \frac{\partial C(A; K, L)}{\partial A} \quad (2)$$

The first-order conditions state that a competitive bank will set the marginal cost of managing assets equal to the spread. All the other components of the accounting identity drop out because they involve inframarginal profits. If, instead, the banking system is assumed to be monopolistic, then profit maximization leads to the following condition:

$$(r_A - r_D) = \frac{\partial C(A; K, L)}{\partial A} + D \frac{\partial r_D}{\partial D} - A \frac{\partial r_A}{\partial A} = \frac{\partial C(A; K, L)}{\partial A} + \frac{1}{\eta_D} + \frac{1}{\eta_A} \quad (3)$$

where  $\eta_D$  and  $\eta_A$  are semi-elasticities of demand deposit and asset supply  $\left[ \eta_D = \frac{1}{D} \frac{dD}{dr_D} \right]$  and  $\left[ \eta_A = -\frac{1}{A} \frac{dA}{dr_A} \right]$ , respectively.

If, however, the banking system is characterized as oligopolistic, the spread will be a function of the number of banks in the system. Assuming a common linear cost function and Cournot behavior (see Freixas and Rochet; 2008), the spread can be expressed as:

$$(r_A - r_D) = \frac{\partial C(A; K, L)}{\partial A} + \frac{1}{N} \left( \frac{1}{\eta_A} + \frac{1}{\eta_D} \right) \quad (4)$$

where  $N$  is the number of banks. Equation (4) suggests that changes in the concentration of the banking system will affect the spread by altering the size of oligopoly profits. In other words, equation (4) rules out contestable markets and predicts that a decline in the number of banks (i.e., an oligopolistic market structure) is associated with higher spreads and marginal operating costs.<sup>7</sup> A commonly used empirical proxy for concentration in the banking sector is the Herfindahl-Hirschman index (HHI). The index is obtained by squaring and summing

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<sup>7</sup> The theory of contestable markets holds that there exist markets served by a small number of firms, which are nevertheless characterized by competitive equilibria (and therefore desirable welfare outcomes), because of the existence of potential short-term entrants.

individual bank market shares. Using HHI as a proxy for market concentration, equation (4) can be rewritten as:

$$(r_A - r_D) \approx OC + HHI \quad (5)$$

where  $OC = \frac{\partial C(A;K,L)}{\partial A}$  is operating costs.

## B. Incorporating Risks

Three fundamental risks are considered in this paper: liquidity risk, credit risk and funding risk.

### *Liquidity Risk*

Liquidity risk is the potential losses a bank faces from interest rate mismatches. In this model, banks are not able to match up deposits with loans, owing to the endemic maturity mismatch between banks' assets and liabilities. In line with other studies in the literature, this paper uses the ratio of liquid assets-to-total assets as a proxy for liquidity risk (LR). The rationale is that if a bank has a higher liquidity ratio, it faces lower liquidity risk, but the opportunity cost of holding higher liquidity increases, leading the bank to charge higher interest rate spreads.

### *Credit Risk*

Credit risk concerns the probability that a borrower will default on a loan. There are two ways in which a risky loan portfolio will raise the spread: (i) intensive use of the bank's productive resources to service risky loans; and (ii) higher probability of default leading to a risk premium on the loan rate. Empirical studies of bank spreads generally use either loan write offs, the delinquent loan portfolio, or provisions for NPLs as indicators of default risk. The problem with these measures, as noted in the literature, is that they are often backward-looking (reflecting realized defaults) rather than forward-looking proxies for default risk. In line with other studies in the literature, this paper uses the lagged ratio of loan loss provisions-to-total loans and advances as a proxy for credit risk (CR).

### *Funding Risk*

Net interest margins also depend on the way lending is funded (FR) and currency risk.<sup>8</sup> This paper uses credit-to-deposit ratio to assess the impact of banks' funding model on their net interest margins. A high and increasing loan-to-deposit ratio funded by capital inflows from abroad would lead to higher net interest margins, if the associated currency risk were adequately internalized. A sudden reversal of such inflows (a decline in the credit-to-deposit ratio) would also put pressure on banks' business models and lead to higher interest margins.

