Empirical assessment of the competitive conduct of Nigerian banks in a post-consolidation era

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Bank Consolidation and Bank Competition in Nigeria

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Abstract

This paper investigates the level of competition in the Nigerian banking industry employing a non-structural approach deduced from Panzar and Rosse (1987) model, on a bank level data 2005 – 2014. The crux of this paper is to ascertain the prevailing market structure in the Nigerian banking industry following the recapitalization policy that took effect in 2005. Empirical evidence from the Panzar and Rosse H-statistic reveals that the market structure of the Nigerian banking industry is monopolistic competition, which implies that banking products and services are homogenous but differentiated, and firms are independent in their decision-making and conduct. Findings also suggest that bank competitiveness decreases as revenue profile tends toward an inclusion of non-interest income or fee based services.

Key Words: Bank competition, bank consolidation, market structure, Panzar-Rosse

JEL Classification Code: G21, L10, L13

1.0 Introduction

This paper investigates the level of competition in the Nigerian banking sector drawing specifically from the bank consolidation exercise, which took effect in 2005, using a reduced form revenue equation by Panzar and Rosse in 1987[1] and earlier discussed by the same authors in 1977. This approach estimates a reduced-form equation relating gross revenue to a vector of input prices and other control variables. Although the bank consolidation exercise in Nigeria increased competitiveness for financial services, the result is bereft of the structural consequences that are associated with a big-push in banking reform (Beck *et. al.* 2013). The problem is whether the Nigerian banking sector that emerged after the consolidation exercise shows evidence of a contestable market.[2] The recapitalization policy and subsequent consolidation exercise was a major reform to improve banking sector performance for rapid economic growth and development.

Before the Structural Adjustment Program (SAP) of 1986 regulatory authorities fixed deposit and lending rates; as a result bank competitiveness was hampered. There was little incentive to engage in banking; only five major banks existed in Nigeria serving a population of over 80 million.[3] However, following the implementation of SAP, the Nigerian economy opened its doors for private participation in the banking sector and many new banks were licensed to operate in Nigeria under the deregulated regime.

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[1] Rosse and Panzar first applied the H-statistic model for competitive conditions in 1977 in a study of the US newspaper industry and since then the model has been applied in studies for several industries.

[2] The theory of contestability implies that firms can leave or enter the market without fear of losing their capital and that every firm in the industry possess similar cost function.

[3] World Bank population estimate based on 1960 population census

The initial experience was an influx of banks and financial service providers, many of whom were ill prepared for the challenges of banking and institutional lending. Hence in the mid-1990s over fifty percent of all the newly licensed banks failed.

In 2001, the concept of universal banking was introduced, which increased the scope of banking operations in Nigeria by the fusion of both merchant and commercial banking. Despite the initial attempts by monetary authorities to increase the capacity of banks in doing business, many banks still resorted to foreign exchange round tripping as an avenue to break-even. In the main, increasing competition for financial products and services further weakened the existing banks. Few Nigerian banks could withstand the pressure of engaging in traditional banking and financing the real sector to ginger the much needed economic growth and development. In July 2004 a major reform of the banking system in Nigeria was introduced as part of a home grown economic development agenda[4]. In order to implement the reform agenda, the Central Bank announced that all banks in Nigeria should be recapitalized to the tune of twenty-five billion Naira,[5] by December 31st, 2005. The recapitalization policy sent shockwaves to the banking industry, became an issue for public discourse, but eventually banks embraced the idea of mergers and consolidation as the only option to meet the minimum capital requirement.

In view of the importance of banking to the economy there is a need to know the extent of competition that emanates from the consolidation exercise, because competition has always been a very contentious issue in the industry, but it is evident that a healthy

[4] One of the secondary objectives of the National Economic Empowerment and Development Strategy (NEEDS) introduced in 2003 by the Obasanjo administration was to strengthen the banking sector.

[5] The Nigerian currency exchanged at an average of 157 naira to a US dollar as at December 2014.

competition among firms strengthens the free market enterprise. According to Shaffer (1982) traditional competitive analysis seeks to infer a degree of competition on the basis of market structure, but competition is actually a property of conduct rather than structure, and so an empirical test for competitive conduct is very essential. However, in order to improve the allocative and productive efficiency in the provision of financial services, banks are expected to compete, albeit competition is widely accepted as a positive phenomenon for the industry. Furthermore, a healthy rivalry among banks can serve as a driving force in improving the quality of banking business, improving pricing and availability of banking products and services offered to customers, and promote technological innovation (see Yilidrim & Phillipatos, 2007).

