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An Empirical Analysis of Commercial Bank Profitability in Financially Liberalized Markets

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An Empirical Analysis of Commercial Bank Profitability in Financially Liberalized Markets

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Abstract

Chapter 1 of the dissertation investigates the determinants of bank interest margin (NIM) and noninterest income (NII) using a system estimation approach for all commercial banks in a group of 28 financially liberalized countries during the period between 1997 and 2004. The empirical results generally suggest that NIM is directly influenced by operating costs, risk aversion, credit risk, the interaction between interest rate risk and bank risk, bank size, volume of credit, and NII. NIM is negatively related to interest rate risk and capital adequacy. NII is found to correlate positively with NIM, total assets, credit risk, liquidity risk, overhead expenses, and pre-tax profit. The study also finds that NII is inversely related to the level of bank deposits and interest rate risk. The influence of bank concentration on NIM and NII is positive, but generally insignificant.

Chapter 2 analyzes the factors that influence two popular bank performance measures: return on equity (ROE) and pre-tax operating income (PTOIAA). Another objective is to test whether the Structure-Conduct-Performance hypothesis holds in a period when banks are increasingly relying on profits from nontraditional activities. Overall, the study finds that both ROE and PTOIAA are positively related to capital adequacy and non-interest income. PTOIAA is directly influenced by non-interest expenses and credit risk. Bank size does not appear to have an impact on ROE and PTOIAA. NII is an increasing function of both ROE and PTOIAA. There appears to be a net gain in overall bank performance associated with banks' increasing involvement in nontraditional activities. Finally, bank market share has no significant impact on ROE or PTOIAA.

Introduction

The effectiveness of financial intermediation is vital for economic growth. The linkage between finance and economic development has been a central topic in the works of Schumpeter (1911), Goldsmith (1969), Mckinnon (1973), and Rajan and Zingales (1998). Empirical studies indicate a strong correlation between the level of financial intermediation and subsequent economic development. For example, King and Levine (1993) find that financial depth (the ratio of liquid liabilities to Gross Domestic Product (GDP)) is positively related to long-term economic growth. Similarly, they find that the method in which the financial system distributes its assets (i.e., credit issued to nonfinancial private firms divided by total credit and credit issued to nonfinancial private firms divided by GDP) is positively related to long-run economic growth and efficiency. In a similar vein, Levine and Zervos (1998) show that the degree of banking development, as measured by bank loans to private enterprises divided by GDP, is positively related to long- term economic growth.

The importance of the relationship between financial intermediation and economic growth has also been a motivation behind major economic reforms within the banking sector. In recent years, banks in developed countries have moved towards internationalization of services, greater international standardization of products, and fewer traditional banking services. Deregulation, new technologies, and globalization are changing the financial services industry. Banking is no longer limited to traditional financial intermediation catered to domestic and local depositors and borrowers in a highly regulated environment. Instead, banking now extends to a wide rage of financial instruments formerly offered by other sectors of the financial services industry aimed at the global individual and institutional investors. Similar developments have

also been taking place in less developed countries, though they are still at an early stage.

Kaminsky and Schmukler (2003) demonstrate that before the 1970s only a small number of countries instituted reforms. This number has been increasing steadily since the 1970s. By the 1990s, all of the financial sectors in their sample countries are fully liberalized. In the first episode of development, most of the reforms focused on the domestic banking sector and capital account, while in the second round both the domestic banking sector and the stock market are jointly deregulated. Their comprehensive study focuses on financial liberalization in banking, stock markets, and capital accounts in 28 developed and emerging economies. They suggest that developed countries tend to liberalize their stock markets first and developing countries tend to liberalize their banking industries first.

According to this methodology, a country is classified as "fully liberalized" when at least two of those three sectors are fully liberalized and the third one is partially liberalized. It is "partially liberalized" if at least two of the above three sectors are partially liberalized. To measure the liberalization of the banking sector, the authors examine regulations on deposit interest rates, allocation of credit, loan rates, and foreign currency deposits. To gauge the liberalization of the capital account, they analyze regulations on offshore borrowing by domestic financial institutions, controls on capital outflows, and exchange rate markets. And in order to measure the liberalization of the stock markets, the authors study the regulations on acquisition of shares in the domestic stock market by foreigners, and repatriation of capital, dividends, and interests. This new list of financially liberalized markets provides an ideal group of candidate countries to be examined. It does not make much sense to study these issues for countries that are not financially liberalized (Brock and Suarez, 2000). Unfortunately, previous papers in this area either focused exclusively on advanced economies or examined countries classified by

geographical region, regardless of the extent of their financial liberalization.

Banks traditionally profit on the spread between their lending and borrowing rates. As intermediaries between lenders and borrowers, banks transform assets. Banks also issue and hold non-liquid loans, engage in asset/liability management (such as duration management), and more recently, provide (nontraditional) off-balance-sheet (OBS) services, including letters of credit and other activities that generate fee income. A popular measure of banking efficiency in the banking literature is the net interest margin (NIM). Traditionally, NIM measures how large a spread between interest revenues and interest costs management has been able to achieve by close control over the bank's earning assets and the search for the least costly sources of funding. Although there is no single definition for NIM, one of the most commonly used definitions in empirical work is the ratio total interest income minus total interest expense as a percentage of total earning assets. While this method of calculation has been used in major bank profitability studies (Ho and Saunders, 1981; Angbazo, 1997; Levine, 2004; Claeys et al. 2004), the present definition may lead to misleading figures by failing to fully account for the presence of the increasing trend in non-interest income (NII) generated primarily by OBS activities. Similarly, failure to include properly constructed measures of OBS activities or other accounting ratios into the regression equations may not only reduce the models' explanatory power, but may also yield results that contradict those predicted by theories.

It is not obvious from a review of the economic and finance literature whether high bank margins are good or bad from a social welfare perspective. High margins may indicate relatively less efficient and less competitive markets even though high margins may increase the stability of the banking system by insulating it from adverse economic shocks. Beck and Kevin (2003), for example, show that highly concentrated banking systems are less likely to suffer from

economic crises. High margins may also reflect inefficient regulation and high risk premia which can induce gambling behavior by banks (Hellman et al., 2000). A review paper on bank competition by Allen et al. (2001) concluded that the research literature was ambiguous and that more research was needed. Another review paper by Berger et al. (2004) suggests that bank competition is generally good from a social perspective. Although concentration is associated with less favorable prices for customers and higher profitability, these results are not robust to other measures of bank competition. For example, concentration has less impact in countries where there is less regulation or where foreign bank entry is permitted. The authors suggest that more research is clearly needed for emerging markets.

The evidence from empirical studies, discussed in the following sections, is also mixed. Reexamining this issue for recent financially liberalized developing nations would shed some light on the social welfare question. Since bank failures can carry significant negative externalities to society, as suggested by Diamond and Dybvig (1983) and Gorton (1988), improving the functioning and efficiency of the banking system is of paramount importance. This process would be greatly facilitated by a thorough understanding of the determinants of bank profits and efficiency in light of recent worldwide changes in regulations and business practices within the banking sector. In addition to enhancing our understanding of the variables that drive NIM and NII, this paper's results could provide potentially important policy implications. For instance, if NIMs in a certain country are primarily influenced by interest rates rather than other factors, then it might be best to focus more public policy attention to its central bank's macroeconomic policies as the main tool to fight interest rate volatility and reduce the cost of intermediation. Similarly, if NIIs are found to be highly and positively correlated with bank risks, then it might be advisable for banks to engage in other interest-earning activities.

Furthermore, if the market structure in a given country is found to be highly concentrated (increasing the likelihood of collusion), public policy should focus on increasing competition and discouraging mergers and acquisitions. On the other hand, if bank concentration is positively correlated with the stability of the banking system, policies directed at facilitating mergers or consolidations should not be impeded.

In my first essay, I empirically examine the factors that have been theoretically shown to influence NIM using the model of Maudos and Guervara (2004) extended to explicitly take into account the effects of OBS activities. I also use new and modified financial ratios to reflect the changing financial services industry. Although banks have recently been earning substantial NII from fees in exchange for various financial services, DeYoung and Rice (2004) suggest that, after reviewing the results from the literature, NIM continues to be the main source of profits for most banks. This is particularly true for banks in less developed economies where they are the key player of the financial system by which funds are channeled from savers to investors. It is important to revisit this issue employing recent data and new theoretical and empirical methodologies.

Also in my first essay, I empirically examine factors commonly found in banks that are heavily involved in nontraditional OBS activities generating NII. The motivation is that NII in many recent fully liberalized markets now accounts for a significant portion of all operating income generated by commercial banks. Similarly, NII now makes up about half of all operating income generated by U.S. commercial banks and a significant amount of total income in many mature economies. Yet, there are very few studies that directly examine this issue. Another novel feature of this paper is the use of joint estimation via the Seemingly Unrelated Regressions (SUR) framework as well as the Generalized Method of Moments (GMM) to account for the

imperfection in the panel data structure. To date, this is the first attempt to examine these issues jointly using a system estimation method to maximize statistical efficiency and to exploit the benefits offered by the relatively large panel data set.

In Chapter 2, I study the significance of the factors that contribute to a bank's return on equity (ROE) and pre-tax operating income (PTOIAA). I apply the Structure-Conduct-Performance (SCP) hypothesis from the Industrial Organization literature to study whether diversification into non-traditional activities has helped increase bank returns. This framework allows me to test the validity of the SCP hypothesis, which posits that market concentration is positively related to bank profit. This is an important issue since it is not clear how banks' increasing reliance on NII affects their overall performance. There is a paucity of research in this area. Also new in this chapter is the use of the extended Generalized Method of Estimation (Arellano and Bover, 1995) and Impulse Response Functions to forecast the behavior of bank performance in response to shocks to other dependent variables in the system.

For both essays, I use bank level panel data for the period between 1997 and 2004 for a group of 28 mature and emerging economies classified as financially liberalized by Kaminsky and Schmukler (2003)[1]. Many of these economies also appear in a 2005 special issue of the Journal of Banking and Finance (2005) that focuses on issues associated with the financial liberalization of the banking sectors in emerging countries. Using a comprehensive set of econometric tools to examine data for 3,593 commercial banks in these countries, to my knowledge, this is the largest data set ever employed in this line of research.

By way of preview, NIM is positively related to operating costs, risk aversion, credit risk, the interaction of interest rate risk and bank risk, bank size, volume of credit, and NII. NIM is

[1] The countries are Argentina, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Hong Kong, Indonesia, Ireland, Italy, Japan, Korea, Malaysia, Mexico, Norway, Peru, Philippines, Portugal, Spain, Sweden, Taiwan, Thailand, Venezuela, United Kingdom, and the United States.

also found to have an inverse relationship to interest rate risk and capital adequacy. In regard to NII, the results indicate that NII is positively correlated to total assets, credit risk, liquidity risk, overhead expense, and pretax profit, and is negatively related to bank deposit levels and interest rate risk. The findings in Chapter 2 suggest the capital ratio and NII positively affect ROE and PTOIAA, while bank size negatively affects ROE and PTOIAA. While bank risk and operating expenses are positively correlated with PTOIAA, they negatively influence ROE. Overall, there appears to be a net gain in performance as banks continue to increase their operations in nontraditional banking activities. Finally, bank market share concentration has no significant effect on either ROE or PTOIAA, a finding that refutes the validity of the SCP hypothesis.

The dissertation has two chapters and is structured as follows. Following this introductory section, Section I presents a summary of relevant papers on NIM. Section II discusses theoretical foundations and related literature for NII. Section III specifies the data and methods employed to investigate the factors that impact NIM and NII. Section IV presents the empirical results. Section V concludes Chapter 1. Chapter 2 begins with Section VII, which introduces background information and reviews the literature on the SCP hypothesis and other related studies. Section VIII explains the data and empirical techniques. Section IX interprets the empirical results. Section X concludes Chapter 2. Concluding remarks are presented in Chapter 3.

Chapter 1

Determinants of Bank Net Interest Margin and Noninterest Income: a System Estimation Approach

I. NIM Literature Review

Two main modeling frameworks have been used in empirical papers examining the factors that affect NIM: the dealership approach first proposed by Ho and Saunders (1981) and the micro model of the banking sector originated by Zaruck (1989). The dealership model considers the bank as a dynamic dealer, establishing interest rates on loans and deposits to balance the asymmetric arrival of demands for loans and supplies of credit. The dynamic dealership model was recently improved by Maudos and Guervera (2004) and provides the theoretical foundation for part of this chapter. On the other hand, the micro model of banking based on the Monti-Klein model (1972) is a static model in which the demand for and supply of deposits and loans clear both markets simultaneously. This model was subsequently extended by Zarruck (1989), Allen (1988), and Wong (1997). There is a large literature on NIM, so I do not attempt to cover it in full. I will instead focus on results of typical studies, described in the following pages, which cover areas that I intend to investigate further.

(a) The Dealership Approach

Ho and Saunders (1981) show that NIM in a given country can be estimated using a theoretical model in which banks are risk-averse dealers in providing services to customers. The banks receive deposits at random intervals and later use these funds to satisfy stochastically

received loan requests. The pure spread between loan and deposit rates is compensation for bank inventory risk arising from uncertainty about the arrival of loan and deposit transaction requests. In empirical work, a two-stage regression method is used to study the determinants of NIM. In the first stage, NIM is regressed on bank-specific variables, such as the ratio of non-interest bearing assets to total assets, the equity ratio, and the ratio of non performing loans to total assets. The constant term obtained from the first stage regression is a measure of the "pure spread" for this country's banking system (the part of the spread that is not attributable to bank-specific characteristics). In the second stage, the constant term captures the effect of market structure on the determination of the pure spread (the portion of the spread that is neither explained by bank specific characteristics nor interest rate volatility). Ho and Saunders show that the pure spread depends on the size of banks' transactions, the market structure of the banking industry, the volatility of interest rates, and the degree of managerial risk aversion. Using data from U.S. commercial banks, pure spread is shown to be positively related to the variance in the rate on bonds, as predicted by their model. Also, smaller banks have an average transaction spread of approximately 1/3 of 1% more than larger banks. The difference is due to market structure.

Ho and Saunders' two step approach to panel data on bank spreads has been used by McShane and Sharpe (1985), Allen (1988), Angbazo (1997), Wong (1997), Saunders and Schumacher (2000), Brock and Suarez (2000), Drakos (2003), and Doliente (2005). McShane and Sharpe (1985) look at the Australian market, but instead of using margin or spread data, they use net profit before tax as a response variable. They find that net profit before tax is related to market power, interest rate uncertainty, and risk aversion. Allen (1988) extends the original Ho-Saunders dealership model to include heterogeneous loans and deposits and posits

that pure interest rate spreads may be reduced as a result of product diversification.

Brock and Suarez (2000) study the determinants of NIM, applying various definitions of NIM for seven Latin American countries, and find that the level of non-performing loans and operating costs have a positive effect on NIM as well as reserve requirements. Further, loan losses and bank capital are significantly and negatively related to bank spreads for most countries in the sample, a result that contradicts with those from developed countries suggested by Ho and Saunders (1981) and Saunders and Schumacher (2000).

Saunders and Schumacher (2000), using data for the period between 1988 and 1995 for six selected European countries, find that regulatory requirements in the form of interest rate restrictions on deposits, reserve requirements, and capital to asset ratios, in addition to interest rate volatility, have a significant impact on bank NIMs. Their results also indicate that the more segmented/restricted the banking system is, the larger the monopoly power of existing banks and the higher their spreads. As with all previous studies, macro interest rate volatility is a determinant of bank margins.

Drakos (2003) finds significantly reduced NIMs for a group of East European countries after their transition to market-based economies. Further, he finds that state banks begin to set substantially lower margins, a sign that he claims to be evidence of former inefficiency. Doliente (2005) uses data for Indonesia, Malaysia, the Philippines, and Thailand to find other bank-specific variables that influence NIMs. These factors include collateral and loan quality in addition to many others that were found to be important in prior research.

(b) The Micro Model of the Banking Firm Approach

An alternative approach to studying NIMs is based on the original micro model of the

banking firm due to Klein (1971) and Monti (1972) in which the banking firm is assumed to exist in the static setting where demands and supplies of deposits simultaneously clear the market. Zarruck (1989) formalizes these ideas and presents a theoretical model of NIM for a banking firm that maximizes the expected utility of profits. Under the assumption of decreasing absolute risk aversion, a bank's spread is shown to increase with the amount of equity and decrease with deposit variability. There is a significant positive effect on bank asset quality since higher levels of equity lead to increases in bank spreads. The model also implies that a deposit insurance premium does not necessarily lead to an improvement in bank asset quality.

A similar argument is made by Chan, Greenbaum, and Thakor (1986). These authors argue that banks optimally choose to spend less on screening borrowers when deposit funding costs or deposit insurance premia increase, or when loan rates are lower because the marginal benefit of screening is diminished. As a result, asset quality problems are more pronounced. Furthermore, increased deposit insurance premia can increase the probability of bank failures due to this reduced asset quality. A deposit insurance premium could, however, improve bank asset quality since it can reduce the negative externalities associated with the problem of information asymmetry such as "adverse selection" or "moral hazard."[2] For example, a deposit insurance premium, especially if risk-based, would influence bank decision making by providing incentives for banks to avoid excessive risk-taking which could lead to bank failure. The market recognizes the value of this scheme (risk-based deposit insurance) and can reward bank assets accordingly. Borrowers, for instance, are more likely to pay higher rates on bank loans because they perceive that these assets are of higher quality. Borrowers also care about the bank's other

[2] In the presence of deposit insurance the problem of moral hazard exists if depositors know a bank will be supported in the event of problems so they have less incentive to monitor the banks. This makes it easier for managers to take greater risks. Since riskier banks are charged higher premiums, a risk-based premium system can also address adverse selection as it reduces the number of risky institutions participating in the deposit insurance program – the "adverse selection" problem.

loans as increases in the bank's credit risk will raise the bank's marginal cost of debt and equity, which in turn increases the cost of funds for the bank. The bank is thus more likely to raise loan rates. By borrowing from banks with lower perceived credit risks, these customers can send a positive signal to the market about their own credit quality.

Goldberg and Hudgin (2002) find that failed U.S. thrifts have smaller proportions of uninsured deposits-to-total-deposits prior to failure and that failing thrifts attract fewer deposits from uninsured depositors before failure than do solvent institutions. Their results suggest that uninsured depositors have incentives to monitor and discipline bank risk exposure and that reducing the insurance limits on deposits will increase market discipline on thrifts.

Following the same methodology, Zarruck and Madura (1992) show that deposit insurance, capital regulations, and increased uncertainty in the levels of loan losses will have a negative effect on NIM in the case where uncertainty arises from loan losses. Their model, unlike previous ones, assumes a situation in which the bank is subject to capital regulations and deposit insurance under non-increasing risk aversion. Madura and Zarruck (1995) find that bank interest rate risk varies among countries, suggesting that interest rate differentials in the risk based capital requirements should be taken into account when studying NIMs.

Angbazo (1997) develops similar theoretical and empirical models employing data for different size classes of banks from 1989 to 1993 and includes credit risk in the basic firm-theoretic NIM model. The author finds that NIMs of U.S. commercial banks are also a function of default and interest rate risk premia. His data also show that banks' OBS activities have helped create a more diversified, margin-generating asset base than deposit or equity financing (similar to the "diversification effect hypothesis" in the Corporate Finance literature). OBS exposure is related to cross sectional differences in interest rate risk and liquidity risk. In a

similar fashion, Wong (1997) expands the original model by introducing various sources of uncertainty to the model. He demonstrates that increases in marginal loan administrative costs, credit risk, interest rate risk, and market power all have a positive influence on banks' NIMs.

Claessens et al. (1998) study the effect of foreign bank entry on the domestic banking sector and find that in less developed countries foreign banks tend to have greater profits, higher NIMs, and higher tax payments as compared to domestic banks. The reverse is true for advanced countries. Denizer (2000) finds that NIM, overhead expenses, and returns on assets are associated with foreign ownership in Turkey's banking sector. Foreign bank entry is associated with higher competition, but lowers returns on assets and overhead expenses.

Demirguc-Kunt and Huizinga (1999) employ a single-stage regression technique with NIM as a dependent variable and a host of explanatory variables identified previously. Their results suggest that, in addition to the usual bank characteristics, bank taxation and regulatory variables, financial structure variables, and legal and institutional variables are determinants of bank profits and margins. Demirguc-Kunt and Huizinga (2000) show that profits and margins are negatively associated with the level of financial development, suggesting that the banking sector is more competitive in advanced countries. In a related study, Hanson and Rocha (1986) find that macroeconomic indicators such as inflation positively affect NIMs for 29 countries using data from 1975 to 1983.