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<sup>8</sup> This paper does not assess the impact of currency risk on net interest margins due to lack of readily available bank-by-bank data on currency composition of loans and deposits.

Liquidity ratio (LR), credit risk (CR), and funding risk (FR) are incorporated into equation 5 to motivate a linear regression framework as follows:

$$(r_A - r_D) = LR + OC + CR + HHI + FR \quad (6)$$

### C. Other Considerations

While there is no generally agreed model for analyzing the impact of macroeconomic shocks, the empirical literature has identified a number of macroeconomic variables deemed to be influential sources for variations in interest spreads. We include real GDP growth (RGDP) and CPI inflation (INFL) in the model to capture the macroeconomic environment. Thus, the equation that combines the microstructure variables with the macroeconomic determinants of interest margins is specified as:

$$(r_A - r_D) = LR + OC + CR + HHI + FR + RGDP + INFL \quad (7)$$

The model predictions can be summarized as follows: (i) the higher the operating costs, the higher the interest margins a bank has to charge; (ii) as market concentration rises, competition declines, and interest margins increase; (iii) higher liquidity ratio, credit risk, and GDP and inflation are positively related to interest margins (Table 1).

### D. Empirical Estimation

For the empirical estimation, equation 7 is rewritten to take the form:

$$NIM_{it} = \beta_1 LR_{it} + \beta_2 OC_{it} + \beta_3 CR_{it} + \beta_4 HHI_{it} + \beta_5 FR + \beta_6 RGDP_t + \beta_7 INFL_t + \varepsilon_{it}, \quad (8)$$

where subscripts  $i$  and  $t$  stand for bank and year, respectively;  $NIM_{it}$  is the net interest margin for bank  $i$  in period  $t$ ; and  $\varepsilon_{it}$  is the error term.

In estimating equation 8, complications relating to the error term need to be addressed. First, the observations and traits that characterize the error term for each bank are bound to be interdependent across time (autocorrelation). Second, given that the banks operate in the same industry and country, there is the possibility that the error terms will tend to be correlated across banks (contemporaneous correlation). Third, the errors will tend to have differing variances across banks (heteroskedasticity). Moreover, the errors may show heteroskedasticity because the scale of the dependent variable differs between banks (Beck and Katz; 1995). For these reasons, the OLS-based PCSE procedure is used to estimate Equation 8 on the grounds that this technique allows to simultaneously correct for autocorrelation, cross-equation residual correlation, and cross-sectional heteroskedasticity in order to improve parameter efficiency and generate more accurate z-statistics.

## E. Data Overview

This section examines the statistical properties of the data and presents some stylized facts about banks' net interest margins (NIM). All the data series, except for real GDP growth and inflation, are commercial banks' quarterly data for the period 1998–2013. They are sourced from the *Comisión Nacional de Bancos y Seguros*' (CNBS)'s database. The quarterly real GDP growth and inflation data are from the database of the Central Bank of Honduras. Table 1 presents a summary of the descriptive statistics of all the variables, along with their expected impact on the dependent variable (NIM). Figures 1-13 (attached) depict average variability of each variable over time.

Quarterly NIM<sup>9</sup> are used throughout this study. Table 1 shows that NIM for subsidiaries of foreign banks have averaged 260 basis points, compared with 190 basis points for locally owned banks. While Figure 1 depicts a discernible pattern of increasing banks' NIM since 2007, Figure 2 indicates that this was solely due to the subsidiaries of foreign banks. In fact, locally owned banks' NIM decreased steadily since 1998 (Figure 3). A possible explanation is that locally owned banks rely more on non-interest income.