Although some studies have discussed the competitive positions of commercial banking in Nigeria, with a view to understanding the changes in the market structure before and after the consolidation exercise, mixed results have been found, and the data for post consolidation studies is too short to provide reliable empirical evidence.[6] In the wake of the consolidation exercise the number of deposit banks dropped from 89 in 2004 to 25 as at January 2006 and further to 20 as at December 2014. Despite the early success of the consolidation exercise, there was still evidence of competitive pressures in the banking industry resulting in the weak performance of some banks sending negative signals to the banking public.[7] In order to strengthen the system, monetary authorities in December 2009 embarked on a major examination of all the 24 banks and found that 10 were in grave conditions with liquidity, capital adequacy and corporate governance

[6] See Ajisafe and Akinlo (2013) for the study on commercial bank competition in Nigeria.

[7] See Okonjo-Iweala (2012) for a discussion on bank consolidation exercise and the implication to the growth and development of the Nigerian economy.

issues. The Central Bank of Nigeria ordered the replacement of the executive management of 8 banks and injected over 620 billion Nigerian Naira into ten banks to stabilize their operations.

In the light of the above, this paper seeks to determine the level of competitive conduct prevailing after the consolidation exercise, and the appropriate market structure. This will enable policy makers to assess the relative success of the recapitalization policy. Studies in bank competition have been largely with a view to understanding the effect of market concentration on performance especially with respect to the conduct of banking firms. This study adds to the findings in earlier studies and strongly furthers the cause of bank competition studies in Nigeria by extending the data and incorporating variables that are most compatible with the intermediation theory and H-statistic tests in many jurisdictions.[8] This study is presented in six sections, the next section is a review of the various attempts by the monetary authorities to reform the banking system in Nigeria, the third section presents a review of related literature and the theoretical perspectives on bank competition, the fourth is a presentation of the data and methodology, the fifth section presents and discusses the results of the empirical analysis, and the sixth concludes the study.

2.0 Overview of Banking Reforms in Nigeria

The first banking ordinance under the British colonial rule was enacted in 1952. The colonial merchants coordinated banking in Nigeria at this time, whose interest was to facilitate trading and currency remittances between the colonies and the home country.

[8] See Ajisafe and Akinlo (2013) and Bikker *et. al*. (2009) for analysis of competitive conduct in Nigerian banks and the role of scale, costs and equilibrium in the assessment of competitive conduct of banks for so many countries of the world.

The 1952 ordinance was an offshoot of a report of the Patton Commission established in 1948 to provide a guideline for the banking industry following incessant bank failures, and to curb financial malpractices that characterized the banking sector. The 1952 ordinance actually launched the first phase of banking system regulation in Nigeria by defining the role and characteristics of banking in Nigeria. The ordinance came up with a broad definition of banking in Nigeria as a business that has banking as its title and open to the public for financial transactions. However, this was the first time banking was mentioned in a legal document for the purpose of regulating the banking business. The objective of the ordinance was to define the role of banking business in the Nigerian economy and prescribe minimum capital requirements for both domestic and foreign owned banks, establish standards for the supervision and conduct of banking, and the necessary reserve requirements for bank deposit management. According to Okpara (2011), under this phase of reform between 1952 – 1958, banks were required to obtain a license on the payment of a nominal capital of GBP25, 000.00 with at least a paid – up capital of GBP12, 500.00 but the foreign banks must have a paid – up capital of GBP100, 000.00. A further stringent requirement was established for existing banks to maintain a reserve fund into which 20 per cent of the profit would be paid annually until the reserve fund equaled the paid-up capital and all capitalized expenditure must have been retired before any dividend payout. The banks were further required to maintain adequate liquidity profile to retain their licenses. No bank was allowed to make unsecured loans against its own shares for more than GBP300.00 to any of its directors or to a company associated with any of its directors.

The second phase of banking sector reform in Nigeria was a continuation of the 1952 ordinance that created the necessary conditions for banking supervision, examination and control of banks in the country by the government. The 1952 ordinance further provided the platform for the establishment of an indigenous Central Bank of Nigeria in 1958 with the appointment of Mr. Roy Pentelow Fetton as the governor from 1958 to 1963. The Central Bank of Nigeria Act of 1958 paved the way for bank examination and supervision in Nigeria. Since the 1958 Act, the mandates of the CBN (with modifications) have included to ensure monetary and price stability, issue legal tender currency in Nigeria, maintain external reserves to safeguard the international value of the legal tender currency. Furthermore to promote a sound financial system in Nigeria, act as a banker of last resort and provide economic and financial advice to the Federal Government. In essence, the Central Bank of Nigeria is the Monetary Authority of Nigeria, a regulatory institution for banks and other financial institutions. The Central Bank ultimately became the monetary adviser to the Federal Government of Nigeria.