Basir et al. (2002) find that net noninterest margins **(**NNM) are a function of bank characteristics, the macroeconomic environment, and the financial market structure.[3] In particular, they find a statistically significant positive relationship between the equity-to-total assets ratio and NNM. However, the interaction term for per capita GDP and the equity-to-total

[3] **NNM is** the Islamic bank equivalent of NIM in non-Islamic banks. Most of Islamic banks' earnings come from interest-free activities since it is not considered appropriate for Islamic banks to charge interest on loans and many other services.

assets ratio has a negative effect on NNM. The ratio of loans to total assets has a negative, but insignificant impact on NNM. Overhead expenses are directly related to NNM. The influence of macroeconomic variables on NNM is inconclusive. Taxes, GDP growth, and the ratio of total liabilities to total assets are all shown to have a positive effect on NNM.

Gischer and Juttner (2004) study the effect of global competition on banks' interest margins and profitability for a group of advanced countries and find that global competition reduces net interest rate margins and returns on assets. They also provide strong evidence of the negative relationship between the fee-to-income ratio and interest rate margins. The fee-to-income ratio also negatively affects bank return on assets (ROA). Peria and Mody (2004) further expand the empirical model to include bank concentration variables in examining the spreads for four Latin American countries and conclude that bank concentration has a direct effect on spreads and costs. Foreign banks in their sample countries are found to charge lower spreads than domestic banks.

Afanasieff and Lhacer (2001) suggest that macroeconomic variables are the most important factors explaining bank spread in Brazil, as compared to CAMEL-type indicators. Barajas et al. (1999) study the effect of financial liberalization in Colombia in the 1990s and finds that spreads have not declined. Catao (1998) examines the determinants of bank spreads for loans and deposits and finds that bank margins are related to average tax ratios, operating costs, bad loans, exchange rate risk, and market structure. Randall (1998) shows that, unlike other studies, loan loss provisioning reduces NIM in Eastern Caribbean countries. Operating expenses have a significant influence on bank spreads for these countries, like those in other countries.

Maudos and Guevara (2004) examine the determinants of NIMs for major European

countries (Germany, France, the United Kingdom, Italy, and Spain) using a larger data set for the period between 1993 and 2000. Using a model similar to that of Saunders and Schumacher (2000) modified to explicitly take into account operating costs and a different measure of the degree of concentration (based on a criticism made by Lerner, 1981, about a shortcoming from the original Ho-Saunders model), Maudos and Guevara find that variable operating costs are statistically significant. This suggests an omitted variable bias problem that might have biased most former studies since they did not include this factor in the NIM regression equation. In particular, they show that banks that bear higher average operating expenses charge higher NIMs to offset their higher transformation costs. Risk aversion, market power, interest rate risk, credit risk, implicit payments, and quality of management are again positively related to NIMs. However, unlike some previous studies, the opportunity cost of reserves does not have a statistically significant effect on spreads. In summary, the literature has identified that NIMs are a function of bank-specific variables and macroeconomic as well as market structure factures. Specifically:

NIM = f (market structure, operating costs, risk aversion, volatility of money market interest rates, credit risk, covariance of interest rate risk and credit risk, size of deposits and loans generated by the bank, total volume of credits, capital adequacy, market power, size of bank transactions, equity capital, quality of management, regulations, collateral, opportunity cost of required reserves, loan and deposit rates, liquidity risk, real GDP, foreign bank entry, inflation, and size of deposits and loans generated by the bank).

The above function does not contain several potentially relevant accounting variables,

discussed below, that may be correlated with NIM. It is also necessary to take into account the various economic forces and changes in business practices that have occurred in recent years. While the banking industry is not declining, the nature of its intermediation activities has changed. Changing economic conditions have created new financial innovations that have increased competition in financial markets. Increased competition has reduced the comparative advantage banks had in obtaining funds and has weakened their position in the loan market. For example, bank interest income has been falling in the United States as markets for both assets and liabilities have become more efficient. Banks, therefore, have tried to offset this reduction in NIM with NII derived from non-traditional banking activities. These new service revenues include fees for deposit services, sales of loans to security markets, earnings from provisions of brokerage services to borrowers and depositors, income from managing and advising mutual funds, underwriting securities, earnings from selling annuities and other investment banking services, and revenues from providing automated services for customers.

Some authors (Lane et al., 1993; Smith et al., 2003; and Gischer and Jutner, 2004) have observed that NIIs in some countries seem to have increased at the expense of NIMs. Also, according to Rogers and Sinkey (1999), if a bank's profits from traditional activities are low in comparison to those of its competitors, NII will be negatively related to NIM. It could also be the case that the bank's NIM is high relative to its peers because the income from OBS activities supplements the bank's NIM, in which case there would be a positive relationship between NIM and NII. Therefore, given the continuous growth of NII, it is important to include this variable when studying bank profitability or else NIM may bias the empirical estimates of the relationship between NIM and its explanatory variables. A thorough investigation of the factors influencing NIMs must, therefore, explicitly account for the potential impact of NII on bank spreads. This is

one of the shortcomings of the Maudos and Guevara's (2004) theoretical model which does not include the explicit effect of NII on NIM.

Next, in studying the determinants of NIM in a period when many changes in business practice, technology, deregulation and globalization are taking place in the financial services industry, it may be necessary to modify our current measures of major financial ratios. Most of the current empirical papers use total earnings assets as the denominator for the performance ratios, which ignores the effect of OBS activities. Cates (1996) argues that one way to reduce measurement problems is to calculate profitability measures using total operating revenue as the denominator. This adjustment improves the accuracy of the performance measures. Since total operating revenue is defined as the sum of net interest income and noninterest income, both traditional and nontraditional banking activities that generate revenue and expenses are taken into account. While this is relevant and intuitively appealing, previous studies have not accounted for this possibility in spite of the continuing and growing dependence on noninterest income from OBS activities. Therefore, I suggest using a Modified NIM (MNIM, defined as the ratio of interest income minus interest expense to total earning plus non-earning assets) and Modified NIM2 as suggested by Cates (MNIM2, calculated as [interest income – interest expense] / total operating revenue) as the dependent variables to examine whether or not regressions using MNIM and MNIM2 as outcome variables provide more consistent estimates.

In short, the above arguments give rise to the following primary hypotheses:

H1: NIM is related to market structure, operating costs, risk aversion, volatility of money market interest rates, credit risk, covariance of interest rate risk and credit risk, size of deposits and loans generated by the bank, total volume of credits, capital adequacy, and

NII.

H2: Regressions using modified bank profitability ratios, such as MNIM and MNIM2 will yield empirical results more consistent with theory than unmodified bank profitability ratios.

(c) The Maudos-Guevara Model

To investigate the factors influencing NIM, I apply the theoretical model of Maudos and Guevara (2004). This model significantly improves upon previous theoretical models. Using the modeling framework of Ho and Saunders (1981) and later extensions, Maudos and Guevara include the influence of operating costs into the modeling of NIM. However, unlike the Ho-Saunders two-stage methodology, Maudos and Guevara analyze the determinants of NIM in a single stage. In the Ho-Saunders two-stage methodology, an estimate of the pure margin is obtained in the first stage using a theoretical model, and then this pure margin and explanatory variables suggested by, but not included in, the model are analyzed in the second stage. The Maudos and Guevara approach incorporates both the variables of the theoretical model and the additional variables in a single stage.[4] An advantage of the single-stage method is that it is not necessary to have long time series in order to estimate the pure spread by pooling data (Maudos and Guevara, 2004). I further control for relevant factors discussed above by incorporating them into the empirical analysis.

The basis of the model is as follows, using the original notations. Consider a risk-averse banking firm acting as a dealer in the loan market. There is a single period in which the bank sets the interest rates at the beginning of the period prior to any loans or deposits being made.

[4] Equation 4 is a typical single-stage regression equation. Angbazo (1997), Demirguc-Kunt and Huizinga (1999) use a similar single-stage regression equation.

Since the bank has to deal with loan demands and deposit offers which reach it at different times, it sets the interest rates on loans (r_L) and deposits (r_D) that minimizes its interest rate risk associated with the need to obtain outside funding. Accordingly, the interest rates are set as a margin relative to the money market interest rate (r):

$$r_D = r - a$$
$$r_L = r + b$$

where *a* is the margin on deposits and *b* is the margin on loans. The unit margin or spread, s, can be shown as:

$$s = r_L - r_D = a + b \tag{1}$$

The spread also compensates the bank for credit risk. The initial wealth of the bank is $W_o = L_o - D_o + M_o$ where L_o is initial loans, D_o is initial deposits, and M_o is initial net money market assets. The innovative feature of this model is that it includes factors not found in previous models, such as production costs generated during the process of intermediation between deposits and loans. Therefore, the bank's operating costs depend on the deposits captured (C(D)) and the loans generated (C(L)). The bank's optimization problem can be written as follows, assuming deposits and credits are made in accordance to the Poisson process such that $\Pr_D = \alpha_D - \beta_D a$ and $\Pr_L = \alpha_L - \beta_L b$:

$$Max_{\alpha,\beta} EU(\Delta W) = (\alpha_D - \beta_D a)\Delta EU(W_D) + (\alpha_L - \beta_L b)\Delta EU(W_L)$$

where *EU(ΔW)* is the bank's expected final level of wealth, $\Delta EU(W_D)$ is defined as

$$\Delta EU(W_D) = U'(W)[aD - C(D)] + \tfrac{1}{2}U''(W)[(aD - C(D))^2 + (D + 2M_o)D\sigma_M^2 + 2L_o D\sigma_{LM}],$$

or the increase in expected utility associated with the new deposit. The increase in expected utility for each loan can be represented as:

$$\Delta EU\left(W_L\right) = U'(W)[bL - C(L)] +$$
$$\tfrac{1}{2}U''(W)[(bL - C(L))^2 + (L + 2L_o)L\sigma_L + (L - 2M_o)L\sigma_M + 2(M_o - L_o - L)L\sigma_{LM}^2$$

where D and L denote deposits and loans, respectively, and other symbols are defined as in the preceding and following sections. Solving for *a* and *b*, then substituting them into Equation 1 yields:

$$\text{Spread (s)} = a + b = \frac{\frac{1}{2}\left(\frac{\alpha_D}{\beta_D} + \frac{\alpha_L}{\beta_L}\right) + \frac{1}{2}\left[\left(\frac{C(L)}{L} + \frac{C(D)}{D}\right)\right] - \frac{1}{2}\left[\frac{U''(W)}{U'(W)}\right]\left(L + 2L_o\right)\sigma_L^2 + (\mathrm{L} + \mathrm{D})\sigma_M^2 + 2(M_o - L)\sigma_{LM}}{} \qquad (2)$$

Thus, the determinants of the interest margins are:

1) Market structure. This is a function of the elasticity of the demand for loans (α) and the supply of deposits (ß). The ratio $\frac{\alpha}{\beta}$ indicates the possible monopoly gains implicit in bank margins.
2) Operating costs. Higher cost firms will charge higher margins in order to compensate for their higher operating costs.
3) Risk aversion $\left(\frac{1}{2}\left(\frac{U''(W)}{U'(W)}\right)\right)$. The more risk averse the bank is, the higher its margins, since the bank is assumed to be risk averse, U''(W) < 0.
4) Volatility of money market interest rates (σ_M^2). Higher margins are positively correlated with the interest margins set by the banks because they need to raise the margins when the

money market interest rates are more volatile. Flannery (1981), however, finds that market fluctuations have no effect on commercial bank profits since large banks effectively hedge themselves against risk by assembling assets and liability portfolio with similar average maturity.

5) Credit risk (σ_L^2). Banks will charge higher margins if the expected rates of returns on loans generated are more uncertain or volatile.
6) Covariance of interest rate risk and credit risk (σ_{LM}).
7) Size of deposits and loans generated by the bank (L + D). According to Equation 5, interest margins are directly related to the size of operations. Greater size is associated with more substantial losses.
8) Total volume of credit$\left(L + 2L_o\right)$. This has a similar effect on banks as does the size of deposits and loans since those banks with greater volumes of loans generated are faced with higher potential losses.

To test this model empirically, I will employ the above variables in addition to a few other theoretically justified ones such as capital adequacy and NII to reflect the recent trends in banking. The following factors have been shown, theoretically, to impact bank margins:

9) Capital adequacy. Zarruk and Madura (1992) show that changes in capital requirements have a direct impact on a bank's optimal interest margin. An increase in the capital-to-deposits ratio is shown to reduce the bank's margin under the reasonable assumption of risk aversion. The explanation is that the increase in required capital results in lower expected profits, but when the capital-to-deposits ratio increases, the amount of bank capital also increases and

partially offsets the negative effect on the bank's spread. No empirical test of this model was done, however. Wong (1997) provides a similar theoretical prediction.

10) NII. NII is included as an explanatory variable to reflect the increase in fee income charged by banks in recent years (see David and Touri, 2000; Smith et al., 2002; and Stiroh, 2004). The relationship between NIM and NII is ambiguous since there has been no theoretical framework examining this issue. It is expected that NII is inversely related to NIM because the move toward explicit pricing of services is likely to reduce NIM. This concept is related to the cross-subsidization literature in banking which suggests that banks may give lower rates to customers who also use bank services that generate fee and commission income. A direct relationship between the two variables may also be observed, for the income from one source may help enhance the other's, as explained in the next section[5]. The relationship between the two variables is ambiguous. In summary, the following empirical specification will be examined:

NIM = f (Market structure, operating costs, level of risk aversion, volatility of money market rates, credit risk, covariance of interest rate risk and credit risk, size of deposits and loans generated, total volume of credit granted, non-interest income, and capital adequacy) (3)

Using data from Bankscope, explained in the Data and Methods section, proxies for the above explanatory variables are as follows:

[5] NIM is also related to NII through this accounting relationship: $\text{NIM} = \frac{BTP}{TA} + \frac{OV}{TA} + \frac{LLP}{TA} - \frac{NII}{TA}$ where $\frac{BTP}{TA}$ is the ratio of profit before tax to total assets, $\frac{OV}{TA}$ is overheads to total assets, and $\frac{LLP}{TA}$ is loan loss provision and $\frac{NII}{TA}$ represents the ratio of noninterest income to total assets.

1) Market structure (BANKHI). It is calculated as the square of the ratio of each bank's total deposits to total deposits within the banking sector of the country in which the bank is based. Numerically, $BANKHI = (TDi / TD)^2$ where TD_i is bank i's total deposits and TD is total deposits within the banking system. The BANKHIs obtained from this method range from 0 to 1 in the case of a completely concentrated market. Deposit-based measures of bank concentration are used in many studies (Al-Karasneh and Fatheldin, 2005; Bamakhramah, 1992; Cavalluzzo and Wolken, 2002; Atemnkeng J. and Joshep, 2005; Cetorelli and Strahan, 2006; Berger and Hannan, 1989; Jiang et. al, 2003; Adams and Amel, 2005; DeYoung and Rice, 2004). The main reason for using deposit data as a proxy for lender market power is that the ability of banks to make loans is directly related to the level of deposits held.
2) Operating costs (NIEAA). A popular ratio is the ratio of noninterest expense to total assets (NIEAA). According to Bankscope, noninterest expense plus provisions for loan losses provide a measure of the cost side of the banks' performance relative to the assets invested.
3) Risk aversion (ETA). The ratio of equity/total assets is used to proxy for the level of risk aversion. As predicted by the model, more risk averse banks charge higher margins to compensate for the higher costs of equity financing compared to external financing.

4) Volatility of market interest rates (LACSFT). According to the maturity mismatch hypothesis, interest rate risk exposure is negatively correlated with average maturity of assets. When a bank obtains more net short-term assets, its interest rate exposure decreases, thus requiring a lower interest margin. Therefore, the ratio of liquid assets to customer and short-term funding will be used as inverse interest rate risk. It is possible to use the standard deviation of security interest rates as a measure of interest rate volatility, but Bankscope data

does not allow for such calculations.

5) Credit risk (LLRGL). The ratio of loan loss reserves to gross loans is used as a proxy for credit risk. The ratio indicates how much of the total loan portfolio has been provided for, but not charged off. It is a reserve for losses expressed as a percentage of total loans. All else equal, the higher the ratio, the poorer the quality of the loan portfolio, and hence, the higher the credit risk.
6) Covariance of credit risk and interest rate risk (COV). This figure is calculated by taking the product of the values of credit risk and interest rate risk.
7) Size of operations (LNTA). Total assets (in logarithms) are used to proxy for the size of operations.
8) Total volume of credits (LNLO). The logarithms of the volume of loans granted will be used for this variable.
9) Capital (CFTA). The ratio of capital funds to total assets is employed to measure capital adequacy.
10) NII (LNOB). The logarithm of the notional value of OBS activities is used to measure the extent to which fees and other income represent the bank's earnings. From the bank's perspective, the higher this figure is the better, ceteris paribus. According to Casu and Girardone (2004) and Clark and Siems (2002), measures of OBS activities all have shortcomings. The credit-equivalent measure first proposed by Boyd and Gertler (1994) and Clark and Siems (2002) can substantially underestimate the level of OBS activities. The alternative asset equivalent measure is revenue-based, which includes losses, and thus can distort the measurement. Similarly, noninterest income may inflate the amount of OBS activities because fees and commissions are drawn from on-balance-sheet activities.

And last but not least, NIM is calculated by Bankscope as the ratio of total interest income less total interest expense to total earning assets. MNIM is calculated as the ratio of total interest income less total interest expense divided by total assets (where total assets = interest earning assets + non-interest earning assets). MNIM2 is constructed as the ratio of total interest income less total interest expense divided by total operating revenue. In summary:

$$NIM_{it} = C_i + \beta_1 BANKHI_{it} + \beta_2 NIEAA_{it} + \beta_3 ETA_{it} + \beta_4 LACSTF_{it} + \beta_5 LLRGL_{it} + \beta_6 COV_{it} + \beta_7 LNTA_{it} + \beta_8 LNLO_{it} + \beta_9 CFTA_{it} + \beta_{10} LNOB_{it} + \varepsilon_{it} \quad (4)$$

where NIM_{it} is NIM, MNIM, and MNIM2. The following chart summarizes the expected relationship between NIM and its explanatory variables.

Dependent Variables: NIM/MNIM/MNIM2	Proxy	Expected Signs
1. Market structure	BANKHI	Positive
2. Operating cost	NIEAA	Positive
3. Risk aversion	ETA	Positive
4. Volatility of interest rate	LACSTF	Positive/Negative
5. Credit risk	LLRGL	Positive
6. Covariance of IR and LLR	COV	Positive/Negative
7. Size	LNTA	Positive/Negative
8. Volume of credit	LNLO	Positive
9. Capital	CFTA	Negative
10.Noninterest Income	LNOB	Positive/Negative

II. NII Literature Review

This section provides some background on the factors theorized to influence NII. According to traditional banking theories, banks earn profits by purchasing funds from depositors at a low interest rate, then reselling those funds to borrowers at a higher interest rate set by the bank based on its comparative advantage in information production and risk bearing. However, over the last decade, commercial banks around the world have increasingly been relying on NII. Rubczynski (1997) maintains that financial intermediaries evolve over time through three phases. In phase one, most external business financing is raised via loans funded through savings. Banks are key players in the financial system and interest income is the primary source of bank income. Phase two occurs when banks begin to reduce their reliance on traditional intermediation activities and increase their OBS activities, with non-depository institutions offering near-bank products and investors holding more securities and equity. Financial liberalization and internationalization, advances in technology, reductions in information asymmetry and transaction costs, and competitive pressures bring about a decline in NIM.

NII measures the amount of noninterest bank revenue coming from service fees relative to the amount of noninterest costs incurred, including wages, expenses related to bank facilities, and loan loss expenses. In the past, NII has been negative for most banks since noninterest costs usually exceed noninterest income. However, this may be changing since bank fee income has been rising dramatically in recent years (Rose, 1993).

DeYoung and Rice (2004) document the substantial increase in noninterest income at U.S. banks during the last twenty years and show that noninterest income currently accounts for

approximately half of all operating income at U.S. commercial banks. In addition, the fee-generating activities tend to be traditional banking activities such as fees earned from the depositors on transactional and safe-keeping services (for instance, money orders and checking), cash management services (payroll processing or lock box), trust services to high net-worth retail clientele, and letters of credit to corporate clients. Ebrahim and Hassan (2005) find evidence that U.S. commercial banks between 1993 and 2002 continue to focus on their main intermediation activities while expanding into new noninterest activities.