Moreover, a striking observation is that the dispersion (standard deviation) of the NIM for the subsidiaries of foreign banks is much larger (0.032) than that for locally owned banks (0.006). One factor that could explain this observation is that variations in net interest margins between locally owned banks and their foreign counterparts might be driven by differences in the market segments in which they operate, which in turn are likely to be the result of informational advantages that the former might have over the latter.<sup>10</sup> In particular, it is possible that subsidiaries of foreign banks, even though they entered the market through mergers and acquisitions, have the least knowledge about the local market and so they are more likely to focus on segments that are more transparent (i.e., where it is easier to access information about borrowers).

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<sup>9</sup> Net interest margins are defined as the difference between a bank's interest earnings and expenses as a percentage of average interest earning assets. There are many reasons why most studies use this definition, including: (i) the data is readily available; and (ii) it forms part of a standard set of bank performance indicators which also include the return on equity (RoE), return on assets (RoA) and the cost to income ratio. The net interest margin is, however, generally seen as a better measure of banks' long-term revenue structure. Nonetheless, by definition, net interest margins do not take into consideration bank charges and income revenue associated with fees and commissions that effectively increase the costs paid by bank borrowers and reduces revenues received by depositors. An additional problem is that, by including all interest earning assets, net interest margins may deviate significantly from the marginal spread that reflects the bank's marginal costs and revenues (Brock and Suarez; (2000). This is particularly true for Honduras, where banks hold non-interest bearing required reserves.

<sup>10</sup> Dell'Ariccia and Marquez (2003) suggest that differences in the information available to different banks will impact whom they would lend to and what spreads they are able to charge.

**Table 1. Variable Description and Expected Impact on Banks' Net Interest Margins**

Variable	Notation	Description	Mean	Standard deviation	No. of banks	Expected impact
<b>All banks</b>						
Net interest margins	NIM	Net interest income as a percentage of interest earning assets	2.2%	0.023	17	
Liquidity risk	LR	Liquid assets-to-total assets	29.3%	0.137	17	Positive
Operating costs	OC	Operating costs-to-total earning assets	2.6%	0.025	17	Positive
Credit risk	CR	Lagged ratio of loan loss provisions-to-total loans and advances	4.1%	0.029	17	Positive
Market concentration	HHI	Herfindahl-Hirschman Index	0.7	0.009	17	Positive
Funding risk	FR	Credit-to-deposit ratio	96.2%	0.415	17	Positive/negative
Real GDP growth	RGDP	Real GDP growth	3.8%	0.0297	17	Positive/negative
Inflation	INF	Inflation	1.9%	0.009		Positive
<b>Subsidiaries of international banks</b>						
Net interest margins	NIM	Net interest income as a percentage of interest earning assets	2.6%	0.032	11	
Liquidity risk	LR	Liquid assets-to-total assets	31.3%	0.179	11	
Operating costs	OC	Operating costs-to-total earning assets	3.3%	0.035	11	
Credit risk	CR	Lagged ratio of loan loss provisions-to-total loans and advances	4.1%	0.034	11	
Market concentration	HHI	Herfindahl-Hirschman Index	0.50	0.008	11	
Funding risk	FR	Credit-to-deposit ratio	99.2%	0.551	11	
<b>Locally owned banks</b>						
Net interest margins	NIM	Net interest income as a percentage of interest earning assets	1.9%	0.006	10	
Liquidity risk	LR	Liquid assets-to-total assets	27.6%	0.085	10	
Operating costs	OC	Operating costs-to-total earning assets	2.0%	0.007	10	
Credit risk	CR	Lagged ratio of loan loss provisions-to-total loans and advances	4.2%	0.024	10	
Market concentration	HHI	Herfindahl-Hirschman Index	0.77	0.011	10	
Funding risk	FR	Credit-to-deposit ratio	93.7%	0.250	10	

Source: Authors' calculations.