The third phase of banking sector reforms in Nigeria came on the heels of the Companies and Allied Matters Act of 1968, which expressly stated that banks like other companies doing business in Nigeria be incorporated with a minimum share capital. In addition the Banking Regulation Act of 1969 provided for a maximum lending to any single individual or company not to exceed thirty three and a half per cent of the total sum of the paid-up capital and statutory reserves of bank, this was an increase from the twenty per cent provision stipulated under the Central Bank Act of 1958. However, the Act further provides that no bank should own any subsidiary company and clients, and gave the apex bank extensive supervisory and regulatory power over all banks

(Akinmoladun, 1992). Further amendments were made to the Banking Act of 1969, in 1970, 1972 and 1979 by decrees to strengthen the CBN for the subsequent indigenization program of the federal government and continued developments in the banking system (Okpara, 1997).

The fourth phase of banking sector reforms in Nigeria was a product of the Structural Adjustment Program of 1986. This era spanned through 1990, when the Nigerian banking system became completely deregulated. The number of banks operating in Nigeria increased two folds from 1987 through 1990. So many privately owned indigenous and state banks emerged during this era to issue credit to both private and public sectors. Interest rate and foreign exchange deregulation was the crux of banking reforms during this era. Though the deregulation reforms in Nigeria started in the fourth quarter of 1986 with the setting up of a foreign exchange market in September 1986, the reforms pertaining to the banking industry proper did not commence until January 1987 (Ikhide & Alawode, 2001 and Asogwa, 2005b). The banking reform under the structural adjustment program took the form of deregulation of interest rates for deposits and lending. Deregulation implies allowing market forces to determine the rate of interest any bank would charge instead of the previous regime where interest rates were predetermined by the monetary authorities. Monetary authorities also liberalized the entry of new banks into the financial market place, which led to the emergence of so many privately owned merchant and commercial banks. The exchange rate for the domestic currency was allowed to float at the foreign exchange market. At the initial stage, this exchange rate policy gave rise to a dual market for foreign exchange; the official rate was for bank and government foreign exchange transactions while the unofficial rate was

controlled by the bureau de change and termed “black market” by participants for transactions with the general public. There was an imbalance arising from the spread between the official and unofficial rates which became a dilemma for the banking sector and monetary authorities in the long run. Unfortunately, the dual exchange rate policy triggered high inflation and macroeconomic imbalances that gave rise to the failure of most of the new banks that came on stream following the liberalization within a very short period of existence. The foreign exchange regime was phenomenal at least in the growth of the number of banks that perceived this as a means of reaping easy profits through foreign exchange round tripping. The increasing number of banking institutions overstretched the regulatory capacity of the CBN while the growing sophistication in the design and use of financial instruments heightened the risks of malpractices and fraud in the industry. In particular, mismanagement such as insiders’ abuse and poor credit appraisal systems, resulted in the accumulation of unpaid loans and advances, which eventually contributed to the distress situation experienced in the banking system in the early 1980’s and mid 1990’s and the revocation of the licenses of 26 banks in 1997. During this period the Nigerian Deposit Insurance Corporation was established in 1988 and commenced operation in January 1989.

The fifth phase of banking reforms was to ensure a healthy banking system, which began with the promulgation of two new decrees in 1991 to enhance the regulatory powers and supervisory authority of institutions responsible for monetary policy formulation and guideline and to enable them manage the banking reform that emanates from the structural adjustment program – the Central Bank of Nigeria Decree 24 of 1991 and the Banks and Other Financial Institution Decree (BOFID) of 1991. The new banking

sector regulatory reforms gave the Central Bank of Nigeria the authority to issue banking licenses and to revoke them. The decree also empowered the Central Bank to apply stringent prudential measures in handling ailing banks. Nonetheless, by 1991 some of the reforms introduced in 1987 were reversed, the regime of interest rate cap and ceilings came back on stream; the ceiling for interest rate on lending was kept at 21% and deposit rate was capped at 13.5%. A maximum intermediation spread of 4% was recommended for all licensed banks, but as inflation ensued due to the flexible exchange rate mechanism, these measures became very difficult to maintain. Following the privatization of government owned banks in 1992, government began the process of divesting itself from the seven banks where it had 60% equity holding (Okpara, 2011). In 1993 the Open Market Operations as an indirect instrument of monetary control was introduced. The first discount house took off in 1993 known as Associated Discount House, subsequently others followed, and by 2003 there were 5 discount houses. The discount house intermediate between the central bank and other banks off-loading government treasury securities from the CBN and auctioning it to banks.