It should be noted that the growing reliance on NII is not unique to the United States. Kaufman and Mote (1994) show that NII also increased in the banking sectors of almost all non-industrialized countries between 1980 and 1990. According to Smith, Stailora, and Wood (2002), NIM in European countries continuously declined over the 1989-1998 time period. During the same period, NII steadily increased from 0.94% to 1.15%. The relative importance of NII as a percentage of total operating income has grown from 32% in 1995 to 42% in 1998. The growth of NII is found to have a positive effect on bank profitability, though this has been limited by the increase in operating costs associated with the development of services generating noninterest income.

Aggeler and Feldman (1998) find that while NIM of U.S. banks rose by 12% from 1992 to 1997, the largest gain in earnings stemmed from NII. NII grew by 34% during this period, almost three times as fast as interest income. Davis and Touri (2000) observe a decline in the ratio of net interest income to NII for European Union states, from 2.9 in 1984-1987 to 2.3 in 1992-1995. The corresponding figures for the U.S. are from 2.6 to 1.8. The sources of non-interest income vary, however. In the United Kingdom and the United States, the primary source is fees and commissions, whereas in France, Italy, and Austria, the "other income" source on NII

is about as important as fees and commissions.

Rime and Stiroh (2001) study the production structure of Swiss banks for the 1996-1999 time period and conclude that excluding non-interest income items and trading and brokerage and portfolio management activities causes profit efficiency to be seriously understated. Thus far, I am not aware of any research examining the factors that influence NII for other countries. Examining this issue in the context of countries other than the United States and Europe will improve our understanding of this relatively new phenomenon. Theoretical explanations for the existence of OBS activities are discussed by James (1989), Benveniste and Berger (1987), and others discussed below.

Bank managers choose the level of nontraditional activities that equates the marginal revenue generated from these activities to their marginal cost. This idea is based on the Monti-Klein model (1972), which optimizes the income accounting identity (Profit = Interest Spread – Costs – Provisions for Loan Losses – Noninterest Expenses). The bank sets the marginal cost of managing an asset equal to the spread.

Leland and Pyle (1977), Diamond (1984), and Ramakrishnan and Thakor (1984) suggest there are economies of scale in monitoring at larger financial intermediaries. Hunter and Timme (1986) show that there are substantial operating economies of scale in bank production, and that larger banks can better compete with nontraditional financial firms. Their empirical results suggest that a bank's optimal mix of inputs is significantly related to both technical change and the scale of output. Larger banks have also used their operating efficiencies as a means of maintaining their competitive position in the deposit markets. Size, therefore, may be positively related to NII.

The level of OBS activities might also be related to the bank's debt structure. Diamond's

delegated monitoring model (1984) suggests that well-diversified financial intermediaries possess a capital structure that is mainly deposits with high leverage and a low probability of default, a prediction that is true for most intermediaries in reality. Since core deposits are attractive, less-costly source of funding, and relatively interest-rate insensitive, they are highly valued by banks. However, not all banks can obtain all the necessary deposits, and thus, have to resort to funding derived from other sources. Therefore, a bank's debt and deposit structure could affect its resource expenditure on traditional and OBS activities. It is quite possible that a bank may engage in more OBS activities if it has fewer core deposits. Berlin and Mester (1998) show that deposits act as inter-temporal contracts that smooth banks' cost of funds. Borrowers are protected from negative economic shocks and the contracts they have with bank lenders reduces the possibility of credit crunches. They argue that the weak growth of core deposits is one of the factors explaining the declining role of banks in the credit markets.

The moral hazard hypothesis (sometimes known as the leverage effect) in banking involves the problem of excessive risk taking when another agent bears part of the risk and cannot easily prevent that risk-taking. By increasing its financial leverage, a bank can enjoy additional benefits from subsidies it receives from deposit insurance. Banks increase financial leverage through OBS activities because they are not subject to capital requirements. Under this hypothesis, banks with relatively low capital tend to engage in more risky loan portfolios, resulting in higher non-performing loans on average. A similar theory proposed by Akerlof and Romer (1993) is the looting hypothesis in which managers of banks with low equity ratios tend to maintain riskier loan portfolios to boost short-term profits and enhance their status and the bank's stock price.

Greenbaum and Thakor (1987) model the borrowers' choice of whether to purchase

insurance or a standby letter of credit (SLC)[6] when banks are risk neutral, depositors are risk averse, and borrowers are either risk neutral or risk averse. The authors demonstrate that in the presence of information asymmetry concerning the quality of the borrower, there exists an equilibrium in which high-quality borrowers signal their low risk by purchasing SLCs. There also exists a fee schedule charged for the SLCs such that each borrower's utility maximizing choice of insurance coverage fully reveals to the bank and investors the default risk of the borrower. Therefore, the higher a borrower's credit rating, the more likely he or she is to purchase an SLC.

Using a different framework that focuses on the bank's choice of whether to make loans or issue SLCs, James (1989) theoretically shows that if the bank has risky debt outstanding, it may forego positive net present value investments if the benefit from undertaking the opportunity accumulates mainly to existing depositors. His model suggests that banks with riskier debt will engage more in OBS activities such as issuing more letters of credit. James also notes that borrowers who borrow using SLCs tend to be of lower default risk than those who do not.

On the contrary, there has been much evidence supporting the "diversification hypothesis" (also known as the "market discipline" hypothesis). Market discipline is said to prevail when depositors penalize riskier banks by requiring higher interest rates or by withdrawing their deposits when they notice the connection between bank risk and OBS activities. According to this view, fee-based earnings would make income more stable since fees are less sensitive to macroeconomic conditions and interest rates. In addition, fee-based products are supposed to reduce bank risk via diversification. Accordingly, we would expect banks with

[6] In an SLC-backed loan the bank underwrites the credit risk and the funds are obtained directly from investors. The bank earns fee income for this service and other services offered to the borrowers.

more OBS activities to have less overall risk as their revenues are more diversified.

Fama (1980, 1985) suggests that banks that have risky asset portfolios need to generate the expected returns to benefit from a diversified portfolio and to finance monitoring costs. In addition to taking deposits and making loans, banks could benefit by diversifying risk. Benveniste and Berger (1987) theoretically show that securitization with recourse may improve the selection of loans granted by reducing the moral hazard incentives associated with fixed-rate deposit insurance.[7] The more risk averse uninsured lenders are allocated with the securitized assets, while the less risk averse ones assume more of the risk. This allocation is shown to be a Pareto improving outcome whether or not deposit insurance is risk based.

Booth and Thakor (1991) theoretically examine the effect of banks' OBS activities (specifically loan commitments) on their asset portfolio risk and show that banks that have loan commitments have lower asset risk than banks that do not. The reduction of risk is the result of two primary sources. First, under a loan commitment, the customer is a safer borrower than in a spot lending agreement due to the fact that the commitment customer can be influenced to select a less risky project than a spot borrower. The bank pre-screens and chooses a potentially less risky borrower to lend to with a commitment loan than it would in a spot market. Second, they show that the bank will make spot loans to less risky borrowers if the bank's existing spot lending portfolio can be observed by its loan commitment customers. Thus, from theory, it seems that credit risk matters in addition to the level of bank capital.

The empirical evidence to support these hypotheses is mixed. Wood and Staikouras (2004) review various studies based on U.S. data and find that the results are mixed. On the one hand, Berger and Benveniste (1987) find that SLCs are negatively related to bank risk. They

[7] The buyer of a security with recourse has the choice of trading in his or her asset claim for a general bank claim should the purchased asset default. If the bank fails, the buyer has the option of keeping the asset.

also test the moral hazard hypothesis by studying whether failing banks are more likely to issue more SLCs and find that failing banks tend to issue less SLCs as banks approach failure. The authors interpret this finding as evidence for the market discipline hypothesis. Koppenhaver (1989) shows that OBS activities are negatively related to loan losses. Berger and Udell (1990) show an inverse relationship between bank risk and loan commitments. Avery and Berger (1990) find that portfolio risk and a bank's incentive to take risk are negatively related to loan commitments. Brewer et al. (1992) suggest that standby letters of credit are perceived by the market as risk-reducing activities.

Sackley et al. (1994) find evidence in support of the market discipline hypothesis for standby letters of credit and loan commitments, respectively. Similarly, Roger and Sinkey (1999) provide further evidence that U.S. commercial banks that are more likely to engage in OBS activities tend to be less risky, larger, and have fewer core deposits and smaller net interest margins. More recently, Allen and Jagtiani (2000), Smith et al (2003), and Gallo et al. (2003) provide additional evidence of diversification benefits at the individual bank or industry level. On the other hand, Avery and Berger (1988) provide evidence for the moral hazard hypothesis by showing that issuance of SLCs, which generate substantial fee income at U.S. banks, is positively related to bank risk. Similarly, James (1989) finds that undercapitalized banks tend to issue more SLCs than well-capitalized banks. Pennacchi (1988) finds that yield spreads on loan sales are directly related to the perceived risk of the selling bank. DeYoung and Roland (2001) argue that fee income generated from OBS activities may not have a stabilizing effect compared to fee income from traditional activities since overall income may become more volatile as a result of higher leverage. However, the increase in volatility is somewhat offset by an increase in profitability.

Stiroh (2003) shows that the move towards OBS activities by U.S. bank holding companies is not associated with better performance because the diversification benefits are more than offset by the increase in volatility from non-interest activities. The net result is a decline in financial performance. Stiroh (2004) finds that greater reliance on nontraditional activities in the U.S. banking industry is negatively related to lower risk-adjusted profits and positively related to risk. Furthermore, diversification benefits from OBS activities do not lead to a decline in the volatility of net operating revenue. Rather, this decrease in volatility reflects the reduction in volatility of net interest income.

Also, DeYoung and Rice (2004) argue that marginal increases in noninterest income are related to lower risk-return tradeoffs. Large banks generate relatively more income from OBS activities, while well-controlled banks rely less on noninterest income. Ebrahim et al. (2005) study a group of U.S. commercial banks between 1992 and 2002 and conclude that commercial banks continue to focus on their main intermediation activities while expanding into new OBS businesses. Their results indicate that while bank returns are positively related to both on-balance-sheet and OBS components of earnings, the significance level is higher for the OBS component. This suggests that the market views OBS activities as a signal for the bank's future growth. Most recently, Allen (2005) finds fee income generated by loan commitments increases both bank profit as well as bank risk, and that investors require banks to reward them for illiquidity risk in the commercial paper market (smaller banks must compensate them for this more than larger banks). Older studies indicate that diversification into nontraditional activities increases overall risks. For example, Boyd and Graham (1986) and Sinkey and Nash (1993) show that credit card lending (which generates fee income through securitization) produces higher, but more volatile, revenue as compared to traditional activities.

Outside the U.S., there are few papers investigating the diversification effect of OBS activities using mostly European data. Calcagnini et al. (2000) study financial convergence in the European Monetary Union (EMU) and find that the ratios of noninterest income to total bank income and assets have generally increased in recent years. Six of nine EMU country ratios of noninterest income to gross operating income have positive time trends that are significant at the 5% level. Smith et al. (2003) study 15 European countries and conclude that income generated from nontraditional banking activities is more volatile than interest income over time. However, the two income streams are inversely correlated, which leads to the conclusion that noninterest income stabilizes bank revenues. Rime and Stiroh (2003) find that failure to account for OBS activities as well as trading, brokerage, and portfolio management activities leads to substantially understated profit efficiency at large Swiss banks. Tortosa-Ausian (2003) studies the significance of OBS activities for cost efficiency at Spanish banks and concludes that average cost efficiency is improved when using a model that includes OBS activities. Casu and Girardone (2004) examine a group of large EU countries whose noninterest income increased dramatically in the 1990s and find that inclusion of OBS items results in an increase in estimated productivity for all countries in the sample. Esho et al. (2005) study Australian credit unions engaged in OBS activities and find that while overall those with a larger share of transaction fees generate more risks and fewer returns, those credit unions that also increase residential lending revenues reduce both risk and return.

Lastly, the level of a bank's involvement in OBS activities may be related to its profit from traditional activities as measured by ROE, ROA, or before tax profit (BTP). From accounting theory, one profitability ratio is a bank's before tax profit (BTP) divided by total assets (TA). It is likely that a bank's level of involvement in OBS activities is related to its

traditional profits as measured by NIM. Demirguc-Kunt et al. (1999) and Claessens (2001) employ regressions involving these variables in their study of bank profitability and find that countries with high interest margins tend to have low ratios of overheads to total assets (OV/TA). Since this ratio is defined as a bank's noninterest expense divided by total assets or overhead expense divided by total assets, a positive relationship between this ratio and NII is expected. The rationale is that since banks operating with high OV/TA are associated with lower NIM, they may choose to engage in more OBS activities in order to maintain the same level of profit or to stay in business. The ratio of loan loss provisions to total assets (LLP/TA) measures expenses related to credit risk inherent in granting loans and advances and should be as low as possible in a well-run bank. By similar reasoning, this ratio may be positively related to NII because LLP/TA is also a measure of management's efficiency in dealing with traditional activities. Therefore, it is important to include these factors as regressors in the NII regression equation.

In summary, the above analysis suggests that NII may be influenced by the following factors:

H3: NII = f (bank size, deposits, credit risk, interest rate risk, liquidity risk, loan loss provisions/total assets, overhead costs/total assets, and before tax profit/total assets)

To proxy for NII, I use the logarithm of the notional value of a bank's total OBS items as described before. For the explanatory variables, the following measures will be used. Bank size is measured by the logarithm of total assets. The logarithm of total deposits or total customer and short term funding is used to proxy for the bank's debt structure, as in Jiang et al. (2003). The ratio of customer deposits to total assets can also be constructed to proxy for this. BTP, OV,

and LLP, a measure of asset quality, are calculated from Bankscope data. With regard to bank risk, various ratios are employed. The ratio of liquid assets to customer and short-term funding is employed to proxy for interest rate risk. Net loans to total assets is a proxy for liquidity risk since it measures the percentage of bank assets tied up in loans. Loan loss reserves to gross loans, or loan loss provision to net interest revenue, is used to reflect credit risk. In short,

$$LNOB_{it} = C_i + \beta_1 LNTA_{it} + \beta_2 LNTD_{it} + \beta_3 LLRGL_{it} + \beta_4 LACSTF_{it} + \beta_5 NLTD_{it} + \beta_6 OVTA_{it} + \beta_7 LLPTA_{it} + \beta_8 BTPTA_{it} + v_{it} \quad (5)$$

where $LNOB_{it}$ is a proxy of NII as described and v_{it} is the error term. The following chart summarizes the above relationships.

Dependent Variable: NII	Proxy	Expected Signs
1. Bank size	LNTA	Positive
2. Deposits	LNTD	Negative
3. Credit risk	LLRGL	Positive/Negative
4. Interest rate risk	LACSTF	Positive/Negative
5. Liquidity risk	NLTD	Positive/Negative
6. Overhead costs	OVTA	Positive
7. Loan loss provisions	LLPTA	Positive
8. Before-tax profit	BTPTA	Positive

III. Data and Methods

I use a sample of commercial banks from the countries classified as financially liberalized by Kaminsky and Schmukler (2003) and match them with those published in a special issue of the Journal of Finance and Banking (2005). Unlike those examined in previous studies, which either lumped countries together based on geographical regions and focused on broad issues, my study concentrates exclusively on liberalized markets. This sample selection is important because it eliminates some of the concerns about significant differences in financial liberalization policies among banks in many less advanced nations. Bonin et al. (2004) also chose to exclude very small transition economies in their study of bank privatization, perhaps for the same fear that it would reduce the power of the statistical analysis.

The primary source of data is Bankscope, a standardized collection of bank statements put together from reports that banks issue in accordance with reporting requirements established in these countries. Bankscope contains data for approximately 15,000 banks worldwide. The May 2005 issue of Bankscope is used in this study, which is the most recent issue as of the start of this study. Balance sheet and income statement data are obtained for commercial banks from Bankscope. Other types of banks, such as central, investment, or development banks are not included because they are not primarily engaged in financial intermediation. The study sample contains 3,593 commercial banks in 28 financially liberalized countries. All ratios regarding bank-specific characteristics are calculated using the standardized global reporting format supplied by Bankscope to make sure that they are comparable. Table 1A shows the summary statistics for the variables in Equation 4 and Table 1B reports the summary statistics for those in Equation 5. Table 2 displays the graphical representations of their median values.

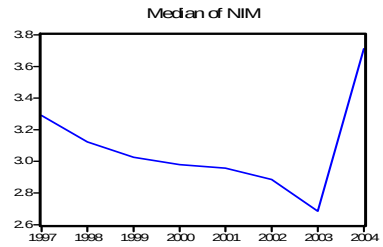
Table 1A: Summary Statistics for Equation 4*

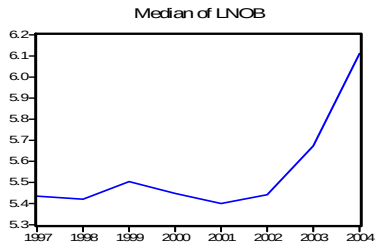
	NIM	BANKHI	NIEAA	ETA	LACSTF	LLRGL	COV	LNTA	LNLO	CFTA	LNOB
Mean	4.366396	0.001337	5.141631	12.42489	31.29835	4.940900	163.6798	7.540325	6.731797	13.40815	5.397034
Median	3.012000	1.13E-06	3.269000	8.151500	17.67900	2.458000	35.67422	7.513464	6.821006	9.750000	5.484780
Maximum	918.3090	1.000000	287.5000	100.0000	988.5710	750.0000	96610.50	14.02575	13.32987	100.0000	13.57964
Minimum	-300.0000	0.000000	-27.13000	-531.9460	-50.00000	-0.674000	-978.1902	-0.681219	-4.135167	-56.77900	-4.422849
Std. Dev.	10.26273	0.013953	8.304394	16.42706	50.29333	10.54688	1144.439	2.183891	2.512476	13.24897	2.656904
Skewness	43.55006	41.38254	12.56202	-0.169026	7.918794	27.71689	54.12895	0.097186	-0.336450	3.645190	-0.108045
Kurtosis	3670.732	2331.425	286.7762	90.13711	103.1328	1719.884	4158.308	2.750209	3.349628	19.68556	3.200207
Jarque-Bera	1.02E+10	4.26E+09	61793307	6009219.	6952663.	1.83E+09	9.05E+09	79.31410	445.2931	93499.24	59.16406
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	79643.06	25.17155	93953.03	235998.3	508160.0	73599.65	2056964.	143281.2	125110.5	90746.38	88311.66
Sum Sq. Dev.	1920998.	3.663678	1260091.	5125226.	41065116	1656871.	1.65E+10	90622.99	117312.2	1187846.	115501.6
Observations	18240	18820	18273	18994	16236	14896	12567	19002	18585	6768	16363

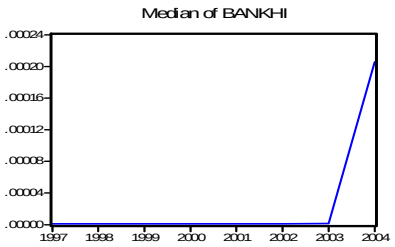
Table 1B: Summary Statistics for Equation 5*

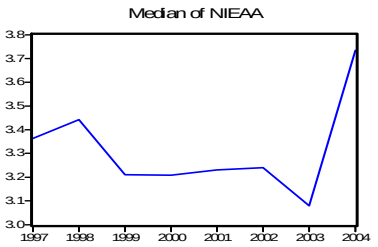
	LNOB	LNTA	LNTD	LLRGL	LACSTF	NLTD	NIM	OVTA	LLPTA	PBTTA
Mean	5.397034	7.540325	7.106821	4.940900	31.29835	52.22582	4.366396	0.042663	0.009967	0.010069
Median	5.484780	7.513464	7.177007	2.458000	17.67900	56.85000	3.012000	0.026766	0.003628	0.009058
Maximum	13.57964	14.02575	13.53799	750.0000	988.5710	99.99000	918.3090	9.164234	5.784672	5.829928
Minimum	-4.422849	-0.681219	-6.214608	-0.674000	-50.00000	-20.75400	-300.0000	-0.097725	-1.792368	-3.146245
Std. Dev.	2.656904	2.183891	2.371424	10.54688	50.29333	24.20835	10.26273	0.105481	0.061544	0.085523
Skewness	-0.108045	0.097186	-0.332204	27.71689	7.918794	-0.487022	43.55006	43.10769	54.11570	14.83157
Kurtosis	3.200207	2.750209	3.640543	1719.884	103.1328	2.475029	3670.732	3219.725	4759.066	1439.985
Jarque-Bera	59.16406	79.31410	664.2097	1.83E+09	6952663.	958.4142	1.02E+10	7.88E+09	1.63E+10	1.58E+09
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	88311.66	143281.2	133011.3	73599.65	508160.0	981166.5	79643.06	779.5751	171.8419	185.0337
Sum Sq. Dev.	115501.6	90622.99	105246.7	1656871.	41065116	11009423	1920998.	203.2969	65.30016	134.4040
Observations	16363	19002	18716	14896	16236	18787	18240	18273	17241	18377