There is also a clear difference between locally owned banks and subsidiaries of foreign banks regarding three other explanatory variables. First, subsidiaries of foreign banks tend to rely more on off-shore funding of credit than their domestic counterparts. Second, the Herfindahl-Hirschman Index shows that locally owned banks are highly concentrated (0.77), compared with a moderate level (0.50) for the subsidiaries of foreign banks. Third, perhaps

partly because of the higher market concentration, the average operating costs for locally owned banks (2.0 percent) are almost half that for the subsidiaries of foreign banks (3.3 percent). Again, this is an indication of market segmentation, which means that it may be misleading to focus on aggregates to understand the behavior of banks' net interest margins in Honduras. In other words, careful consideration needs to be given to bank-specific performance and bank ownership.

The following section employs the OLS-based PCSE regression procedure to provide more comprehensive analysis of the determinants of NIM in Honduras. As seen in Table 2, the Im-Pesaran-Shin unit root tests show that the  $w-t\text{-bar}$  statistics are in most cases significant at all the usual testing levels. Therefore, the null hypothesis can be rejected, indicating that the series are stationary. In addition, removing the cross-sectional mean from the series to mitigate the effects of cross-sectional correlation obtains test statistics that are significant.

**Table 2. Im-Pesaran-Shin Panel Data Unit Root Tests 1/**

	Im-Pesaran-Shin		Im-Pesaran-Shin (demean)	
	W-t-bar	P>t	W-t-bar	P>t
<b>All banks</b>				
Net interest margins	-3.51	0.00	-1.55	0.06
Liquidity risk	-5.72	0.00	-6.13	0.00
Operational costs	-6.54	0.00	-2.48	0.01
Credit risk	-2.85	0.00	-2.65	0.00
Herfindahl-Hirshman index	0.98	0.84	-2.41	0.01
Funding risk	-3.19	0.00	-2.81	0.00
Real GDP growth	-5.30	0.00		
Inflation	-10.70	0.00		

Source: Authors' calculations.

1/ All variables are in levels. All regressions are augmented one lag and have no trend.

## V. ESTIMATION RESULTS

We present the estimation results of Equation 8 in three steps. In the first step, we run the model on only the bank specific variables (Table 3, column 1). The second and third columns of Table 3 include dummies for subsidiaries of foreign banks and locally owned banks, respectively. In the second step, we run the model, including the macroeconomic variables, but excluding the funding risk variable (Table 3, columns 4-6). In the third step, we run the full model (Table 3, columns 7-9). As can be seen in Table 3, the R-squares for the three steps are practically the same, which suggests that bank specific variables explain almost all the variability in banks' net interest margins. We note that, by controlling for funding risk, the estimated coefficients for the dummy variables are not statistically significant, which means that ownership does not matter. We proceed by analyzing the estimation results in column 7.

As expected by the empirical model, the liquidity ratio is positively correlated with net interest margins. It is also statistically significant. This result is in tune with the literature, since banks tend to pass their liquidity risks to their clients via increased interest margins.

Even though the estimated coefficient of the liquidity variable seems to be quantitatively small, it captures the positive impact of holding large amounts of excess liquidity (including low-yielding short-term assets, required reserves, and cash in vault) on net interest margins.<sup>11</sup> It also highlights the importance of a vibrant interbank market for operational efficiency and lower net interest margins.