The sixth phase began in the late 1993 and spanned 1994 – 1998, with the re-introduction of regulations. During this period, the banking sector suffered deep financial distress, which necessitated another round of reforms designed to manage the distress. About 33 banks were recorded distressed in 1993 for the first time since the establishment of the central bank; and in 1995, the number of distressed banking institutions both commercial and merchant reached 60 (Okpara, 2011). This necessitated another reform measure in 1994, to grant permission and ensure that commercial banks in Nigeria start paying interest on demand deposits (current account) as deemed appropriate.

The monetary authorities implemented a policy of using indirect instruments of credit control to grant loans to financial institutions based on their portfolio of foreign exchange held in foreign deposits. This measure was to support the cash reserve ratio, which before the reforms had been virtually stagnant. According to Adegbite (2005), to avoid undue interference by governments (both state and federal), banks were advised to desist from accepting deposit from government and all such deposits held by the commercial and merchant banks were withdrawn with immediate effect.

The seventh phase of banking reform in Nigeria began in 1999 following the transition to a democratically elected government and spanned through 1999 – 2003. This era reinvigorated the process of liberalization of the financial sector, with the adoption of policies that establish a framework to tackle bank fragility and strengthen competition. The dichotomy between commercial and merchant banks was removed and the idea of universal banking ensued in 2001. The licensed banks were permitted to carry out both merchant banking and commercial banking under one shop.

The eighth phase of banking reform in Nigeria literally began in 2004 and lasted through 2009. The second term of the Obasanjo administration embraced very heavy tactical economic reform program under the aegis of National Economic Empowerment and Development Strategy (NEEDS) launched in 2003. In this overall macroeconomic reform package was a banking reform strategy aimed at strengthening the financial sector and improve the availability of domestic credit to the private sector. To accomplish this goal, the Central Bank of Nigeria requested all deposit banks to raise minimum capital from two billion to twenty five billion Nigerian Naira by the end of 2005. Banks failing to meet this requirement were expected to merge or face a revocation of their license at

the beginning of January 2006. Balogun (2007) opined that the financial system was characterized by structural and operational weaknesses and that their catalytic role in promoting private sector led-growth has been jeopardized by lack of funds, but could be further enhanced through a more pragmatic reform. Ebong (2006) also stated that prior to this reform, the banking system was characterized by low capital base, high non-performing loans, insolvency and illiquidity, over dependence on public sector deposits and foreign exchange trading, poor asset quality, weak corporate governance, a system with low depositors' confidence. Above all, the Nigerian banking sector could not support the real sector of the economy at 25% of GDP compared to African average of 78% and 272% for developed countries. In his contribution to the debate on bank consolidation, Lemo (2005) noted that the banking industry had remarkable features of market concentration and documented that the top ten out of eighty-nine banks controlled more than 50% of the aggregate assets, more than 51% of the total deposit liabilities, more than 45% of the aggregate credits. Also the Central Bank governor, Soludo (2004), described the industry as being generally characterized by small-sized and marginal players with very high overhead cost. The primary objective of the reform is to guarantee an efficient and sound financial system. This reform, the governor stated was designed to enable the banking system develop the required resilience to support the economic development of the nation by efficiently performing its functions as the fulcrum of financial intermediation. Thus, the reforms were to ensure the safety of depositors' money, position banks to play active developmental roles in the Nigerian economy, and become major players in the sub-regional, regional and global financial markets (Adeyemi, 2007). The components of the 13-points reform agenda announced by

Governor of the Central Bank of Nigeria on July 6, 2004 includes an increase on the minimum capital requirement of all licensed banks from two billion naira to twenty five billion naira with a deadline of 31st December. 2005; consolidation of banks through mergers and acquisitions to ensure that there are no "single family" owned banks; phased withdrawal of public sector funds from banks with effect from July 2004; adoption of a risk-focused and rule-based regulatory framework; adoption of zero tolerance for weak corporate governance; tackle banking firm corporate misconduct and lack of transparency; improve on the automation of the rendition process of returns by banks and other financial institutions through the electronic financial analysis and surveillance system (e-FASS); establish a hotline and confidential internet address for all Nigerians wishing to share any confidential information with the Governor of the Central Bank; strict enforcement of the contingency planning framework for systemic banking distress; establish an asset management company as an important element of distress resolution; promote the enforcement of dormant laws especially as enshrined in the Bank and Other Financial Institutions Act (BOFIA) of 1990 with specific reference to those relating to the issuance of dud checks and the law relating to the fiduciary duties of the board of banks and vicarious liability in the case of bank failure; review and update the relevant laws and drafting of new ones relating to effective operations of the banking system; closer collaboration with the economic and financial crimes commission (EFCC) in the establishment of the financial intelligence unit (FIU) and the enforcement of the anti-money laundering and other economic crime measures; the rehabilitation and effective management of the federal minting and printing company. Ebong (2006) noted that of the thirteen elements, public discourse on the subject focused largely on two; the increase in