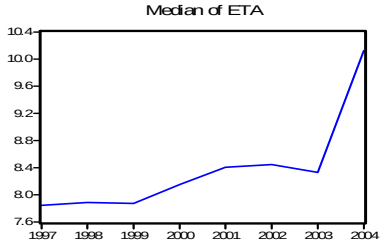
Table 2: Summary Statistics of all Variables

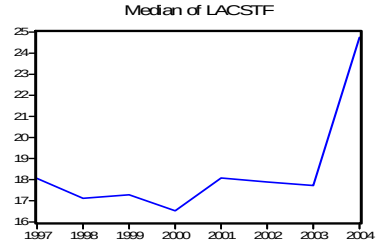


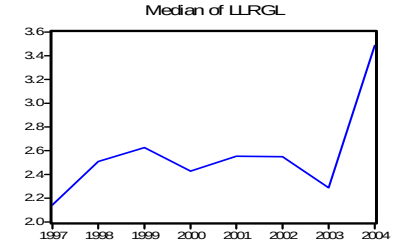


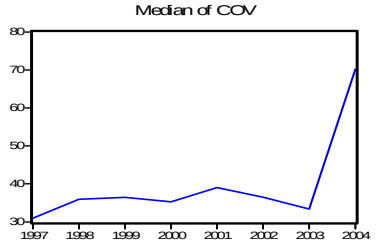


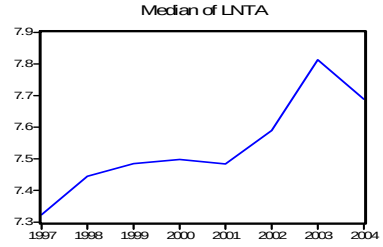


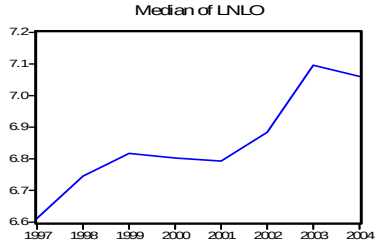


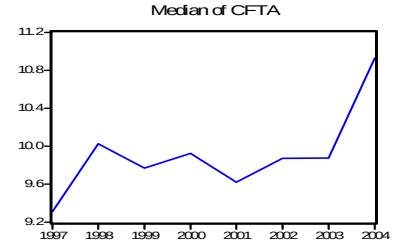


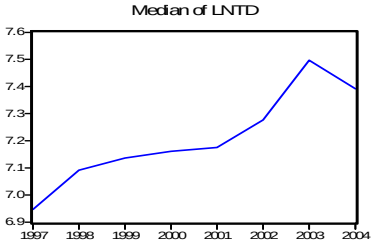


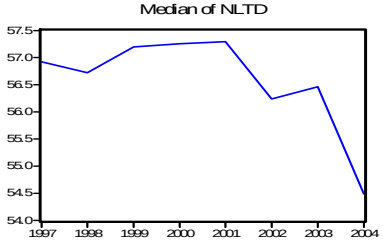


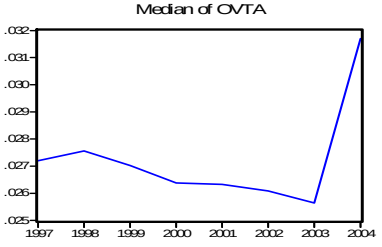


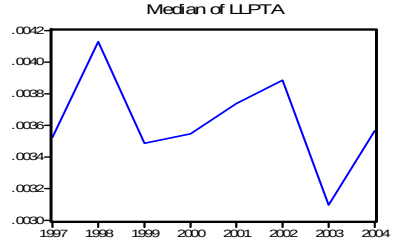


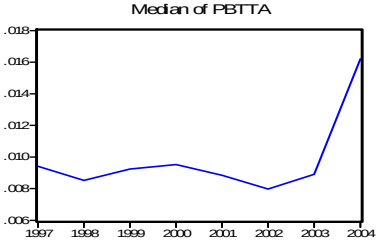












Equations 4 and 5 are to be jointly estimated as a system, as explained below. Appendix I provides some additional statistics about the data set.

The data in Table 2 confirm the common observation in the literature that NII as proxied by LNOB has been steadily increasing in recent years, from 5.45 in 1997 to 6.1 in 2004. Also, NIM gradually decreases from 3.3 in 1997 to 2.7 in 2003 before skyrocketing in 2004. There appears to be a weak inverse relationship between NII and NIM during the period. This observation is in accordance with the data on a few European countries indicating that NIM and NIM move in opposite directions (Lane et al., 1993; Smith et al., 2003; Gischer and Jutner, 2004).

I first examined the correlation matrix for these variables and found that NIM is positively correlated with NII. However, this only indicates an association between the two variables but does not help predict their relationship, if any. We will examine this issue in the Empirical Results section. A Granger Causality Test, discussed also in the following section, for NIM and NII was also conducted, indicating a two way causal relationship between NIM and NII. That is, based on the data we cannot reject the hypothesis that NIM Granger causes NII and vice versa. For the empirical analysis, the following equations of interest are estimated jointly[8]:

$$NIM_{it} = C_i + \beta_1 BANKHI_{it} + \beta_2 NIEAA_{it} + \beta_3 ETA_{it} + \beta_4 LACSTF_{it} + \beta_5 LLRGL_{it} + \beta_6 COV_{it} + \beta_7 LNTA_{it} + \beta_8 LNLO_{it} + \beta_9 CFTA_{it} + \beta_{10} LNOB_{it} + \varepsilon_{it} \quad (4^*)$$

And

$$LNOB_{it} = C_i + \beta_1 LNTA_{it} + \beta_2 LNTD_{it} + \beta_3 LLRGL_{it} + \beta_4 LACSTF_{it} + \beta_5 NLTD_{it} + \beta_6 OVTA_{it} + \beta_7 LLPTA_{it} + \beta_8 BTPTA_{it} + v_{it} \quad (5^*)$$

[8] The variables in equations (4*) and (5*) are defined on pages 32 and 44, respectively.

Note that NIM is excluded from Equation 5* because we do not have a specific theory suggesting that NIM should be one of the explanatory variables for NII. On the other hand, the cross-subsidization literature mentioned posits that customers at banks that engage in OBS activities may receive lower rates, ie. NIMs, due to cross-subsidization of bank activities since the banks may also earn fee and commission income such as consultation fees or underwriting of securities from many of these customers. Thus, it seems that an increase in NII may have an influence on NIM, but the reverse is not theoretically supported. I also ran the regression equations with NIM in Equation 5* to see if there would be any differences and obtained essentially the same results.

On the surface these equations appear to be *seemingly unrelated* to each other as they have different independent and dependent variables. However, since they are using the same data, the error terms between the two equations may be related.[9] This contemporaneous correlation between ε_{it} and v_{it} is due to the fact that these errors contain the influence of factors that have been omitted from the equations. Since the firms are similar in many respects, it is likely that the effect of the omitted factors on NIM and NII by one firm will be similar to the impact on NIM and NII by another firm. If this is the case, ε_{it} and v_{it} will be capturing similar effects and will be correlated. One solution to this problem is to estimate the two equations *jointly* using SUR methods.

SUR estimators are superior to Ordinary Least Squares estimators, especially when the sets of equations are theoretically related (Johnston, 1984). Hayashi (2000) shows that as a special case of the GMM, SUR is more precise than OLS because SUR utilizes the information

[9] This feedback problem was pointed out by the examining committee and the method of Seemingly Unrelated Regressions was first suggested.

on the correlation between the error terms by transforming the errors so that they have the same variance and are uncorrelated. The transformations are as follows: (1) Estimate the equations separately using OLS and use the residuals from this step to estimate the variances. (2) Estimate the two equations jointly using Generalized Least Squares using the estimates from Step 1. It should be noted that SUR reduces to OLS if the errors are uncorrelated or if the regressors are identical in the two equations (Green, 2003). In addition, SUR estimators are best linear unbiased estimators under most conditions. The joint analysis of the sets of regression equations rather than equation by equation analysis produces more accurate estimates and predictions than OLS does. For these reasons, I jointly estimate the above equations with SUR as the primary method.

GMM and Granger Causality Tests are used to check the results and to examine other issues. Since GMM provides an alternative to almost all of other estimators, it has recently been used in various panel data applications. The optimal GMM estimator is more efficient than other common estimators in the presence of heteroskedasticity. GMM can also be used to account for serial correlation of unknown form. In panel data, the GMM estimator has been shown to be more efficient than the fixed effects or random effects estimators if the strict exogeneity assumption of the regressors fails. Theoretically, it never hurts to always use GMM. However, its gain in efficiency is not known in small samples (Hayashi, 2000). Since my pooled data set is relatively large, I include the GMM estimates adjusted for heteroskedasticity and cross section correlations along with the SUR estimates for comparison purposes.

Granger causality is a method for determining whether one series is useful in predicting another. While regression analysis reflects correlations, Granger Causality indicates something about the causality among the variables. A series X Granger-causes Y if it can be shown,

through the F tests, that those *X* values provide statistically significant information on future values of *Y*. A simple test for Granger Causality is to regress X on lagged values of itself and lagged values of Y. If the lagged values of Y are jointly significant, Y is said to Granger cause X. If one of more lagged Y values are not significant then Y is said not to Granger cause X. I use the recommended two lags for annual data in this study (Wooldridge, 2000) when performing these tests. I also tested the series with other lags and obtained virtually identical results. Prior to the estimation, all variables are tested for the presence of nonstatitionarity using the Panel Unit Root tests developed by Im, Pasaran and Shin (2003), Maddala-Wu (2001), and Choi (1999). The results, significant at the 1% significance level, indicate that all tested series do not contain any unit root.

IV. Empirical Results

Table 3A reports the SUR results.

Table 3A: Determinants of NIM and NII

Note: *, **, and *** denote significance levels of 1, 5, and 10 percent, respectively.
Total system (unbalanced) observations 13,846
Dependent variables: NIM (Equation 4*) and LNOB (Equation 5*)
NIM is defined as (Interest Income – Interest Expense) / Total Earning Assets

	SUR (GLS) Coefficient	Standard Error	GMM Coefficient	Standard Error
Intercept	2.454105*	0.270346	2.461084*	0.0000
BANKHI	2.159628	1.604505	2.160109***	0.0804
NIEAA	0.633604*	0.016856	0.633460*	0.0000
ETA	0.170313*	0.018636	0.170269*	0.0000
LACSTF	-0.013433*	0.001936	-0.013429*	0.0001
LLRGL	-0.073750*	0.013209	-0.073756*	0.0004
COV	0.000959*	0.000152	0.000959*	0.0004
LNTA	-0.638341*	0.077182	-0.640624*	0.0017
LNLO	0.374917*	0.071897	0.374243**	0.0235
CFTA	-0.104888*	0.017698	-0.104885*	0.0000
LNOB	0.192445*	0.028142	0.195400*	0.0000
C(12)	-2.434612*	0.093803	-2.434805*	0.0000
LNTA	1.631717*	0.032578	1.631572*	0.0000
LNTD	-0.666209*	0.032347	-0.666056*	0.0000
LLRGL	0.006134**	0.002566	0.006140***	0.0938
LACSTF	-0.002312*	0.000521	-0.002312*	0.0017
NLTD	0.001666***	0.000879	0.001668	0.1244
OVTA	5.332053*	0.370521	5.331940*	0.0000
LLPTA	2.686066*	0.520480	2.688266**	0.0453
PBTTA	5.504960*	0.412376	5.509203*	0.0000
Adjusted R-Square (E. 4* and E. 5*)		0.430933 0.625251		N/A

Equation (4*): NIM = C (1) + C (2) * BANKHI + C (3) * NIEAA + C (4) * ETA + C (5) * LACSTF + C (6) * LLRGL + C (7) * COV + C (8) * LNTA + C (9) * LNLO + C (10) * CFTA + C (11) * LNOB

Equation (5*): LNOB = C (12) + C (13) * LNTA + C (14) * LNTD + C (15) * LLRGL + C (16) * LACSTF + C (17) * NLTD + C (18) * OVTA + C (19) * LLPTA + C (20) * PBTTA

According to Table 3A, most of the SUR and GMM regression coefficients have the expected signs and are quite similar. Market concentration as proxied by BANKHI is positively correlated with NIM, but not statistically significant at 5% level, according to both SUR and GMM estimates. The GMM estimate for this coefficient is significant at a 10% level, however.

Operating cost, NIEAA, has a significant direct effect on NIM, suggesting that banks with high operating costs choose to work with higher NIM. More risk averse banks, as measured by ETA, charge higher margins to compensate for the higher costs of equity financing. Interest rate risk, LACSTF, is inversely related to NIM since banks require lower margins if they can obtain more short term assets.

The coefficient on credit risk, LLRGL, has an unexpected negative sign. Theory suggests that firms with higher credit risk should work with higher NIM to maintain the same profit level. The unexpected result could be due to a variety of reasons related to either model specification or a biased definition of the outcome variable. Prior studies employing this ratio have found similar contradictions. In Tables 4A and 5A, we will consider two variations of this ratio, MNIM and MNIM2.

The rest of the coefficients carry the predicted signs. The covariance between credit risk and interest rate risk, COV, is directly related to NIM. Firms with high levels of market and credit risks charge higher rates. Size, LNTA, is negatively correlated with NIM. This may suggest the presence of agency problems or other inefficiencies associated with management or the lack of economies of scale and synergy. As expected, the more loans a bank generates, the higher its NIM. This is indicated by the significant positive coefficient for total volume of credit, LNLO.

Finally, in Equation 4*, OBS activities have a direct impact on NIM. This result

contrasts with the prediction from the cross-subsidization literature and the casual observation from data on a few European countries that NII has been growing at NIM expense. A possible explanation for the direct relationship between NIM and NII is that banks in the study sample, particularly those in financially liberally markets, are able to provide nontraditional services to traditional customers.[10] In the U.S., for instance, banks have obtained a significant amount of their noninterest revenue for providing technology and consulting services to current customers and from adopting securitized lending practices that generate origination and serving fees. In addition, while these banks have also increased their interest payments, they have also enlarged their fees for deposit and related services. Radecki (1999) shows that payments services constitute about one third to two-fifths of the combined operating income at U.S. banks, and predicts that banks will be able to increase their fees as payment services are becoming more efficient.

The second half of Table 3A presents the results for Equation 5*, in which LNOB is the dependent variable. The SUR and GMM estimates are as predicted and are strikingly similar with varying degrees of statistical significance. Bank size, measured by LNTA, matters when it comes to OBS activities. As shown by Hunter and Timme (1986) and others, there are economies of scale in providing nontraditional services to consumers. The level of core deposits is negatively related to OBS activities, as also found in Rogers and Sinkey (1999). This may stem from the fact that banks with more core deposits tend to have higher NIMs, thus are less likely to engage in nontraditional activities (cross-subsidization literature).

Credit risk, LLRGL, is found to increase with banks' level of involvement in nontraditional, fee generating business. The moral hazard hypothesis is supported by the data.

[10] This explanation is due to the dissertation chair. Some authors provide alternative explanations for the potential positive effect of NII on NIM. Chapter 3 briefly discusses this possibility.

According to this hypothesis, banks increase financial leverage through riskier OBS activities which result in higher non-performing loans, in line with James' (1989) finding that banks with riskier debt tend to engage in more nontraditional activities such as issuing more letters of credit. It may also indicate that banks that operate with riskier loan portfolios must increase their non-interest income activities to compensate for the potential loss in the traditional line of business.

The significant negative sign on the interest rate risk coefficient, LACSFT, provides some support for the diversification or market discipline hypothesis since revenues from OBS activities are more diversified and relatively insensitive to macroeconomic conditions. The proxy for liquidity risk, NLTD, suggests that firms with higher liquidity risk, or higher levels of net loans to total assets, are more likely to participate in fee-generating activities. However, based on the GMM estimate, the coefficient is not statistically significant at a 10% level.

The last three coefficients on the accounting ratios OVTA, LLPTA, and PBTTA suggest a logical relationship between these variables and NII. Intuitively, we expect to see banks operating with high ratios of overhead and total assets or risky loan portfolios (those with elevated levels of loan loss provisions relative to total assets) to engage in other non-interest earning activities to compensate for the potential losses in the traditional line of business. The regression results fully support this conjecture. In two related studies, Demirguc et. al (1999) and Claessens (2001) found that these ratios are negatively related to NIM, but they did not examine their relationship with NII. My results compliment these and other studies in the area. Lastly, the ratio of before tax profit to total assets, PBTTA, is directly related to the level of banks' involvement in OBS activities as the extra revenues generated should boost bank total profit.

Table 3B shows Granger Causality Tests on all series in Equation 4*. Note that for the

Granger Causality tests the asterisks indicate that the null hypothesis is rejected at the 1% (*) or 5% (**) significance level. Also, the reported statistics are for equations using two lags. Tests with one lag were also performed and the results were essentially unchanged.

Table 3B: Pairwise Granger Causality Tests for NIM
Sample: 1997-2004

Null Hypothesis:	Obs	F-Statistic	Probability
BANKHI does not Granger Cause NIM	11269	1.35436	0.25816
NIM does not Granger Cause BANKHI		0.17577	0.83881
NIEAA does not Granger Cause NIM	11387	67.5320*	7.0E-30
NIM does not Granger Cause NIEAA		106.900*	1.0E-46
ETA does not Granger Cause NIM	11394	24.2072*	3.2E-11
NIM does not Granger Cause ETA		3.37313**	0.03432
LACSTF does not Granger Cause NIM	9634	3.26675**	0.03817
NIM does not Granger Cause LACSTF		19.6150*	3.2E-09
LLRGL does not Granger Cause NIM	8780	11.8022*	7.6E-06
NIM does not Granger Cause LLRGL		11.9980*	6.3E-06
COV does not Granger Cause NIM	7324	1.88205	0.15235
NIM does not Granger Cause COV		0.52288	0.59284
LNTA does not Granger Cause NIM	11399	35.8494*	3.0E-16
NIM does not Granger Cause LNTA		0.23230	0.79272
LNLO does not Granger Cause NIM	11140	17.5620*	2.4E-08
NIM does not Granger Cause LNLO		6.05666*	0.00235
CFTA does not Granger Cause NIM	3292	18.5196*	1.0E-08
NIM does not Granger Cause CFTA		6.51527*	0.00150
LNOB does not Granger Cause NIM	9535	10.7323*	2.2E-05
NIM does not Granger Cause LNOB		5.02698*	0.00658

The tests confirm most of the SUR and GMM results. For instance, we cannot reject the null hypothesis that bank concentration has no impact on NIM and vice versa. NIEAA, ETA,

LACSTF, and LLRGL do Granger cause NIM at a 5% significance level or better. The causality runs both ways. NIM also Granger causes these variables. COV is not found to Granger cause NIM. LNTA, LNLO, CFTA, LNOB also Granger cause NIM. Similarly, in Table 3C, all of the variables in Equation 5* are found to Granger cause LNOB, with the exception of PBTTA. The causation is mostly bidirectional. I also experimented with other lags and the results are largely unchanged.

Table 3C: Pairwise Granger Causality Tests for LNOB
Sample: 1997 2004

Null Hypothesis:	Obs.	F-Statistic	Probability
LNTA does not Granger Cause LNOB	9939	111.375*	1.5E-48
LNOB does not Granger Cause LNTA		6.42761*	0.00162
LNTD does not Granger Cause LNOB	9892	61.0573*	4.4E-27
LNOB does not Granger Cause LNTD		3.27279**	0.03794
LLRGL does not Granger Cause LNOB	7758	22.9061*	1.2E-10
LNOB does not Granger Cause LLRGL		2.07889	0.12514
LACSTF does not Granger Cause LNOB	8883	5.24144*	0.00531
LNOB does not Granger Cause LACSTF		14.2807*	6.4E-07
NLTD does not Granger Cause LNOB	9892	5.69754*	0.00337
LNOB does not Granger Cause NLTD		10.8335*	2.0E-05
NIM does not Granger Cause LNOB	9535	5.02698*	0.00658
LNOB does not Granger Cause NIM		10.7323*	2.2E-05
OVTA does not Granger Cause LNOB	9537	21.4825*	4.9E-10
LNOB does not Granger Cause OVTA		16.9068*	4.7E-08
LLPTA does not Granger Cause LNOB	9095	11.8183*	7.5E-06
LNOB does not Granger Cause LLPTA		0.36745	0.69251
PBTTA does not Granger Cause LNOB	9584	0.16134	0.85100
LNOB does not Granger Cause PBTTA		3.34288**	0.03538

Table 4A presents the results for the equation using MNIM as the dependent variable.