**Table 3. OLS-PCSE Panel Estimation Results**  
(Dependent variable: Banks' Net Interest Margins) 1/

	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5	Eq. 6	Eq. 7	Eq. 8	Eq. 9
Liquidity risk	0.01 *** (4.10)	0.01 *** (4.17)	0.01 *** (4.39)	0.01 *** (3.26)	0.01 *** (2.90)	0.01 *** (3.85)	0.01 *** (3.53)	0.01 *** (3.52)	0.01 *** (3.91)
Operating costs	0.46 *** (6.99)	0.46 *** (7.04)	0.45 *** (7.04)	0.52 *** (9.21)	0.50 *** (8.34)	0.52 *** (9.26)	0.46 *** (7.04)	0.47 *** (7.11)	0.46 *** (7.12)
Credit risk	0.09 *** (2.77)	0.09 *** (2.89)	0.09 *** (2.68)	0.11 *** (3.93)	0.11 *** (4.03)	0.11 *** (3.84)	0.08 *** (2.73)	0.09 *** (2.93)	0.09 *** (2.79)
Herfindahl-Hirschman index	-0.08 *** (-3.04)	-0.10 *** (-3.13)	-0.09 *** (-3.57)	-0.07 *** (-2.95)	-0.12 *** (-3.54)	-0.08 *** (-3.20)	-0.10 *** (-3.83)	-0.12 *** (-3.55)	-0.11 *** (-3.97)
Funding risk	0.004 *** (3.51)	0.004 *** (3.02)	0.004 (3.55)				0.004 *** (3.26)	0.003 *** (2.70)	0.004 *** (3.24)
Real GDP growth				-0.01 (-1.14)	-0.01 (-1.01)	-0.01 (-1.03)	-0.01 (-1.46)	-0.01 (-1.44)	-0.01 (-1.37)
Inflation				0.12 *** (4.31)	0.11 *** (4.27)	0.12 *** (4.36)	0.07 *** (3.03)	0.07 *** (3.10)	0.07 *** (3.13)
Dummy (Subsidiaries of foreign banks)		0.001 (1.14)			0.004 *** (3.60)			0.002 (1.55)	
Dummy (Locally owned banks)			0.000 (0.06)			-0.001 (-0.75)			-0.001 (-0.90)
R-square	0.79	0.80	0.79	0.78	0.79	0.79	0.79	0.80	0.80
Wald test	3523.9	3760.3	5537.6	3942.6	4194.1	6139.3	5283.2	5364.1	7564.3
Prob > $\chi^2$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	17	17	17	17	17	17	17	17	17

Source: Authors' calculations.

1/ Coefficients in parentheses represent the respective z values. \*, \*\*, \*\*\* denotes significance at 10, 5, and 1 percent, respectively.

In line with Pineda (2010), we find that operating costs are positively and significantly correlated with net interest margins. In fact, the estimated coefficient is the largest among all the explanatory variables. Operating costs are, therefore, the most important determinant of banks' net interest margins. This finding is also in line with earlier studies on developed countries<sup>12</sup> and emerging economies.<sup>13</sup> Three factors explain this outcome. First, we associate this result with the costs of monitoring domestic borrowers. Operating costs reflect the activities in which different banks specialize. For example, banks that focus more on retail operations usually face larger operational costs than banks that are more oriented toward wholesale markets. This is because retail operations involve the establishment of a large number of branches, equipment and personnel to serve the retail customer. These larger costs usually translate into a higher spread (Brock and Suarez; 2000). Second, deficiencies in the legal system contribute to high cost of credit. Outdated bankruptcy procedures increase the cost of asset recovery while lengthy civil procedures related to contract enforcement and adjudication of claims make credit operations riskier and costlier (IMF; 2001). Third, operating costs reflect less efficient management and inferior organizational structures. In

<sup>11</sup> Results not shown in this paper show that required reserves are highly correlated with our liquidity ratio.

<sup>12</sup> See for example Maudos and Fernandez de Guevara (2004); Valverde and Fernandez (2007); Williams (2007); and Maudos and Solis (2009).

<sup>13</sup> See for example Demirguc-Kunt and Huizinga (1998); Claessens, Demirguc-Kunt, and Heizinga (2001); Martinez and Mody (2004); Hesse (2007); Schwaiger and Liebeg (2008); Horvath (2009); and Fungacova and Poghosyan (2009)

this context, the legal infrastructure should be updated to speed up the resolution of financial claims. Banks should also be encouraged to upgrade their operational efficiency in order to bring down overhead costs.