the minimum capital requirement of banks from two billion naira to twenty five billion naira, and subsequent mergers and acquisitions for banks unable to meet the capital requirement on their own. Okpara (2011) stated that in a bid to comply with this minimum capital requirement banks adopted the following strategies – right issues for existing shareholders and capitalization of profits, public offers through the capital market and/or private placement, mergers and acquisitions, and a combination of the above mentioned strategies.

The final phase of the reform in the banking sector leading up to the time frame of this study was to cushion the effect of the financial crisis of 2007 – 2009, which hit hard on the banking system in Nigeria. The financial crisis dealt heavily on Nigerian banks because of over reliance on shareholders equity as a veritable source of financing the consolidation exercise, while most of the banks if not all banks participated in IPO's and suddenly a crash of the stock market completely repressed the value of investor's funds. The result was a weak balance sheet for most banks and inability to meet their financial obligations with depositors. Most of the steps taken by monetary authorities during this period bordered on the implementation of the previous 13 point agenda of the Central Bank. The implementation of the cash–less policy of electronic money transfer and the establishment of Asset Management Corporation of Nigeria (AMCON) for the management of the assets of failed banks. In the lead of the bold steps taken by the Central Bank was the implementation of a maximum ten year policy for the Executive Directors and Chief Executive Officers of Banks in Nigeria. As at July 31, 2010 all Chief Executive Officers who have served in that capacity for at least ten years cease to function in that capacity and as such hand over to their second in the chain of command.

Ultimately, all the reforms implemented restored the confidence of the public in the banking system and improved the level of competition and corporate governance in the Nigerian banking system. In addition, Central Bank of Nigeria ordered all banks to sell their non-performing loans to AMCON, as a result from 2011 there was no existing non-performing loans in the financial statements of banks, but impairment costs were incurred.

3.0 Literature Review and Theoretical Framework

3.1 Literature Review

Banks provide the financial backbone for the growth and development of any economy. Researchers are always interested in understanding the conduct of banking business in relation to macroeconomic stability. To understand competition there is a need to examine the conduct or behavior of individual banking firms in view of the structure of the banking industry. Several empirical studies have established a strong relationship between banking structure and economic growth (see Jayaratne and Strahan, 1996; Levine, Loayza and Beck, 2000; Collender and Shaffer, 2003). In the debate on whether banking competition improves or deters social and economic welfare in terms of systemic stability several studies have equally emerged in the literature (Smith, 1998; Allen and Gale, 2004; De Jonghe and Vender Vennet, 2008; Schaeck et al., 2009) and with respect to productive efficiency (Berger and Hannan, 1998; Maudos and de Guevara, 2007).

A major academic dimension that has transformed the viewpoints of researchers over the years is the emergence of the New Empirical Industrial Organization (NEIO) literature, which posits that increasing concentration may lead to unhealthy control or market power; as a result bank competition is impaired when concentration is increasing

because of the tendency of banks to collude. This controversy has been the subject of mainstream bank competition literature, which is divided into structural and non-structural approaches. The structural approach embraces the structure-conduct-performance (SCP) paradigm and the efficient hypothesis (EH), whereas the non-structural approaches include the Iwata Model (1974), Bresnahan (1982) and Panzar – Rosse (1987) and Rosse and Panzar (1977) model.

The SCP originally developed by Bain (1951), investigates whether high levels of market concentration result in collusive behavior and other non-competitive practices among larger firms. The simplest procedure that the study adopts to test the SCP hypothesis is the least squares regression method of estimating firm profitability on a proxy for market concentration. An expected positive coefficient implies that as concentration is increasing, market power is equally increasing resulting from higher profits due to collusive behavior of firms in the industry. The Structure Conduct Performance (SCP) model asserts that banks are able to extract monopolistic rents in concentrated markets by their ability to offer lower deposit rates and to charge higher loan rates, as a result of collusion or other forms of non-competitive behavior. The more concentrated the market, the less the degree of competition. The smaller the number of firms and the more concentrated the market, the greater is the probability that firms in the market will achieve a joint price-output configuration that approaches the monopoly solution. Thus, firms in more concentrated markets will earn higher profits (for collusive or monopolistic reasons) than firms operating in less concentrated ones, irrespective of their efficiency (Bikker and Bos, 2008).