Table 4A: Determinants of NIM and NII

Note: *, **, and *** denote significance levels of 1, 5, and 10 percent, respectively.
Dependent variables: MNIM (Equation 4*) & LNOB (Equation 5*)
Total system (unbalanced) observations 13,798
MNIM is defined as (Interest Income – Interest Expense) / Total Assets

	SUR (GLS) Coefficient	Standard Error	GMM Coefficient	Standard Error
Intercept	0.023182*	0.001697	0.023181*	0.003320
BANKHI	0.013962	0.009991	0.013962***	0.007410
NIEAA	0.004526*	0.000106	0.004526*	0.000417
ETA	0.001104*	0.000116	0.001104*	0.000190
LACSTF	-0.000115*	1.21E-05	-0.000115*	2.47E-05
LLRGL	-0.000482*	8.53E-05	-0.000482*	0.000136
COV	6.95E-06*	9.70E-07	6.95E-06*	2.26E-06
LNTA	-0.005462*	0.000489	-0.005462*	0.000956
LNLO	0.003647*	0.000460	0.003647*	0.000829
CFTA	-0.000499*	0.000110	-0.000499*	0.000170
LNOB	0.000971*	0.000176	0.000970*	0.000250
C(12)	-2.434813*	0.093804	-2.434805*	0.124097
LNTA	1.631568*	0.032578	1.631572*	0.043620
LNTD	-0.666053*	0.032347	-0.666056*	0.044666
LLRGL	0.006140**	0.002566	0.006140***	0.003664
LACSTF	-0.002312*	0.000521	-0.002312*	0.000735
NLTD	0.001668***	0.000879	0.001668	0.001085
OVTA	5.331947*	0.370522	5.331940*	1.248549
LLPTA	2.688318*	0.520481	2.688266**	1.342601
PBTTA	5.509304*	0.412377	5.509203*	0.884154
Adjusted R Square (E. 4* & E. 5*)		0.524817 0.625530		N/A

Equation (4*): MNIM = C (1) + C (2) * BANKHI + C (3) * NIEAA + C (4) * ETA + C (5) * LACSTF + C (6) * LLRGL + C (7) * COV + C (8) * LNTA + C (9) * LNLO + C (10) * CFTA + C (11) * LNOB

Equation (5*): LNOB = C (12) + C (13) * LNTA + C (14) * LNTD + C (15) * LLRGL + C (16) * LACSTF + C (17) * NLTD + C (18) * OVTA + C (19) * LLPTA + C (20) * PBTTA

Table 4B shows the associated Granger Causality tests.

Table 4B: Pairwise Granger Causality Tests
Sample: 1997-2004

Null Hypothesis:	Obs	F-Statistic	Probability
BANKHI does not Granger Cause MNIM	11161	0.52610	0.59092
MNIM does not Granger Cause BANKHI		0.15470	0.85667
NIEAA does not Granger Cause MNIM	11242	43.3736*	1.7E-19
MNIM does not Granger Cause NIEAA		795.915*	0.00000
ETA does not Granger Cause MNIM	11246	3.11725**	0.04432
MNIM does not Granger Cause ETA		0.97405	0.37758
LACSTF does not Granger Cause MNIM	9541	22.8258*	1.3E-10
MNIM does not Granger Cause LACSTF		0.61721	0.53947
LLRGL does not Granger Cause MNIM	8725	24.0681*	3.8E-11
MNIM does not Granger Cause LLRGL		7.61095*	0.00050
COV does not Granger Cause MNIM	7286	12.4137*	4.1E-06
MNIM does not Granger Cause COV		3.22128**	0.03996
LNTA does not Granger Cause MNIM	11251	16.8392*	5.0E-08
MNIM does not Granger Cause LNTA		1.68599	0.18531
LNLO does not Granger Cause MNIM	11013	110.853*	2.2E-48
MNIM does not Granger Cause LNLO		5.32402*	0.00489
CFTA does not Granger Cause MNIM	3223	14.3030*	6.5E-07
MNIM does not Granger Cause CFTA		2.43022***	0.08818
LNOB does not Granger Cause MNIM	9459	60.3202*	9.3E-27
MNIM does not Granger Cause LNOB		35.4390*	4.6E-16

As discussed previously, the difference between this ratio and NIM is that the denominator of MNIM is total assets instead of total interest earning assets. MNIM was hypothesized to improve the precision of the estimates as its denominator includes the effect of OBS activities since total assets equals to total earning assets plus total noninterest earning assets. The results are similar to those in Table 3A.

All coefficients have the same signs, but slightly different estimates and significance levels. Bank concentration, BANKHI, is again not significant at 5% level in both SUR and GMM estimates. It is significant at the 10% level based on the GMM estimate, as in Table 3A. Other variables have virtually identical effects on LNOB as those in Table 3B. The R squared values are slightly higher, suggesting better fit. Granger Causality Tests are also performed on these series. The results, reported in Table 4B, are basically the same as those shown in Table 3B. BANKHI once again does not Granger cause MNIM, and vice versa. The other variables are found to strongly Granger cause MNIM.

Table 5A displays the regression results where MNIM2 is the response variable. It was argued that regressions using MNIM2, defined as net interest income to total revenue, should yield most reliable estimates since the ratio's denominator captures the influence of bank OBS activities more effectively than total assets since total revenue includes net interest income and noninterest income. This hypothesis was first proposed by Cates (1996), but has not been implemented in any empirical work. Regression results from Table 5A indicate that all coefficients now carry the predicted signs with lower statistical significance in general.

It is important to note that the coefficient on LLRGL is now positively related to NIM, a result that is more consistent with theories than those shown in Tables 3A and 4A. Banks faced with higher credit risk, proxied by LLRGL, must charge higher NIM. However, concentration once again has an insignificant effect on NIM, according to the SUR estimate. NIEAA and LLRGL are no longer meaningfully related to NIM, even though they carry the correct signs. All GMM coefficients have the right signs with slightly less statistical significance. Therefore, it appears that regressions utilizing performance ratios with total revenue as the denominator yield estimates that are more in agreement with theory.

Table 5A: Determinants of NIM and NII

Note: *, **, and *** denote significance levels of 1, 5, and 10 percent, respectively.
Dependent variables: MNIM2 (Equation 4*) & LNOB (Equation 5*)
Total system (unbalanced) observations 13,798
MNIM2 is defined as (Interest Income – Interest Expense) / Total Revenue

	SUR (GLS) Coefficient	Standard Error	GMM Coefficient	Standard Error
Intercept	0.452833*	0.017221	0.455188*	0.033589
BANKHI	0.146380	0.101396	0.146533*	0.037168
NIEAA	0.001466	0.001071	0.001419	0.003812
ETA	0.008002*	0.001177	0.007987*	0.001562
LACSTF	-0.000277**	0.000123	-0.000276	0.000219
LLRGL	0.000177	0.000866	0.000174	0.001142
COV	3.64E-05*	9.85E-06	3.63E-05***	1.87E-05
LNTA	-0.081614*	0.004962	-0.082385*	0.012441
LNLO	0.064577*	0.004670	0.064341*	0.010613
CFTA	-0.003288*	0.001118	-0.003287**	0.001466
LNOB	0.004512**	0.001789	0.005520*	0.002060
C(12)	-2.433178*	0.093799	-2.434805*	0.124097
LNTA	1.632838*	0.032576	1.631572*	0.043620
LNTD	-0.667364*	0.032345	-0.666056*	0.044666
LLRGL	0.006130**	0.002566	0.006140***	0.003664
LACSTF	-0.002318*	0.000521	-0.002312*	0.000735
NLTD	0.001645***	0.000879	0.001668	0.001085
OVTA	5.332741*	0.370502	5.331940*	1.248549
LLPTA	2.677282*	0.520452	2.688266**	1.342601
PBTTA	5.496783*	0.412354	5.509203*	0.884154
		0.186116		
Adjusted R Square (E. 4* & E. 5*)		0.625251		N/A

Equation (4*): MNIM = C (1) + C (2) * BANKHI + C (3) * NIEAA + C (4) * ETA + C (5) * LACSTF + C (6) * LLRGL + C (7) * COV + C (8) * LNTA + C (9) * LNLO + C (10) * CFTA + C (11) * LNOB

Equation (5*): LNOB = C (12) + C (13) * LNTA + C (14) * LNTD + C (15) * LLRGL + C (16) * LACSTF + C (17) * NLTD + C (18) * OVTA + C (19) * LLPTA + C (20) * PBTTA

Table 5B shows the familiar Granger causality results. Bank concentration again does not seem to Granger cause MNIM2. Other variables (except LNOB) are related to MNIM2 in a Granger sense.

Table 5B: Pairwise Granger Causality Tests
Sample: 1997-2004

Null Hypothesis:	Obs	F-Statistic	Probability
BANKHI does not Granger Cause MNIM2	11152	1.34743	0.25995
MNIM2 does not Granger Cause BANKHI		0.08852	0.91529
NIEAA does not Granger Cause MNIM2	11233	28.8561*	3.2E-13
MNIM2 does not Granger Cause NIEAA		16.0177*	1.1E-07
ETA does not Granger Cause MNIM2	11237	23.9433*	4.2E-11
MNIM2 does not Granger Cause ETA		29.6294*	1.5E-13
LACSTF does not Granger Cause MNIM2	9539	17.5813*	2.4E-08
MNIM2 does not Granger Cause LACSTF		24.8667*	1.7E-11
LLRGL does not Granger Cause MNIM2	8725	17.1620*	3.6E-08
MNIM2 does not Granger Cause LLRGL		2.22668	0.10795
COV does not Granger Cause MNIM2	7286	50.1718*	2.3E-22
MNIM2 does not Granger Cause COV		10.9094*	1.9E-05
LNTA does not Granger Cause MNIM2	11242	6.88088*	0.00103
MNIM2 does not Granger Cause LNTA		4.54368**	0.01065
LNLO does not Granger Cause MNIM2	11010	11.5286*	1.0E-05
MNIM2 does not Granger Cause LNLO		2.84387***	0.05824
CFTA does not Granger Cause MNIM2	3222	15.2881*	2.5E-07
MNIM2 does not Granger Cause CFTA		0.98334	0.37417
LNOB does not Granger Cause MNIM2	9456	0.73239	0.48079
MNIM2 does not Granger Cause LNOB		7.92991*	0.00036

V. Conclusions

This paper analyzes the effects of various factors on bank interest margin and its nontraditional counterpart, noninterest income using a system estimation approach for 3593 commercial banks in a group of 28 financially liberalized countries for the period between 1997 and 2004. The empirical results generally suggest that NIM is directly influenced by operating costs, risk aversion, credit risk, the interaction between interest rate risk and bank risk, bank size, volume of credit, and NII. NIM is negatively related to interest rate risk and capital adequacy. NII is found to correlate positively with NIM, total assets, credit risk, liquidity risk, overhead expenses, and pretax profit. With respect to NII, the variable is inversely related to the level of bank deposits and interest rate risk. The influence of bank concentration on NIM and NII is positive and insignificant.

While most of the regression results obtained are as hypothesized in H1, H2, and H3, a few are at odds with the proposed hypotheses. Although the results generally indicate that NIM is related to operating costs, risk aversion, volatility of interest rates, credit risk, the interaction between interest rate risk and credit risk, size of deposits and loans generated, total volume of credit, capital, the predicted negative relationship between NIM and NII and the expected positive influence of market structure on NIM are not supported by the data. The nonexistence of a significant connection between the market concentration and NIM variables may stem from the fact that no one single firm, however concentrated, can effectively alter market outcomes in a globally integrated financial market.

The finding that NII exerts a positive impact on NIM questions the common belief that banks tend to engage in more OBS activities when their intermediation-based profits are low to

compensate for potential revenue loss. Rather, the data suggest an important benefit of bank involvement in nontraditional activities since they can augment NIM by allowing banks to offer traditional customers with more banking options. This is the first study to my knowledge to offer empirical support for this conjecture. In a related study, Rice and Stanton (2003) examine the payment services-driven revenue of the top 40 bank holding companies in the U.S. and note that this figure makes up at least sixteen percent of total operating revenue. In their study, the payment services-driven revenue includes traditional service charges on deposit accounts, trust and investment service income, credit card revenue, and revenues obtained through electronic delivery services. This figure could be higher if other nontraditional services were taken into account.

Regression results are also in accordance with the predictions from the second hypothesis, with some exceptions. While regressions using total revenue instead of total assets or total interest earning assets as the denominator of dependent variables such as MNIM2 yield the most consistent estimates as hypothesized, those employing MNIM do not. The only improvement from using MNIM is the slight increase in the goodness of fit. This theoretically predicted sign on LLRGL in Table 5A does not come without a cost as some of the variables in regressions involving MNIM2 suffer from a loss of statistical significance. Results obtained from regressions with MNIM as the dependent variable are virtually identical in sign to those utilizing the standard NIM ratio. This does not fully support H2, nor does it completely support the idea that it is inappropriate to use the unmodified NIM as the dependent variable in many previous studies. Particularly, it does not appear to matter much whether total interest earning assets or total assets is used in the denominator when constructing NIM, at least for this study sample. Nevertheless, the choice of measures for NIM such as MNIM2 can be crucial in

obtaining consistent results. Thus, it is advisable to have a standardized measure for NIM when conducting future studies in this area.

Results from Granger Causality Tests suggest a need to account for other factors that potentially affect NIM and NII. When the variables are causally related in both directions (in the Granger sense), it is probably that some third influence is causing them (Hiemstra and Jones, 1994). To illustrate, according to Tables 3B and 3C, for LNOB to Granger cause NIM the F-test for the null hypothesis that LNOB does not Granger cause NIM should be significant and the F-test for the null hypothesis that NIM does not Granger cause LNOB should not be significant. In all cases, however, there are bidirectional causal relationships among the variables, except BANKHI, COV, LNTA (in Table 3B) and LLPTA, PBTTA (in Table 3C), suggesting that the variables are significantly related. Therefore, it may be beneficial to incorporate other potentially relevant factors into the modeling of the joint determinants of NII and NIM.

Furthermore, this paper also demonstrates the importance of jointly estimating NIM and NII in empirical work as this system estimation approach yields results with higher levels of statistical significance. The apparent empirical relationship between NIM and NII presents a challenging task of integrating more parameters in the modeling of NIM and NII in future research. To date, there has not been a unifying theoretical framework that accounts for other relevant variables such as the explicit effect of OBS activities on NIM. Overall, the empirical results presented in this chapter support the hypotheses relatively well, with a few discussed exceptions.

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Chapter 2

Factors Affecting Returns on Equity and Pre-tax Profit: An Industrial Organization Approach

In this chapter, I study the significance of factors that may affect performance, specifically returns on equity and pre-tax operating income, at commercial banks in financially liberalized markets. I also apply the SCP hypothesis from the Industrial Organization literature to examine whether diversification into non-traditional activities has helped increase bank returns. This approach also provides a framework to examine policy related issues. Banks, like most non-financial firms, are faced with agency problems. For instance, equity holders concerned with enhancing their returns to equity may prefer riskier portfolios than debt holders receiving fixed returns. Subordinated creditors, on the other hand, are more likely to pressure banks to diversify even though this may not maximize equity holders' wealth. Diversification does not necessarily lead to better performance or lower risk.

According to the SCP hypothesis, there is a positive correlation between bank profits and market concentration due to the greater possibility of collusion. From a social viewpoint, bank concentration creates an environment that can reduce social welfare. This is an issue that has important public policy implications. If the market structure in a given country is found to be highly concentrated (thus increasing the likelihood of collusion), public policy should focus on increasing competition (such as discouraging mergers and acquisitions). On the other hand, if bank concentration is positively correlated with the stability of the banking system, policies should be directed at facilitating mergers or consolidations. Below is a review of relevant literature.

VII. Literature Review

The empirical literature on the effect of bank concentration on bank profitability is voluminous, so I will briefly discuss directly related papers. Berger et al (2004) provides a comprehensive review of papers in the area and concludes that the research results supporting the SCP hypothesis are mixed. The general empirical analysis takes the following form:

$$\prod_{ijt} = C + \beta\, CON_{jt} + \gamma' X_{ijt} + E_{ijt} \qquad (6)$$

where $\prod_{ijt}$ is some measure of bank profit such as ROE or return on assets (ROA) at time *t* by bank *i* located in market *j*, CON_{jt} represents a measure of market concentration in market *j* at time *t*, X_{ijt} denotes a vector of control variables that may differ across banks, markets, or time periods, and E_{ijt} is the disturbance term. If $\beta > 0$, then the SPC hypothesis holds: the higher the market concentration, the higher the bank's returns.

It is not clear whether bank competition is beneficial from a social welfare perspective. While a competitive banking system is more efficient (in the sense that a higher quantity of credit is available at lowest price to consumers) and therefore important to economic growth, market power can have positive implications for efficiency (by improving credit availability to younger firms and providing incentives for banks to screen loans which improves the allocation of resources) and can be necessary for the stability of the banking system. There is no agreement in the theoretical literature as to whether competition or market power increases efficiency or stability. Besanko and Thakor (1992) theoretically demonstrate that as more banks enter the market, the deposit rates increase and loan rates decrease. However, Petersen and Ranjan

(1995) argue that banks with market power are more likely to engage in relationship lending, increasing the supply of credit available to younger firms. Since younger firms are relatively more risky, banks in a competitive market charge the firms higher rates to compensate for this higher risk. Banks in concentrated market, however, will lend to the firms without increasing the interest rates because the creditors expect that they will be able to recover this initial subsidy via higher interest rates in the future.

Keely (1990) shows that banks with market power have higher rents and charter values, which represent the opportunity cost of going bankrupt. The higher this opportunity cost, the lower the propensity to take risks. An increase in competition lowers the charter value and is associated with an increase in risk taking behavior. Hellman et. al (2000) employ a dynamic model in which banks compete for deposits and show that banks in competitive markets tend to increase the deposit rates to attract more customers. Consequently, overall bank profit and charter value are lower and risk taking is elevated. Gonzales (2005) empirically shows that higher bank charter values in a group of thirty-six countries are associated with less regulatory restrictions and that fewer restrictions provide incentives for banks to take less risk. Barth et al. (2004) provide similar evidence: in countries with more regulation, there is a higher probability of a banking crisis.

The relationship between bank concentration and bank performance has been examined in many published studies using European and U.S. data. The results are not uniform. Some studies find that banks in more concentrated markets, as measured by Herfindahl-Hirschman Index, charge higher rates on loans and pay lower rates on deposits (see Berger and Hannan, 1989; Hannan, 1991; and Newman and Sharpe, 1992).

Berger and Hannan (1989) were among the first researchers to perform direct tests of the

SCP hypothesis using regression equations similar to Equation 1 with deposit rates paid by commercial banks as dependent variables. They obtain data for 470 U.S. banks from 1983 to 1985 and, using the pooled Fixed Effects method, find results suggesting that the more concentrated the market, the lower the deposit rate. Their finding supports the SCP hypothesis. Similar results are obtained for all but some certificate of deposit rates.

Hannan (1991) uses an extensive set of loan-specific surveys to test the SCP hypothesis and concludes that banks in more concentrated markets tend to engage in anti-competitive behavior. Newman and Sharpe (1992) examine the impact of market power in the deposit market on the stickiness of deposit rates in the U.S. They find that banks adjust deposit rates downwards more quickly than they adjust them upwards. The authors attribute this to the banks' market power in the deposit market. Williams et al. (1994) pool annual data from 1986 to 1988 for Spanish banks and also find support for the SCP paradigm. They argue that further concentration in this banking market will lead to a reduction in competitiveness in the system and that concentration cannot be warranted on efficiency grounds. Other studies consistent with the SCP hypothesis include 32 of the 44 papers reviewed by Gilbert (1984).