We also find that the ratio of loan loss provisions to total loans (our measure of credit risk), which is a measure of credit quality, is positively and significantly correlated with banks' net interest margins. This result suggests that structural reforms aimed at promoting prompt expedition of legal cases, making financial information on potential borrowers accessible to all banks, and good accounting standards will improve risk assessment, reduce non-performing loans, and the need for higher loan loss provisions.

Contrary to the priors of the empirical model, the estimated coefficient for market concentration is negative and statistically significant. This is true for all banks and indicates that the market is contestable. In other words, higher concentration is a consequence of tougher competition among banks (Boone and Weigand; 2000). A possible rationale is that more efficient banks have lower costs, serve the best-quality borrowers and garner greater market share, thereby forcing less efficient banks to consolidate and reduce operating costs in order to offer competitive interest margins.

Funding risk is an important determinant of net interest margins, particularly for subsidiaries of foreign banks. We find that not controlling for funding risk makes the dummy variable for the subsidiaries of foreign banks positive and statistically significant (Table 3, column 5). In contrast, by controlling for funding risk (see column 8), we find that the estimated coefficient is positive and statistically significant, but that the estimated coefficient for the dummy variable becomes statistically insignificant. This means that high and increasing loan-to-deposit ratios funded by parent banks put pressure on subsidiaries of foreign banks' business models and lead to higher interest margins. While the paper does not describe the channel behind this relationship, it could be related to transmission of shocks by parent banks to affiliates (Chava and Purnandam, 2011; Cetorelli and Goldberg, 2012a; and Cetorelli and Goldberg, 2012b). With relatively low percentage of the adult population having an account in the formal banking system in Honduras, improving access to financial services—financial inclusion—would help limit negative cross-border spillovers.

Turning to macroeconomic variables, we find that the results are mixed. As expected and in line with Pineda (2010), the estimated coefficient for inflation is positive and statistically significant, and the size is non-negligible. As stressed by Huybens and Smith (1999), inflation does exacerbate informational asymmetries and therefore leads to larger interest margins. However, similar to Pineda (2010), we find that economic growth (the business cycle) has no statistically significant impact on banks' interest margins. This finding suggests that banks are not adequately pricing intrinsic risks of projects and so are not allocating resources efficiently (Rajan and Zingales, 1998).

## VI. CONCLUSIONS AND POLICY IMPLICATIONS

This study provides empirical evidence on the determinants of banks' interest margins in Honduras. To this end, we specify an empirical model which constitutes an extension of the cost function model developed by Klein (1971) and Monti (1972).

As predicted by the empirical model, all the explanatory variables, except for bank concentration, real GDP growth and bank ownership, have the expected effect on banks' net interest margins. We find that operating costs are the most important determinant of banks' interest margins. In addition, we find that high provisions for nonperforming loans and liquidity ratio get translated into high net interest margins. We also find that credit-to-deposit ratio positively impacts banks' net interest margins. However, contrary to the priors of the model, the banking concentration variable is negative and statistically significant, indicating that tougher competition has led to higher concentration and lower net interest margins. Beyond bank specific variables, we find that inflation (uncertainty in the macroeconomic environment facing banks) appears to be an important determinant of high interest margins. However, real GDP growth has no statistically significant impact on banks' net interest margins. Finally, we find that ownership does not matter if the transmission of funding risks from parent banks is limited.

These results suggest that banks, particularly subsidiaries of foreign banks, are under pressure to consolidate and reduce operating costs in order to offer competitive interest margins. To allow banks to upgrade their operational efficiency, the authorities could implement structural reforms aimed at supporting the information environment (such as promoting credit information-sharing systems and collateral registries) and promoting international accounting standards, independent and credible auditing of borrowers (private companies), prompt adjudication of legal cases, financial inclusion and a vibrant interbank market. At the same time, maintaining macroeconomic stability, such as low and stable inflation, will lower information asymmetries. Together, these measures will allow banks to adequately price intrinsic risk and improve the efficiency of resource allocation.

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## ANNEX: Attachments