On the other hand, the EH, which stems from Demsetz (1973) and Peltzman

(1977), states that efficient firms increase in size and, therefore, in market share due to their ability to generate higher profits, leading to higher market concentration. Under the EH there is no direct relationship between competition and concentration, and a highly concentrated sector is the logical outcome of market forces (Gutierrez de Rozas, 2007).

However, banking literature has progressed beyond these simple approaches to more complex non-structural models. The development of the non-structural approach is due to the endogeneity of market structure and in the recognition of the theoretical and empirical shortcomings of the structural model. As mentioned earlier, three major non-structural models of competitive behavior emerged in the New Empirical Industrial Organization (NEIO) framework, as measures of competition with emphasis on the analysis of the competitive conduct of firms and estimating deviation from competitive pricing.

These non-structural theories assume that a bank maximizes profit by increasing the prices (price of outputs in the loan market) and are rewarded with higher profits (Bikker and Bos, 2008). The non-structural models are Iwata Model, Bresnahan Model, Panzar – Rosse Model.

Iwata (1974) theory of bank performance is for the estimation of conjectural variation values for individual banks supplying a homogeneous product in an oligopolistic market. Bikker and Bos (2008) observed that some of the profitability determinants are interrelated and/or cannot be observed in practice and hence requires a set of limiting assumptions for identification problem.

The Bresnahan (1982) theory of bank performance runs contrary to Iwata (1974) in the underlining assumption that all banks are equal and identical and make an aggregate analysis. The model assumes that banks maximize their profits by equating marginal cost and perceived marginal revenue. According to Bikker and Bos (2008) empirical applications of the Bresnahan model are scarce. Shaffer (1989 and 1993) used the Bresnahan model to estimate competition for the US loan markets and the Canadian banking industry respectively.

Panzar and Rosse (1987) theory of bank performance estimates competitive behavior of banks on the basis of the comparative static properties of reduced-form revenue equations based on cross-section data. Panzar and Rosse (P–R) assumed that the only firm specific data available are revenues and factor prices, however, they show that if their method is to yield plausible results, banks need to have operated in a long-term equilibrium (that is to say, the number of banks needs to be endogenous to the model) while the performance of banks needs to be influenced by the actions of other market participants.

Bikker and Haaf (2002) studied the competitive conduct of banking firms in 23 OECD countries over the period 1988-1998. For every single country results describe a monopolistic competition environment. They posit the distinction between several bank sizes, in order to capture different geographical markets. The study further postulates that large, medium-sized and small banks are supposed to operate in an international, national and regional dimension, respectively. However, competition appears to be stronger for large banks and weaker for small banks. These results support the findings in De Bandt and Davis (2000).

In the same vein, Claessens and Laeven (2004) employed a multi-country analysis of banking competition to compute the H-statistic for fifty developed and developing countries for the period 1994-2001. The result shows that monopolistic competition is the best description of the markets under consideration. Subsequently, they draw attention on the factors underlying competition by regressing the estimated H-statistics on a number of country-specific characteristics. These refer to the presence of foreign banks, activity restrictions, entry regime, market structure, and competition from the non-bank sector, general macroeconomic conditions and overall development of the country. They do not come across a straightforward relationship between competition and concentration, but find that fewer entry and activity restrictions (i.e. higher contestability) result in more competition.

In a multi-country study of 25 EU member states covering the period 1998 - 2002 Staikouras et al. (2006) find evidence of monopolistic competition with larger banks behaving more competitively than smaller banks, and banks in new member countries showing higher levels of competition than former members. Conversely, the smaller banks earned interest income in a less competitive environment than larger banks, but in the case of earning more of total revenue, larger banks prevailed in less competitive situations.

In a study of Latin American banking system, Yillidrim & Phillipatos (2007), using data for the period 1993 – 2000 finds that the banks in this region seem to earn their revenues as if operating under conditions of monopolistic competition. Of course this finding is true of the banking sector because theory suggests that banks are licensed, regulated, supervised in order to engage in product or service differentiation. In the same

vein, the study also reveals that bank returns are negatively related to the degree of competition, also affirms that foreign bank entry can stimulate competition in national banking markets and thus force domestic banks to improve their operating efficiency.