On the other hand, Demsetz (1973), Smirlock (1985), Berger (1995), Pollius and Samuel (2003), and Goddard et al (2004) provide evidence inconsistent with the SCP hypothesis. More recently, Athanasoglou at al. (2005) show that capital is significant in explaining bank profitability and that credit risk lowers profits. The SCP hypothesis is not supported as the relationship between industry concentration and bank profitability is found to be insignificant. These authors argue that concentration is the result of superior efficiency of the leading firms. Banks that have a comparative advantage in production become larger and obtain a larger market share and, consequently, make the market more concentrated. Therefore, these firms earn

economic rents. Sometimes known as the Efficient Structure Hypothesis (ESH), this view posits that market share proxies for relative firm efficiency and is thus directly correlated with profitability. In other words, some firms earn abnormal profits due to better efficiency, which results in higher market share.

It is not clear whether the SCP hypothesis is valid in a period where many banks have increasingly diversified into non-interest earning activities. That is, are banks better off (in terms of higher ROE, ROA, or before-tax profit) with this diversification? Also, what are the welfare implications as a result of banks' increased involvement in non-traditional businesses? The evidence for or against the SCP hypothesis suggests different policy implications. Empirical support of SCP provides a case for intervention to reduce concentration and monopoly power. Reducing monopoly power may be accomplished by enacting policies that facilitate firm entry into the banking sector or through a regulator who monitors the prices set by existing firms or sets rules on pricing such as placing limits on deposit rates. Evidence for SCP dictates that loan and deposit rate setting in the banking markets should not be interfered with.

A few other European studies provide conflicting and unexpected results. Using ROA as the dependent variable, Molyneux and Forbes (1996) use data for a number of European countries from 1986 to 1989 and find results supporting the SCP hypothesis and rejecting the ESH. Size does not have any significant effect on profitability, and capital adequacy is found to be positively related to profitability. Goldberg and Rai (1996) perform similar tests on 11 European countries using ROA, ROE, and NIM/total assets as a proxy for pricing by banks. The authors find that the results are sensitive to the performance measure employed, and both SCP are ESH are rejected. Mendes and Rebelo (2003) examine banking data for Portugal from 1990 to 1999 and find that there is some evidence of SCP for the first half of the 1990s. However,

their findings for the latter half of the 1990s support ESH: firms with greater market shares can earn more profits.

Corvoisier and Gropp (2002) employ a Cournot model of loan pricing, where banks are assumed to be price makers in the loan markets, but are price takers in the deposit markets.[11] They also empirically show that for demand deposits and loans, increasing bank concentration in Euro area countries during the years 1993-1999 has resulted in less competitive pricing by banks. This finding supports the SCP hypothesis. However, for time deposits and savings, the more concentrated the market, the lower the bank margins. This result contradicts the SCP model.

Jonghe and Vennet (2005) examine whether competition affects charter values of European banks by computing bank charter value based on Tobin's Q (the ratio of the market value of a bank divided by the replacement cost of the bank's assets) for a large number of European banks using stochastic frontier analysis. The authors find that less levered banks do not perform as well as their more levered counterparts, but this relationship reverses at higher capital ratios. They also find strong evidence for the ESH and that more cost efficient banks earn higher returns. It should be noted that, in order to calculate Tobin's Q, it is necessary to have accurate measures of both market value and replacement cost of a firm's assets (Carton and Perloff, 2003). It is difficult to obtain estimates of the replacement cost of the assets unless markets for used equipment are available. Also, intangible assets created through expenditure on advertising and research and development are hard to appraise. Consequently, Q is typically inflated and can be an inaccurate measure of market power. Henwood (1997) shows that the Q ratio failed to predict investment in the 1970s and the 1990s.

[11] It is not uncommon to model the banking industry with the Cournot model. Cabral (2000, chapter 9) shows that it does not take many identical firms for the performance of the Cournot model to approach that of perfectly competitive framework which is the ideal approximation when there are many firms in the market. Cabral also shows that with 15 firms, the Cournot model is virtually identical to that of perfect competition in terms of efficiency loss.

Papers examining the internal determinants of bank profitability (the $X_{ijt}s$ in Equation 6) generally use variables such as capital, operating expenses, size, credit risk, and loan to deposit ratios. Smirlock (1985) and Akhavein (1997) find a direct relationship between profitability and bank size. Short (1979) and Berger and Mester (1997) suggest that bank size has a small, positive impact on efficiency. Similarly, Beck et al. (2004) show that bank size is related to bank performance. However, there could be an inverse effect between bank size and performance since very large banks tend to experience more agency and bureaucratic problems (Athanasoglou et al., 2005). Bourke (1989), Molyneus and Thorton (1992), and Goddard et al. (2004) suggest a direct connection between bank size and capital ratios: large banks are likely to raise less capital and thus are more profitable than smaller ones are.

Eisenbeis et al (1999) report that bank risks as measured by financial leverage, the ratio of loan charge offs to total loans, and managerial incompetence measured by stochastic frontier inefficiency scores are significantly related to bank performance. In particular, inefficient banks tend to have higher common stock variances, higher idiosyncratic risk in stock returns, lower capital ratios, and higher loan charge-offs. Miller and Noulas (1997) report that profitability and credit risk are negatively related. It is also expected that bank expenses have a negative impact on bank returns. Williams and Molyneux (1994) find that the ratio of loans to deposits is positively related to bank performance for Spanish banks. Similarly, Bourke (1989) suggests that liquidity ratios such as the loan/deposit ratio are positively related to profitability.

Finally, it should be noted that bank NII may have a positive or negative influence on bank accounting returns. As discussed previously, NII may improve bank performance returns by augmenting total bank revenues. DeYoung and Rice (2004) provide evidence of this direct relationship for U.S. commercial banks. On the other hand, it has been argued that fee-based

services at U.S. banks are also positively related to the higher risk resulting from the increase in banks' revenue volatility (DeYoung and Roland, 1999). Therefore, the net effect of NII on ROE is ambiguous. It is important to include this variable into any empirical analysis to assess the effect of banks' diversification into nontraditional activities on returns. In summary, theories and evidence suggest that:

> H4: Bank returns on equity and the ratio of pre-tax operating profit to average assets in countries with fully liberalized banking sectors may be influenced by market concentration, bank capital, operating expenses, credit risk, size, the loan to deposit ratio, and NII.

Panel data regressions of the following form are used to explore this issue:

$$\pi_{itj} = C_i + \beta_1 BANKHI_{ijt} + \beta_2 LNTCR_{ijt} + \beta_3 NIEAA_{ijt} + \beta_4 LLPNIR_{ijt} + \beta_5 LNTA_{ijt} + \beta_6 LNOB_{ijt} + \beta_7 NLTDB_{ijt} + E_{itj} \quad (7)$$

where π_{itj} is represented by ROE and PTOIAA.[12] The rationale for my choice of dependent variables is as follows. From financial accounting, two of the most important bank profit ratios are ROE and ROA. ROA is mainly an indicator of managerial efficiency in converting bank assets into net earnings. On the contrary, ROE is a measure of the rate of return to shareholders. The main reason for including ROE, but not ROA, into the empirical model is that ROE avoids the basic problems that plague ROA.

[12] The ratio used in the regression analysis is pre-tax operating income to total assets. According to Bankscope, it is an excellent measure of profitability unaffected by trading activities. This ratio measures the operating performance of the bank before tax and unusual items. Another advantage of using this ratio is that it is not affected by different tax regimes between countries.

Koch and McDonald (2003) show that since today's banks engage in substantially different strategies, ROA analysis discounts the wide variation in strategies pursued by financial institutions especially when banks frequently engage in OBS activities. Unlike ROE, ROA contains no direct information about how or which of a bank's activities contribute to shareholder wealth. ROE is a preferred measure because it is the most relevant from the stockholders' perspective. Stiroh and Strahan (2003) similarly show that ROE is a better measure of a bank's average profit rate because it is the return to the owner's equity investment in the banks. ROA is only useful when comparing firms that possess comparable equity to total assets ratios because its numerator, bank earnings, is calculated net of the interest paid on liabilities. Also, unlike ROA, ROE recognizes that the ability to reduce risk and operate with higher leverage and lower equity ratios is an important benefit of diversification into nontraditional services.

Although accounting profit ratios have sometimes been criticized as noisy measures of bank performance, they continue to be among the most important profitability ratios in the banking industry and the IMF, as evidenced by their presence in virtually all bank performance reports. In addition, reliable data for these variables are readily available to researchers who would otherwise have to estimate alternative proxies using other methods which could introduce more noise into the measures[13]. As a measure of a bank's ability to create revenue from nontraditional activities, it is quite possible that ROE is correlated with NII. It is, therefore, important to account for the effect of this variable on NII. Further, in order to test the robustness of my results to the choice of measure I use a popular alternative measure of bank profitability, PTOIAA, as the dependent variable for the second regression. It is hypothesized that the effects of BANKHI, LNCTR, NIEAA, LLPNIR, LNTA, LNOB, and NLTD on PTOIAA

[13] Tobin's Q, discussed in the proceeding pages, its variants, and other stock-market based measures.

are similar to those on ROE[14].

The independent variables are constructed as follows. Concentration is proxied by BANKHI, which is calculated as the square of the ratio of bank *i*'s total deposits to total bank deposits in the banking system; LNTCR measures total capital as required by Basel Accord; NIEAA is the ratio of noninterest expense to total assets; LLPNIR is a proxy for bank credit risk and is computed as the ratio of loan loss provisions to net interest revenue; LNTA denotes the logarithm of total assets; LNOB measures the effect of OBS activities and is proxied by the ratio of other (non-interest) income to total assets; NLTDB represents a liquidity ratio measure and is proxied by the ratio of loans to total deposits and borrowing; and E is the error term. Data for these variables are obtained from Bankscope. The following chart summarizes the relationship between ROE and its explanatory variables.

Dependent Variables: ROE/PTOIAA	Proxy	Expected Signs
1. Market concentration	BANKHI	Positive/Negative
2. Capital adequacy	LNTCR	Positive
3. Expense ratio	NIEAA	Negative
4. Credit risk	LLPNIR	Negative
5. Size	LNTA	Positive/Negative
6. Net interest income	LNOB	Positive/Negative
7. Lend-back ratio	NLTDB	Positive/Negative

[14] Hannan (1991) similarly suggests that empirical work employ total profit as a dependent variable. I also performed the estimation using the ratio of total profit to total assets as the dependent variable and obtained similar results.

VIII. Data and Methods

As in Chapter 1, data for the above variables are obtained from Bankscope for commercial banks in financially liberalized countries as defined in Kaminsky and Schmuckler (2003). Other types of banks, such as central, investment, or development banks are not included because they are not primarily engaged in financial intermediation. In order to test H4 and its variant with PTOIAA as the dependent variable, I assembled a large cross-country panel data set covering 3,593 commercial banks in 28 financially liberalized countries from 1997 to 2004.[15] Panel data are especially useful in controlling for the effects of outside variables that may make the relationship between the independent and dependent variables partially or fully spurious. In addition, models estimated with panel data require less restrictive assumptions than cross-sectional models. Other advantages of using panel data include substantially larger sample sizes and reduced omitted variable bias. The dataset for this study is an unbalanced panel, to maximize sample size. As in Chapter 1, I tested for the presence of unit root using the Panel Unit Root tests developed by Im, Pasaran and Shin (2003), Maddala-Wu (2001), and Choi (1999). The null hypothesis of unit root is rejected at the 1% significance level.

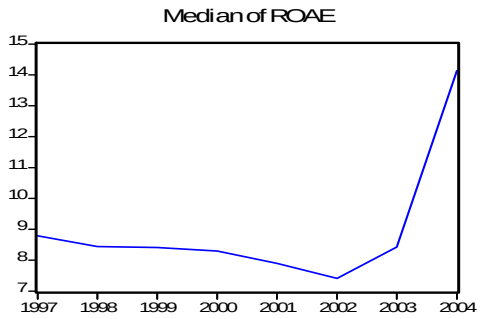
Table 6 provides the summary statistics for the variables. All ratios regarding bank-specific characteristics are calculated using the standardized global reporting format. Table 7 shows graphical representations of the median values for these variables from 1997 to 2004. The data indicate that both ROE and PTOIAA are quite stable for the first six years, increasing rapidly beginning 2002. The correlation matrix is shown in Table 8.

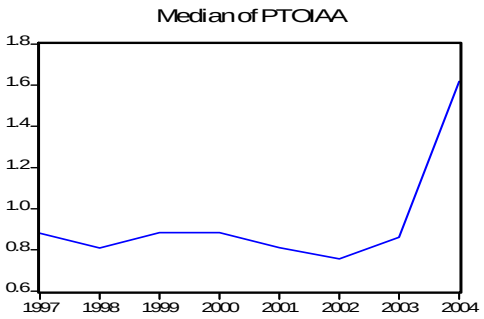
[15] These are the same countries examined in chapter 1: Argentina, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Hong Kong, Indonesia, Ireland, Italy, Japan, Korea, Malaysia, Mexico, Norway, Peru, Philippines, Portugal, Spain, Sweden, Taiwan, Thailand, Venezuela, United Kingdom, and the United States.

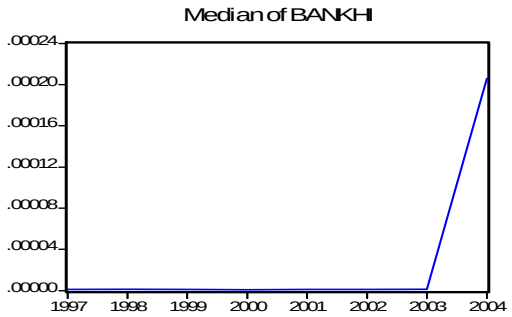
Table 6: Summary Statistics

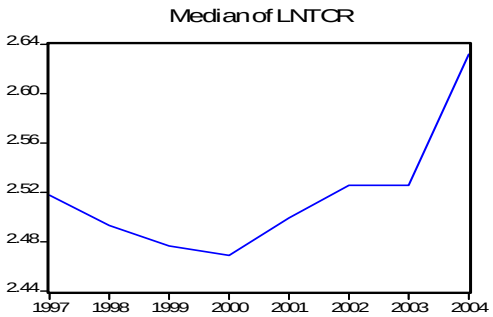
	ROE	PTOIAA	BANKHI	LNTCR	NIEAA	LLPNIR	LNTA	LNOB	NLTDB
Mean	1140466.	0.855566	0.001337	2.648743	5.141631	3255305.	7.540325	5.397034	65.99364
Median	8.394500	0.851000	1.13E-06	2.501436	3.269000	13.11500	7.513464	5.484780	68.13350
Maximum	2.15E+09	96.30400	1.000000	11.41140	287.5000	2.15E+09	14.02575	13.57964	996.0000
Minimum	-975.3550	-121.3760	0.000000	-2.302585	-27.13000	-978.5470	-0.681219	-4.422849	-135.5220
Std. Dev.	49476718	5.277909	0.013953	0.586503	8.304394	83549219	2.183891	2.656904	39.64701
Skewness	43.35897	-4.096458	41.38254	1.921166	12.56202	25.62604	0.097186	-0.108045	6.039259
Kurtosis	1881.001	110.9223	2331.425	16.82376	286.7762	657.6938	2.750209	3.200207	95.16802
Jarque-Bera	2.77E+09	7691927.	4.26E+09	86847.17	61793307	3.08E+08	79.31410	59.16406	6237962.
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	2.15E+10	13482.87	25.17155	26818.53	93953.03	5.58E+10	143281.2	88311.66	1143406.
Sum Sq. Dev.	4.61E+19	438959.9	3.663678	3482.507	1260091.	1.20E+20	90622.99	115501.6	27232914
Observations	18830	15759	18820	10125	18273	17152	19002	16363	17326

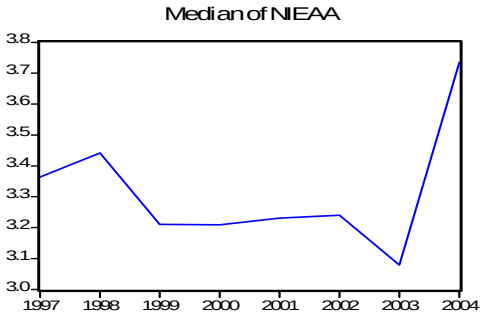
Table 7: Summary Statistics of All Variables

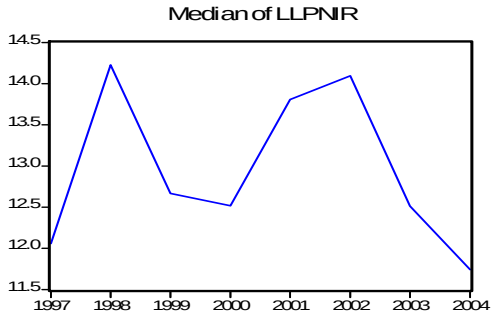


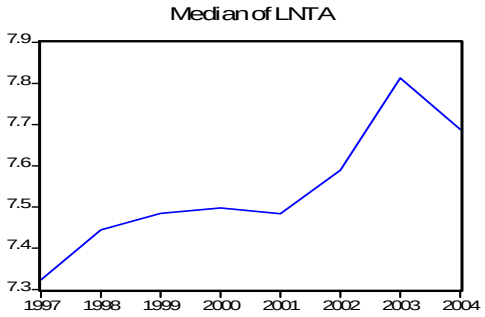


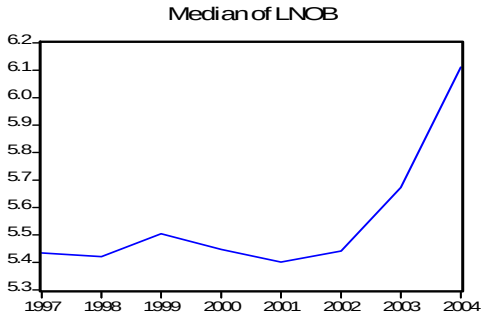












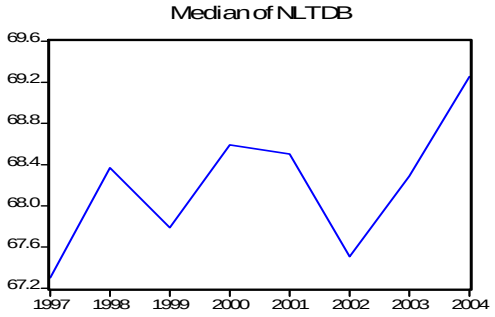


Table 8: Correlation Matrix

	ROE	PTOIAA	BANKHI	LNTCR	NIEAA	LLPNIR	LNTA	LNOB	NLTDB
ROE	1.000000	-0.036578	-0.001726	0.146478	0.011579	0.087119	-0.003175	-0.003449	-0.010164
PTOIAA	-0.036578	1.000000	-0.003506	0.242714	-0.130604	-0.077534	-0.013673	0.059800	0.065350
BANKHI	-0.001726	-0.003506	1.000000	-0.016988	-0.017770	-0.001154	0.145784	0.122009	-0.003691
LNTCR	0.146478	0.242714	-0.016988	1.000000	0.219299	-0.008577	-0.475336	-0.319947	-0.149995
NIEAA	0.011579	-0.130604	-0.017770	0.219299	1.000000	0.045121	-0.274592	-0.122888	0.067349
LLPNIR	0.087119	-0.077534	-0.001154	-0.008577	0.045121	1.000000	-0.021576	-0.019029	-0.018001
LNTA	-0.003175	-0.013673	0.145784	-0.475336	-0.274592	-0.021576	1.000000	0.767846	-0.033510
LNOB	-0.003449	0.059800	0.122009	-0.319947	-0.122888	-0.019029	0.767846	1.000000	0.051893
NLTDB	-0.010164	0.065350	-0.003691	-0.149995	0.067349	-0.018001	-0.033510	0.051893	1.000000

There are various panel data estimation methods for this data structure. The most common technique in the literature is the Fixed Effects (FE) model. Sometimes, the Random Effects (RE) model is also employed in studying bank profitability. The FE model assumes that the marginal effects of the explanatory variables on the dependent unit are the same for all units (ie. firms). The constant term is allowed to vary among the units to account for the differences between units. These constant terms capture all unobserved characteristics that differentiate the units from each other since, for example, unique differences and cross sectional variation between banks can play an important role in explaining the variation in ROE or PTOIAA among banks. The model also assumes that the error terms are homoskedastic and uncorrelated both over time and across banks. An advantage of the FE method is that it leads to consistent estimates even if the time-invariant component of the error term is correlated with the regressors. It has also been shown that the FE estimator is consistent even when the RE model is valid or even if the time-invariant component of the error term is correlated with the regressors (Johnston and Dinardo, 1998).

The RE model, on the other hand, assumes that the regressors may contain variables that are constant over the observed time interval, but that may vary between units. The RE model also assumes that the disturbances are correlated over time. It exploits both the time and cross sectional variations. However, the RE approach may be subjected to omitted variable bias when the time-constant component of the disturbance is correlated with the explanatory variables. While the RE model may be relevant for other data structures, it is probably unsuitable for my data structure since it assumes that the above-mentioned constants are randomly drawn from the population. This is quite a strong assumption since the present study uses all commercial banks reported in Bankscope. The banks in financially liberalized countries are rather technologically

advanced and financially sound and have survived the selection process due to their above-average performance.[16]

It is important to note that neither of the above models is effective in estimating models when heteroskedasticity of unknown form is present since the assumption of strict exogeneity for the covariates is violated (Wooldridge, 2002).[17] The GMM estimator, which makes use of the orthogonal conditions to allow for efficient estimation in the presence of arbitrary heteroskedasticity, is more efficient than the FE estimator in large samples. When there is no heteroskedasticity, the GMM estimator is no worse than other estimators asymptotically. However, the gains in small-sample applications are not well-understood. GMM is also useful in applications when the regressors are not strictly exogenous even after controlling for the unobserved effect. GMM is also appropriate in situations where there is serial correlation. For these reasons, I use a recent GMM method developed by Arellano and Bover (1995) and the FE model to compare the results in this model.

Unlike the standard GMM estimator that eliminates unobserved firm-specific effects by taking first differences, which has been found to provide unsatisfactory results (Mairesse and Hall, 1996), the Arellano and Bover estimator is an extended GMM estimator that uses lagged first differences of the series as instruments for the levels equations in addition to the traditional lagged levels as instruments for equations in first differences. In standard GMM, all regressors are potentially correlated with the individual effects. But, as Arellano and Bover (1995) have shown, the levels of the variables contain information about the parameters of interest, which if exploited, can substantially improve the accuracy of the estimates. This method of Orthogonal

[16] Nevertheless, I estimated the equations with the RE method and generally obtained results similar to the FE and GMM estimates. However, the R-squared value is lower.
[17] That is, the conditional mean of the time-varying errors is zero and the observed regressors in every time period are not correlated with the time-varying disturbances in each time period.

Deviation is used to remove the individual effects for the model in this paper, with allowance for heteroskedasticity and cross-sectional correlation.[18]

Finally, I examine the short-term forecasts of the regressors on bank profit via the impulse response functions. Impulse responses trace out the responsiveness of current and future values of the dependent variables of interest to innovations (shocks) to each of the variables in the system, assuming that the error returns to zero in later periods. For each variable from the equation, a shock is applied to the disturbance term, and the outcomes on the system are noted. Impulse response functions allow us to study the effects on ROE or PTOIAA of a one-unit increase in bank concentration or other independent variables. In other words, I am interested in the behavior of the impulse response functions of ROE and PTOIAA to one-unit shocks in BANKHI, LNTCR, NIEAA, LLPNIR, LNTA, LNOB, and NLTDB. For example, policy makers or managers are often interested in the impact to ROE or PTOIAA if concentration increases. Similarly, what happens to ROE or PTOIAA when credit risk rises and how long this effect is predicted to last? This methodology has been used extensively in macroeconomics and there is no reason to limit its scope to macroeconomic data. This is probably the first time that the method is used to analyze bank performance data[19].

[18] The original GMM estimators for static panel data are developed in Hausman and Taylor (1981), Amema and MaCurdy (1986). Their estimators reduce to the Fixed Effects estimator if all or the explanatory variables are correlated with the individual effects but uncorrelated with the error term and to the RE estimator if they are uncorrelated with the effects and disturbances. Arellano and Bover (1995) improve on these models, introduce the method of "Orthogonal Deviation", and show that these estimators are invariant to various transformations of the original equations.

[19] Berger and DeYoung (1997) were probably the first researchers to employ a related tool from Macroeconometrics, Granger Causality Test, to study problem loans in commercial banks.

IX. Empirical Results

Table 9A presents the FE and GMM results for the equation with ROE as the dependent variable. The models seem to fit the data well. The GMM and FE estimates have similar signs, but have different levels of statistical significance. It may be that the explanatory variables are correlated with the individual effects, but uncorrelated with the error term (Hausman and Taylor, 1981 and Arellano and Bover, 1995). All coefficients have the expected signs. The adjusted R-squared value for the FE model is 0.36, which is relatively high as compared to typical R-squared values of less than .20 in similar studies. Smirlock (1985), Fortier (1988), and Williams et. al (1994) report values substantially less than those in this study. This may be due to the larger sample size of this study or the quality of the data source. In general, the regression results in this paper confirm those found in previous studies.

Table 9A: Factors affecting Bank Return on Equity (ROE)
Note: *, **, and *** denote significance levels of 1, 5, and 10 percent, respectively.

Independent Variables	GMM Coefficient	Std. Error	FE Coefficient	Std. Error
BANKHI	-2.288006	27.79182	0.603774	16.20105
LNTCR	3.155880*	1.049591	13.19294*	1.075065
NIEAA	-0.399103*	0.055952	-0.158050**	0.062044
LLPNIR	-7.43E-08*	4.35E-09	-9.07E-09***	4.80E-09
LNTA	-0.211746	0.866061	2.232748**	0.904216
LNOB	0.928946**	0.436320	0.295595	0.449236
NLTDB	-0.033079**	0.014060	-0.020573	0.014304
Adjusted R-squared	N/A		Adjusted R-squared	0.358662

The highly insignificant coefficient on bank concentration, BANKHI, suggests that concentration plays an unimportant role in bank profitability. This result does not support the

SCP hypothesis which implies a positive relationship between concentration and profit. Unlike the conventional wisdom that the greater the degree of monopoly, the higher will be bank prices, concentration in the banking markets does not seem to affect bank conduct that leads to lower social welfare. A possible explanation for this is that the benefits of domestic concentration have been weakened as the world economy has become more integrated. A consequence of this finding is that policy makers may be well advised to expend fewer resources exploring the antitrust effects of merger cases and to focus on other important issues.

Total capital ratio, LNTCR, is found to be positively related to ROE. It is easier for well-capitalized banks to pursue more business opportunities and thus earning higher profit since the higher this ratio the more protection afforded to the bank. Bourke (1989), Molyneus and Thorton (1992), Demiguc and Huizinga (1999), and Goddard et. al (2004) have noted this direct relationship between capital and the costs of intermediation. Expenses significantly reduce ROE, as expected. This suggests improvements in cost management can enhance profit. Banks may be able to achieve this by learning about the profitability of different customer relationships so that management can target services and change pricing strategies to make sure the packages of services and products are profitable. Koch et. al (2003) show that banks can improve efficiency by either reducing costs while maintaining current level of services, raising the level of output but keeping current expenses unchanged, or enhancing workflow.

Credit risk, LLPNIR, negatively influences bank profitability. It appears that loan loss provisions were inadequate to cover actual losses during the time period of this study. This may indicate the presence of market discipline during this period. For instance, if investors perceive that the risk of lending to a bank is rising, they will demand a higher rate of interest for any loan, increasing the bank's borrowing costs. If the risk is not controlled, the bank will not be able to

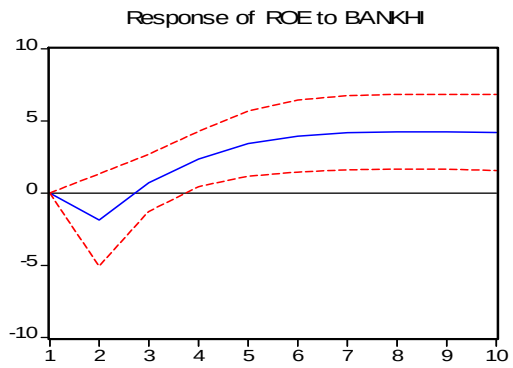
borrow in the long run, and thus will be prevented from expanding its operations. This may lead to a reduction in ROE. To maximize ROE or to reduce losses, it is important that banks use all information on potential borrowers and monitor their customers on a regular basis.

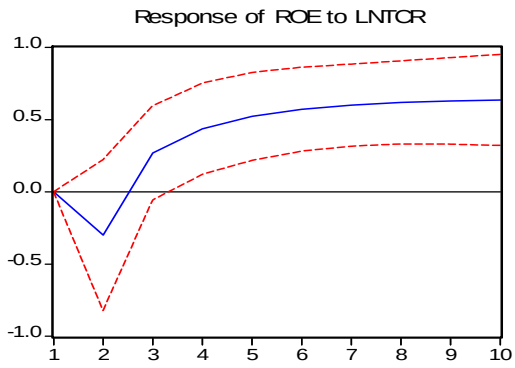
It is interesting to note that bank size has a direct effect on ROE, according to the FE estimate. This implies that there are economies of scale in the production of bank services and that agency problems are not an important concern at banks. While this result is not surprising, it does not provide support for the moral hazard hypothesis and contradicts the findings of a study by Athanasoglou et. al (2004) for Greek banks. The GMM coefficient for this variable, however, is negative and insignificant. Thus, it is unclear how bank size influences ROE.

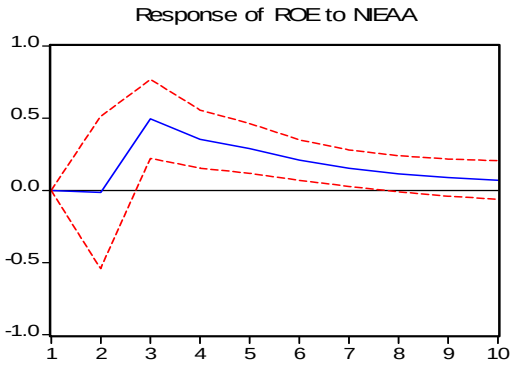
An important finding of this research is that noninterest income, proxied by LNOB, is directly related to ROE, an unsurprising result. Noninterest income also has a similar effect on NIM, as we saw in Chapter 1. Thus, it appears that OBS activities help increase ROE by augmenting traditional bank profit, as measured by NIM, which in turn expands total profit. DeYoung and Rice (2003) find similar results.

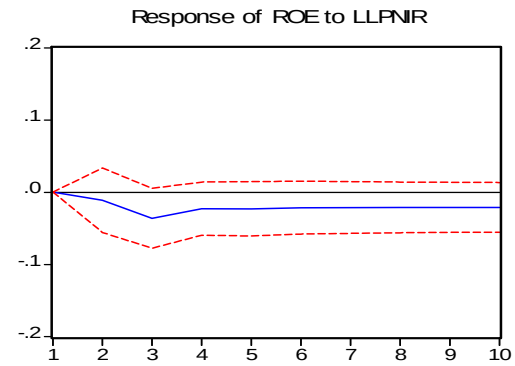
Finally, the lend-back ratio, NLTDB, is found to negatively and significantly affect ROE, based on the GMM estimate. The effect of NLTDB is negative and insignificant, according to the FE estimate. These results are in accordance with those from a previous study by Williams and Molyneux (1994) who find that the lend-back ratio is positively related to bank profit in Spain between 1986 and 1987. However, this ratio has a negative and insignificant impact on profit in 1988. The influence of NLTDB on profit in the pooled sample for the period is insignificantly positive. Table 9B presents the graphical results of the impulse responses of ROE to shocks to the independent variables. A shock to BANKHI causes ROE to decline by approximately 2 percentage points in the first two years.

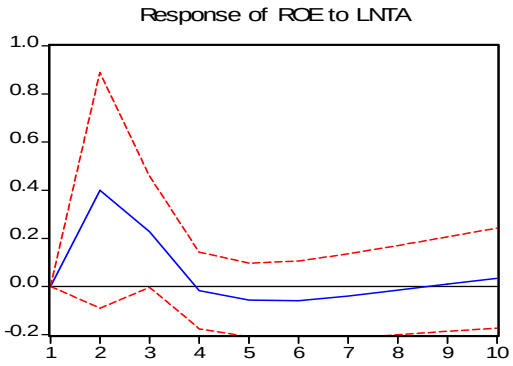
Table 9B: Impulse Response Functions of ROE to Shocks (+/- 2 Standard Errors)

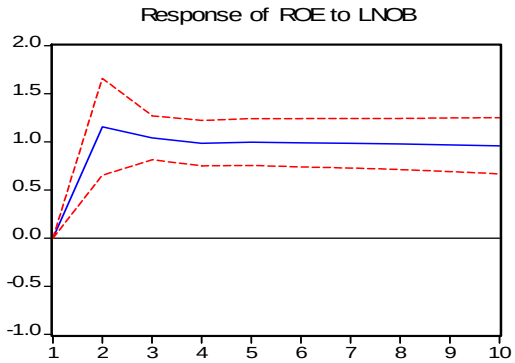


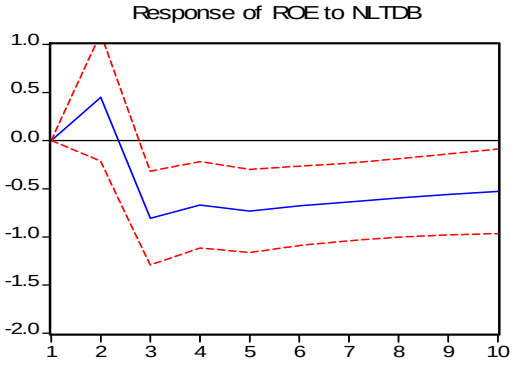












However, ROE starts to reverse its course after two periods, suggesting that BANKHI does not have a long-lasting effect on ROE. Similarly, an innovation to capital ratio, LNTCR, generates a reduction in ROE in the first two periods. ROE quickly and steadily increases in subsequent periods. ROE reacts positively and strongly to shocks to LNTA in the first two years, but this trend begins to subside afterwards reaching zero at period 4. The upward trend begins to pick up again at year 8.

It is important to note that shocks to LNOB always a positive influence on ROE and the impact of the shock does not die down even after 10 periods. Innovations to credit risk, LLPNIR, exert a negative influence on ROE for all periods. It is interesting to note that NIEAA always has a direct, but very small, effect on ROE. Intuitively, an increase in noninterest expense should be associated with a reduction in ROE. A possible explanation for this is transmission-time lags. It may take up to three periods for banks to respond to this impact, at which point the effect starts to level off. Finally, disturbances to NLTDB initially cause ROE to increase during the first two years, but this trend dramatically reverses in succeeding years.

Table 10A presents the GMM and FE results for the equation with PTOIAA as the dependent variable. The effect of bank concentration on this measure of profitability is positive, but statistically insignificant. This provides further evidence against the SCP hypothesis. Total capital ratio, while possessing the correct sign as postulated, is no longer a meaningful determinant of PTOIAA even at 10% level. Operating expenses and credit risk matter to PTOIAA, as they do to ROE. However, their signs are both positive. A significantly positive effect of operating expenses on PTOIAA may reflect the fact that banks that are heavily involved in OBS activities expend more resources to attract more customers (DeYoung and Rice, 2004). The positive relationship between LLRGL and PTOIAA suggests that there is a trade-off

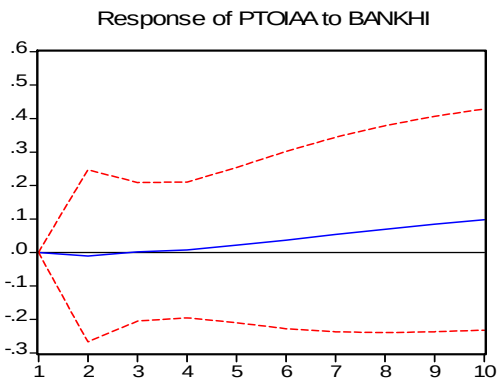
between risk and return. The significant negative coefficient on LNTA implies that agency problems may be prevalent at larger banks. Finally, the effect of OBS activities, as measured by LNOB, and NLTDB are strongly related to PTOIAA, according to the GMM estimates.

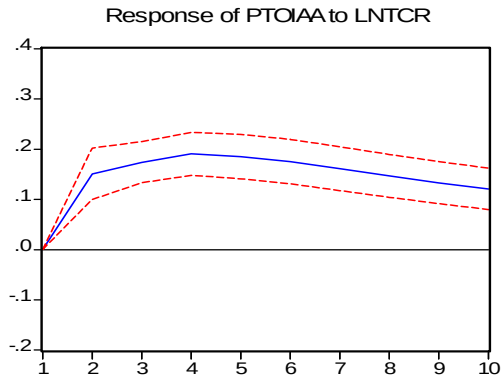
Table 10A: Factors affecting Bank Pretax Profit (PTOIAA)
Note: *, **, and *** denote significance levels of 1, 5, and 10 percent, respectively.

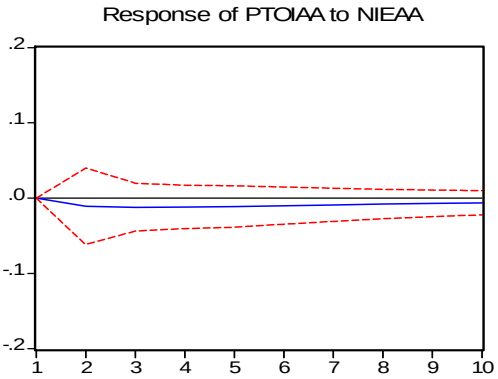
Independent Variables	GMM Coefficient	Std. Error	FE Coefficient	Std. Error
BANKHI	1.292025	2.087803	1.432096	1.975050
LNTCR	0.858166*	0.104705	0.662955*	0.098360
NIEAA	0.041704*	0.005874	0.097646*	0.005471
LLPNIR	1.19E-09*	4.44E-10	6.16E-10	5.05E-10
LNTA	-0.243948*	0.088016	0.047881	0.080898
LNOB	0.311174*	0.042610	0.010140	0.040428
NLTDB	0.009131*	0.001460	-0.000137	0.001343
Adjusted R-squared	N/A		Adjusted R-squared	0.563909

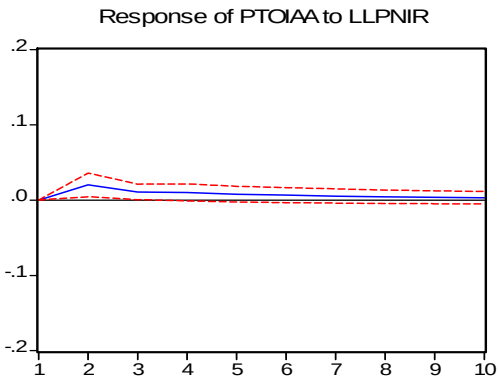
Table 10B displays the impulse responses of PTOIAA to innovations to the independent variables. Bank concentration, BANKHI, once again has a positive effect on PTOIAA. The effect is small and appears to be long-lasting since the response persists indefinitely. This implies that banks in highly concentrated markets can expect to consistently earn abnormal pre-tax income. The responses of PTOIAA to disturbances to LNTCR and LLPNIR are analogous. The more loans banks can generate, as indicated by NLTDB, the higher their PTOIAA. However, this effect begins to decline after 2 years, and the shock appears to work its way out of the system by period 10. Shocks to LNTA and NIEAA consistently cause a negative, but minute, impact to PTOIAA. Finally, innovations to LNOB are predicted to exert a positive influence on PTOIAA. Overall, the forecasts seem to explain the data well, with a few surprises.