Buchs and Mathiesen (2005) finds evidence to show that banks in the Ghanaian banking industry faced a non-competitive market structure between 1998 and 2003, which by their estimation tend to hamper financial intermediation and at the same time poses a threat to the profitability of the banking system. The study further observed that the very high profitability of some banks in Ghana is to the detriment of others and seem to indicate a persistently low level of market contestability.

In the Nigerian case, a study by Asogwa (2005b) to determine the competitive conditions of the banking sector for the period 1997 – 2001 using a conjectural variation technique and simultaneous equation model shows that the coefficients on the market power parameter are compatible with monopolistic competition. In the same vein, the study by Ajisafe and Akinlo (2013) using adjusted return on assets and the ratio of gross earnings to total assets as dependent variable in their assessment of competition in the Nigerian banking industry from 1990 – 2009 finds a low level of monopolistic competition.[9] In an earlier study using data from 1980 to 2010, Osuagwu (2014) finds no evidence of a collusive behavior amongst banks in Nigeria as concentration is increasing, which implies that competition has been largely on a level playing field before the consolidation exercise. However, this study takes a different dimension as it examines the market structure of the banking system in Nigeria using post consolidation data only. In

[9] Applied panel unit root tests to data, find variables to be stationary at levels. The micro-foundation of bank level data reduces the likelihood of a unit root. This informs why less emphasis is placed on unit root tests in this and many other studies on bank competition.

furtherance to previous studies, this examines the level of competitiveness in the Nigerian banking system following the greatest bank recapitalization exercise ever, that resulted in the consolidation or hitherto the collapse of some banks; reducing the number from eighty-nine to twenty four in 2005, then to twenty in 2010. This study is unique in the sense that the dependent variables posses all the intermediating characteristics and to a large extent follow strictly the theory in Rosse and Panzar (1977) and Panzar and Rosse (1987). This study further improves our understanding of whether competitiveness increases as the propensity to earn additional income other than interest income increases. The introduction of operating income as a dependent variable will tend to disclose the direction of competitiveness in Nigerian banking sector outside the interest revenue stream.

3.2 Theoretical Framework

The two mainstreams for the appropriate definition of output and input in banking follows the intermediation theory and the production theory. The former assumes that a bank attracts deposits and other funds and transforms them into loans and securities (investments), using inputs such as labor, capital and materials. Interest payments are seen as part of the costs and the corresponding dual cost function includes not deposits but the interest rate paid on deposits as an input factor. Loans and investments are the output components. Examples of this view are found in Altunbas *et al.* (1994). The latter approach assumes that a bank provides services related to loans and deposits. In this view, interest payments are not regarded as banking costs. The output components comprise loans and deposits. Examples of this approach can be found in Resti (1997)

among others. The theoretical perspective of this study follows the intermediation approach proposed by Sealey and Lindley (1977).

The theoretical method developed by Panzar and Rosse (1987) estimates competitive behavior of banks on the basis of the comparative static properties of reduced-form revenue equations based on cross-section data. There are basic assumptions about the Panzar-Rosse H-statistic model; that banks operate in a long-run equilibrium and that the cost-structure of banks is homogenous, given that the production function follows a Cobb-Douglas function with constant returns to scale. Panzar and Rosse (P–R) show that if their method is to yield plausible results, banks need to have operated in a long-term equilibrium (that is to say, the number of banks needs to be endogenous to the model) while the performance of banks need to be influenced by the actions of other market participants. In equilibrium, the zero profit constraint holds at the market level.

The Panzar-Rosse model proposes a structural demand and cost function such that

$Ri = Ri\ (yi, n, zi)$ ……. (1)

$Ci = Ci\ (yi, wi, xi)$ ……. (2)

Where Ri is total revenue, Ci is total cost, y is output, n is number of firms, z is a factor of exogenous variables affecting revenue, w is a factor of input variable with specific costs such as labor, and x is a representation of other exogenous variables.

Profits $\pi i = Ri\ (yi, n, zi) - Ci\ (yi, wi, xi) = 0$ …… (3)

at long-run equilibrium and a profit maximizing condition with zero profit, marginal revenue must be equal to marginal cost.