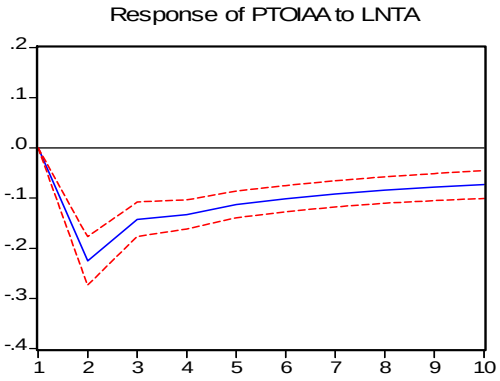
Table 10B: Impulse Response Functions of PTOIAA to Shocks (+/- 2 Standard Errors)

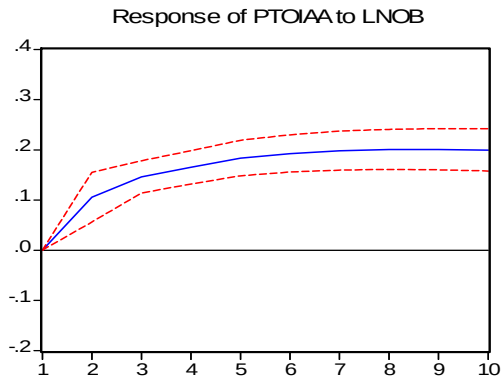


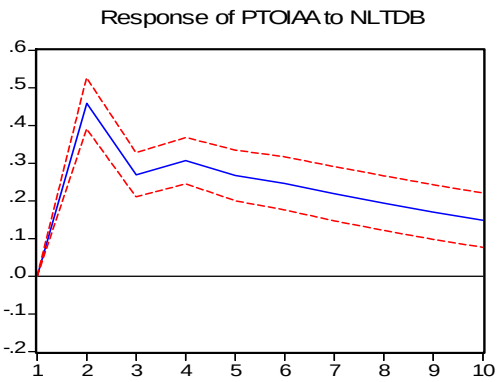












X. Conclusions

The main objective of this chapter is to examine the factors that influence two popular bank performance measures: ROE and PTOIAA. Another purpose is to test whether the SCP hypothesis holds in a period when banks are increasingly relying on profits from nontraditional activities. The analysis is based on data collected from 28 financially liberalized countries between 1997 and 2004. The regression results generally suggest that both ROE and PTOIAA are strongly related to the levels of capital adequacy, expense ratio, credit risk, and net interest income. As hypothesized in Hypothesis 3, ROE and PTOIAA are positively related to capital adequacy and non-interest income. In addition, PTOIAA is directly influenced by non-interest expenses and credit risk. Bank size is predicted to have a negative influence on ROE and PTOIAA, based on the GMM estimates. The results also indicate that, like those in the previous chapter in which NIM was found to enhance NIM, NII is an increasing function of both ROE and PTOIAA. There appears to be a net gain in overall bank performance associated with banks' increasing involvement in nontraditional activities. Finally, the GMM method tends to yield more statistically significant coefficients than does the FE approach. Forecasts generated by the impulse response functions are similar to the predictions from the regression results.

It is not exactly clear why bank profitability ratios such as ROA have been used in many recent studies, despite of ROA's stated weaknesses. A possible explanation for this phenomenon is that, unlike ROE, ROA allows investors to see if a particular firm has excessive debt or uses financial leverage to affect returns because ROA's denominator includes liabilities and shareholder equity. Due to ROA's overwhelming popularity, and to satisfy my curiosity, I reexamined H3 using ROA as the dependent variable. Once again, bank concentration and bank

size are not significantly related to ROA. NII has a significant direct effect on ROA, as expected. Capital and noninterest expenses are positively related to NII. The direct relationship between noninterest expenses and NII may reflect the increased service costs associated with nontraditional activities. I also find that NII is inversely related to loan loss provisions and the lend-back ratio for this sample banks. Both GMM and FE methods yield similar results.

Based on the evidence presented, it appears that diversification in nontraditional activities has helped increase profits, particularly NIM, ROA, ROE, and PTOIAA. A number of studies have found similar benefits associated the diversification into OBS activities (Stover, 1989; Gallo et al., 1996). This result casts doubt on the belief that there are diseconomies of scope in the joint production of intermediation-based and nontraditional banking activities. Mester (1992), for example, shows that it is more cost effective for banks to specialize in one of the above activities, and the inefficacies associated with providing both services may stem from the fact that products and services are relatively new and that managers are less experienced. Furthermore, agency problems may be more pronounced at firms that are heavily involved in both lines of business (Stulz, 1990). On the other hand, DeYoung and Hunter (2003) show that there can be economies of scale especially at larger banks in the production and servicing of consumer loans. However, the data in this study do not support this conjecture as the coefficient for LNTA is not statistically significant.

The significant positive effect of LNOB on NIM, ROA, ROE, and PTOIAA further supports the notion that fee-based revenues can help stabilize bank earnings by reducing total risk since diversification reduces a bank's exposure to any activity. In addition to the reviewed papers, Saunders and Walters (1994) find that expanding into nontraditional activities results in substantial reduction in risk, especially in insurance activities. Kwan (1997) securities trading is

riskier but is often more profitable than banking activities. Securities underwriting is riskier and sometimes generates less profit than interest-based banking activities. Overall, banks seem to gain from diversifying into securities activities. In a similar vein, Brewer (2002) finds that involvement in nontraditional activities dramatically reduce bank holding companies' risk for the period between 1978 and 1986. These results do not appear to support the claim that fee-based services increase fixed costs, earnings volatility, and worsen risk-return tradeoffs (DeYoung and Roland, 2001; DeYoung and Rice, 2004; Stiroh, 2004).

An important finding from this study is that bank concentration has no significant impact on ROE or PTOIAA. Therefore, the SCP hypothesis which implies a direct relationship between concentration and performance cannot be supported by the data. While Berger (1995), Ranjan and Peterson (1995), and others provide similar theoretical and empirical evidence, support for the SCP can be found in Weiss (1989), Shaffer (2000) and some of the reviewed papers. The effect of market structure on bank performance is thus unclear. Shaffer (2002), using information-theoretic models of bank lending, provides an explanation for the ambiguous relationship between concentration and profits. The author shows that there is a positive relationship between charge-off rates and the number of banks in the market because riskier customers have a higher likelihood of being mistaken for good borrowers. Accordingly, loan rates in those markets are set higher in such markets to compensate for the additional risk. On the other hand, the SCP hypothesis implies that loan rates fall as the number of bank in the industry increases due to more competition. Thus, the net effect depends on the magnitudes of the market power and asymmetric information effects. It is clear that further research in this area is needed.

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Chapter 3

Concluding Remarks

The purpose of the dissertation is two-fold. First, I explore the determinants of bank NIM and NII in the recently classified, financially liberalized countries using recent data and modeling methods. An important feature of the research is the joint estimation method which, to date, is the first attempt in bank profitability studies. Second, I applied a framework derived from the industrial organization literature to examine the significance of the factors theorized to influence bank return on equity and pre-tax profit for the same group of countries. The approach also allows me to test the validity of the moral hazard, market discipline, and SCP hypotheses in the context of banking.

In general, regression results from Chapter 1 indicate that NIM is directly influenced by operating costs, credit risk, managerial risk aversion, the interaction between interest rate risk and bank risk, volume of credit, and NII. NIM is negatively related to interest rate risk and capital adequacy. An interesting finding is that NII is significantly and positively correlated with NIM. NII is also found to be positively related to credit risk, liquidity risk, overhead expenses, loan loss provisions, and pretax profit. As predicted, NII is inversely related to the level of bank deposits and interest rate risk. Finally, the effect of bank concentration on NIM and NII is positive, but generally insignificant.

In comparing the results of the system estimation approach used in this study to the results of research using different approaches, it is important to keep in mind that this study examines data for a different group of countries and a different time period. Specifically, this

study investigates data for 28 financially liberalized countries for the period from 1997 to 2004. Therefore, my results may differ from those of studies focused on banks in countries with sophisticated banking systems such as the United States. Also, most papers employ either ad-hoc variables or different theoretical and empirical frameworks with different proxies for the regressors. Further, regression results using the same set of cross sections for different time periods can produce different results (Williams et al., 1994; Clayes et al., 2004; Maudos and Guevera, 2004).

As discussed, it is crucial to control for the contemporaneous correlations between the error terms in Equation (4*) and Equation (5*). The system SUR and GMM methods effectively take into account these effects by exploiting the relevant information contained in those two equations. In addition, other advantages of the system method include enhanced accuracy of the estimates and higher statistical power. The only possible disadvantage of using such a method is the potential contamination if the empirical specification is not theoretically sound or incorrectly specified (Johnston and Dinardo, 1997). This is unlikely to be a problem since the regression equations examined contain only variables derived from theoretical models.

In general, the empirical results obtained from this work are similar to those from previous studies, and are sometimes more consistent with theoretical predictions. For instance, the regression coefficients from the present study carry virtually all of the signs as predicted by theoretical models by Maudos and Guevara (2004), Zaruck (1992), and Wong (1997). Using the FE method, Maudos and Guevara (2004) find that the volume of loans is negatively related to NII, a result that is not predicted by their theoretical model. On the other hand, the variable representing credit risk in my study, LLRGL, has the theoretically expected sign only when using the modified ratio for NIM, the MNIM2, as the dependent variable. As well, the paper

finds that bank concentration does not have a significant positive impact on NIM, a result that is not in accordance with that of Maudos and Guevara (2004) and Demigur-Kunt et al. (2003) in which a significant positive direct effect between the two variables is found. Moreover, while the finding that the volume of core deposits is negatively related to NII is theoretically supported, it contrasts with the result from DeYoung and Rice (2004).

With regard to the variables proposed to affect NII, most of these variables are found to significantly impact NII. Rogers and Sinkey (1999), using both RE and FE, find similar results. A very different finding from this study is that, at least for the 28 countries and time period considered, NII has not increased at the detriment of NIM, contrary to the usual prediction from the cross-subsidization literature. One explanation for this phenomenon is that banks can also sell nontraditional services to traditional customers. Another possibility, due to Rogers and Sinkey (1999), can be illustrated in the following example. Consider a bank heavily involved in nontraditional activities. The revenue from these activities can enhance the profit from traditional activities if the bank's profit from traditional activities are high relative to that from competing firms. In this case, it is possible that the interest rate spread (between loans and deposits) or volume has not declined or a decrease in one variable is offset by an increase in the other. The other scenario is when the bank's profit from traditional activities is relatively low. Here, the spread or volume (or both are decreasing) and a negative relationship between NII and NIM can be expected to occur. The cross-subsidization literature, as discussed, predicts an inverse relationship between NII and NIM.

Not surprisingly, the system estimation method produces results with higher statistical significance and goodness of fit as indicated by the adjusted R-squared (R^2) values than those from prior research. Most of the coefficients in the current study are significant at a one percent

level, with the rest of the coefficients ranging from 5 to 10 percent, excluding that of BANKHI. Results from the reviewed studies are generally significant at a 5 or 10 percent level, with some regressors having unexpected signs and/or no statistical significance. This is probably due to increased sample size afforded by the joint estimation method which has the effect of reducing the variance leading to higher statistical significance.

With respect to the goodness of fit as measured by the adjusted R^2, it is important to note that a high R^2 is not necessary for good estimates (Wooldrige, 2000). R^2 could be small due to high variance of the error terms and the estimates could be good based on other criteria. Since R^2 is also highly sensitive to the range of variation of the dependent variables, R^2 from equations with different dependent variables should not be compared, and it should be used with caution. While a low R^2 indicates that we have not accounted for other factors that influence the dependent variable, the size of the R^2 does not have any effect on the unbiasedness of the estimators. It is not desirable to include all factors that may affect the dependent variable because the dissertation only examines theoretically justified variables. Lastly, since the usual R^2 is measure of goodness of fit for OLS models, the R^2 s obtained in Chapter 1 and those from previous studies are not exactly comparable because this study uses the Generalized Least Squares (SUR) estimators which accounts for the correlated error terms. Kennedy (1992) argues that, citing Aigner (1971), it is more relevant to examine the relative strength of the individual explanatory variables in terms of policy context, not on the basis of the R^2.

While R^2 s from this study may seem low, they are on average slightly higher than those from similar studies.[20] For example, the values reported in Table 3A are 43% and

[20] A value of 0.2, for example, may be high in some applications. Even an R^2 of 0.95 may be considered low in certain applications (Verbeek, 2004).

63% for Equations 4* and Equation 5*, respectively. Although the values associated with a few of the reviewed studies are in the 80-90 percent, the majority of those studies have $R^2 s$ less than 50%, with many falling in the 10-30 percent range. Similar studies with R^2 values exceeding 70% include Gerlach and Su (2003), Anfanasief et. al (2003), Maudos and Guevara (2004), Jiang et. al (2003), Ho and Saunders (1981). Papers whose R^2 values mostly range below 60% include Al-Karacash and Fatheldin (2005), Kunt et. al (2003), Stiroh (2004), DeYoung and Rice (2004), Clayes and Vennet (2004), Angbazo (1997), Levin (2002), Stiroh (2002), Kunt and Huizinga (1999), Brock and Franken (2003), Haweck and Ruy (2004), Fisher and Jttner (2004), Peria et. al (2004), Peters et. al (2004). Papers with exceedingly low $R^2 s,$ less than 25% percent, are those by Vennet (2002), Clark and Siems (2003), D'Souza and Lai (2004), Smirlock (1985), Ibraham et. al (2005), Rogers and Sinkey (1999).

Overall, it appears that the system estimation approach used does indeed, not just in theory, provide more robust statistical results, particularly in terms of statistical power and goodness of fit. It is perhaps the most sensible method for controlling the contemporaneous correlations of the disturbance terms. More importantly, the results obtained from this method also signal the need to consider both NIM and NII in both theoretical and empirical research in the future.

How has bank diversification into nontraditional activities affected the overall profits of banks in financially liberalized markets, such as ROE and PTOIAA? Is bank concentration related to these profitability measures, as purported by the SCP hypothesis? What are other important determinants of ROE and PTOIAA? Chapter 2 of the dissertation examines these issues from an industrial organization perspective, employing traditional (Fixed Effects Model) and panel GMM techniques, as well as the Panel Vector Autoregression methods. I find that

while bank concentration generally is positively related to the profit measures, the effect is not statistically significant. This result does not provide support for the SCP hypothesis which implies a significant direct relationship between market structure and profit. It is consistent with a number of similar reviewed papers (Jiang, et. al (2003); Athanasoglou (2005); Maudos (1998)). This finding, however, not in accordance with other studies such as Demigur-Kunt et al. (2003) who provide evidence of a significant positive correlation between the market structure and performance measure variables and Cyree (2005) who empirically shows that the two variables are negatively related. Further, while the finding that banks with higher NII tend to have higher accounting returns is similar to that in DeYoung and Rice (2003), the result that banks with a greater volume of deposits are less reliant on NII is at odds with these authors' finding. It should be noted the negative relationship between NII and the volume of deposits found in this study is supported by theory as well as empirical evidence (Rogers and Sinkey, 1999).

The SCP framework also makes it possible to investigate other aspects of bank profitability. For instance, within the context of SCP, international competition is expected to affect bank profitability by increasing contestability. Banks can now compete in the international market for funds and for the provision of financial services regardless of where they are located. The higher number of firms causes banks to price more competitively which reduces the market power any one firm can exert. It has been argued in the literature that increased competition forces banks to change their product mix (by engaging in more OBS activities), cost/market structures, or pricing behavior (reducing profit margins). This study examines many of these relationships by including in the regressions the effect of banks' involvement in fee generating business (which has been subject to more intense competition), and the influences of expenses, size, bank risks on bank performance measures argued to better reflect the current state

of the financial service industry: ROE and PTOIAA as opposed to ROA and other accounting measures. In general, the chapter finds that, as hypothesized, both noninterest income and capital ratios have a direct impact on ROE and PTOIAA. ROE is negatively influenced by credit risk and operating expenses. Bank size and concentration, however, have an ambiguous effect on both ROE and PTOIAA. Similarly, liquidity ratios such as NLTDB do not seem to exert any influence on ROE and PTOIAA.

Other novel features in the dissertation include robustness checks and forcasting tools adopted from macroeconomics and applied to panel data such as Granger Causality Tests and Impulse Response Functions. The results from these tests almost always confirm the findings obtained from the regression analyses. A common observation from the analysis of the Impulse Response Functions, for example, is that the effect of the independent variables on the outcome variables is not long-lasting. It is predicted that shocks to ROE and PTOIAA are momentary and often subside in a few years. Although banking is a highly regulated industry, the market seems quite efficient in the sense that market forces work to drive high or low levels back towards normal levels rather quickly.

The extended GMM method in this study seems to capture many of the effects better than the FE estimators traditionally employed in many similar papers may have missed. For example, according to the FE method, both nontraditional income and the lend-back ratios are not statistically related to ROE. These ratios are, however, significantly related to ROE, based on the GMM estimates. Similarly, while credit risk, bank size, noninterest income, and lend-back ratios are not important determinants of pretax profit based on the FE estimates, they are statistically significant to PTOIAA, according to the GMM counterparts.

In terms of goodness of fit, the models seem to fit the data slightly better than most from

prior studies. Again, it is important to keep in mind that the outcome variables, sample and period studied in this paper are not exactly the same as those in previous papers. The R^2 s from regression equations employing ROE and ROA as dependent variables in prior research almost always below 50%, and are often less than 15 percent (Stiroh, 2004; Smirlock, 1985; Peters et al., 2004; DeYoung and Rice, 2004; Al-Karanesh, 2005; Vennet, 2002; Ibraham et al., 2005; D'Souza and Lai, 2004).

Finally, the findings from this work have implications for regulatory policy and business strategy. First, bank concentration does not seem to have an important impact on bank profitability measures such as NIM, NII, ROE, or PTOIAA. Akhavein et al. (1997) document that the banking mergers of the 1980s increased market power, profit and cost efficiencies. It is thus prudent to shift the allocation of resources from anti-merger policies to other productive activities. Second, the positive relationship between NII and NIM indicates that the shift towards nontraditional activities is beneficial to banks as it has contributed to improvements in NIM, ROE, and PTOIAA. Therefore, policies aimed at allowing banks enter new markets to engage in new OBS activities are likely to yield desirable outcomes. Since the freedom to offer a variety of services will also help banks compete more effectively with non-bank financial institutions or foreign banks by diversifying their strategies, this may mean that extensive regulation limiting bank activities is no longer as essential. Another negative consequence of regulatory restrictions, as Gonzales (2005) and Barth et al. (2004) have shown, is that they increase financial instability and excessive risk taking by reducing bank charter value. Third, it is evident from the regression results in this study that capital adequacy is highly correlated to bank profitability, including NIM, ROE, and PTOIAA. An important policy implication is requiring banks to maintain sufficient capital which can also contribute to financial stability by both

increasing banks' capacity to absorb negative economic shocks and reducing their incentive to take greater risks as banks with more capital at risk have more to lose when things go wrong. Standardization of regulation across countries such as the Basel capital and prudential standards could be beneficial. I close this study with a caveat that my results do not necessarily generalize to banks in countries other than those that constitute my data set for the period between 1997 and 2004.

Appendix: Country Statistics

Country	1997	1998	1999	2000	2001	2002	2003	2004	Total
Argentina	128	128	128	128	128	128	128	128	1024
Brazil	253	253	253	253	253	253	253	253	2024
Canada	68	68	68	68	68	68	68	68	544
Chile	54	54	54	54	54	54	54	54	432
Colombia	42	42	42	42	42	42	42	42	336
Germany	309	309	309	309	309	309	309	309	2472
Denmark	84	84	84	84	84	84	84	84	672
Spain	162	162	162	162	162	162	162	162	1296
Finland	19	19	19	19	19	19	19	19	152
France	348	348	348	348	348	348	348	348	2784
UK	263	263	263	263	263	263	263	263	2104
Hong Kong	71	71	71	71	71	71	71	71	568
Indonesia	99	99	99	99	99	99	99	99	792
Ireland	55	55	55	55	55	55	55	55	440
Italy	248	248	248	248	248	248	248	248	1984
Japan	318	318	318	318	318	318	318	318	2544
Korea	59	59	59	59	59	59	59	59	472
Mexico	68	68	68	68	68	68	68	68	544
Malaysia	63	63	63	63	63	63	63	63	504
Norway	29	29	29	29	29	29	29	29	232
Peru	43	43	43	43	43	43	43	43	344
Philippines	63	63	63	63	63	63	63	63	504
Portugal	50	50	50	50	50	50	50	50	400
Sweden	25	25	25	25	25	25	25	25	200
Thailand	27	27	27	27	27	27	27	27	216
Taiwan	55	55	55	55	55	55	55	55	440
US	528	528	528	528	528	528	528	528	4224
Venezuela	62	62	62	62	62	62	62	62	496
Total	3593	3593	3593	3593	3593	3593	3593	3593	28744

VITA

James Nguyen was born in the chaotic year of the Dragon, one year after the Fall of Saigon. His family moved to Houston, Texas when he was in his early teens. James quickly learned the new language, attended a local high school, and graduated in 1995. He later earned his B.S. and M.A., both in Economics. After a stint teaching Economics at a local college, he decided to enroll in the Doctoral Program in Financial Economics at the University of New Orleans in the Fall of 2002. James is described by friends as having a good sense of humor. James has also been actively involved in various charitable programs around the country. He wishes to thank his family members for their unconditional support, his friends, teachers, and advisors for their assistance and encouragements especially during his graduate study. Last, but not least, James would like to thank Uncle Sam for making this long and arduous journey possible by generously sponsoring his family to the States.