Let the superscript* denote equilibrium values at the industry level,

$R_i^*(y^*, n^*, z) - C_i^*(y^*, w, x) = 0$ …… (4)

Variables marked with an asterisk represent equilibrium values. Market power is then measured by the extent to which a change in factor input prices (∂w_{ki}) is reflected in the equilibrium revenues (∂R_i*) earned by bank *i*. Panzar and Rosse define a measure of competition, the '*H*-statistic' as the sum of the elasticity of the reduced-form revenues with respect to the *K* input prices:

$$H = \sum_{k=1}^{K} \left(\frac{\partial R_i^*}{dWk}\right)\left(\frac{Wk}{R_i^*}\right) \quad \text{..... (5)}$$

The estimated value of the *H*-statistic ranges between $-\infty$ and 1. $H < 0$ if the underlying market is a monopoly, it ranges between zero and unity for other types of competition such as oligopoly and monopolistic competition, and an $H = 1$ indicates perfect competition. Panzar–Rosse (P-R) developed a test to discriminate between these market structures.

Shaffer (1983) demonstrated formal linkages between the Panzar–Rosse *H*-statistic, the conjectural variation elasticity and the Lerner index. Bikker *et al* (2006) provides an overview of 28 studies that apply the P–R method to the banking industry. In Mwenda and Mutoti (2011), the *H*-statistic is derived as the sum of the estimated input factor price coefficients or elasticity, that is, $\beta 1 + \beta 2 + \beta 3$. The rationale for using the partial adjustment revenue equation is that this specification yields more robust results than the static revenue function.

4.0 Methodology

4.1 Data

This study employs a cross-sectional data of twelve banks out of the twenty banks that exist in Nigeria at the time of this study for the period 2005 - 2014. The data is drawn from the annual reports of the selected banks, which constitute over 80% of the total

market size. The banks not included in the study were mostly new banks formed out of the restructuring exercise of 2010, and those banks whose asset structure is not indigenous to the Nigerian economy.[10] The financial year of all banks in the sample is assumed to begin in January and end in December. Data from the following banks have been used in this study – Access Bank, Diamond Bank, Eco-Bank, Fidelity Bank, First Bank, Guaranty Trust Bank, Skye Bank, Sterling Bank, United Bank for Africa, Union Bank of Nigeria, Wema Bank and Zenith Bank.

***4.2 Empirical Model*:** To determine the competitive position of banks following consolidation, the empirical Panzar and Rosse *H*-statistic model is applied in two phases; the first model is as stated in Bikker and Haaf (2002) and a second model follows the estimation technique employed by Gutierrez de Rozas (2007) for the Spanish banking industry using a reduced form revenue equation and presented as follows:

$$lnII_{it} = \alpha + \beta lnIE_{it} + \gamma lnSC_{it} + \delta lnOE_{it} + \zeta lnBSF_{it} + \eta lnOI_{it} + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where *lnIIit* is the natural logarithm of the ratio of total interest income to total assets (II/TA) of bank *i* at time *t.* In the second estimation, the dependent variable is the ratio of operating income to total assets (l*nIRit*). All the variables are expressed in the natural logarithmic form to reduce the effect of outliers and normalize data for analytical convenience. *lnIE* is the ratio of interest expenses to total assets (IE/TA), or the average funding rate, *lnSC* is the ratio of personnel expenses (staff cost) to total assets (SC/TA), *lnOE* is the ratio of physical capital expenditure or other expenses to total assets (OE/TA), and *lnBSF* are bank specific exogenous factors (without explicit reference to their origin from the cost or revenue function), *lnOI* is the ratio of other income to total

[10] Stanbic IBTC bank, Standard Chartered bank, keystone bank, Mainstreet bank, Heritage bank, Unity Bank, Citibank and First City Monument Bank

assets (OI/TA), in this case non-interest income, ε is a stochastic error term. IE, SC and OE are the unit prices of the inputs of the banks: funds, labor and capital, or proxies of these prices.

In Equation (6), the *H* statistic is given by $\beta + \gamma + \delta$.[11] In order to verify whether the competitive structure has changed over time equation (6) can be applied to a pooled cross-section (across banks) and time series analysis over the time span 2005 – 2014.

The dependent variable is the 'ratio of total interest revenue (income) to total assets', as in Molyneux and Thornton (1992). The decision to consider the interest part of the total revenue of banks is consistent with the underlying principles of the P-R model, that financial intermediation is the core business of most banks.

Bank-specific factors (BSF) are additional explanatory variables, which reflect differences in risks, costs, size and structures of banks and should, at least theoretically, stem from the marginal revenue and cost functions underlying the P-R model in equation (6). The ratio of capital or equity to total assets (TE/TA) is used as a proxy for risk component in the first estimation, whereas in the second estimation the ratio of total loans to total assets (TL/TA) and the ratio of total deposits to total assets (TD/TA) are used as control variables. Total assets (TA) are used as scaling factor.

The decision to consider operating income in the second estimation stem from the fact that in recent years banks' income is increasingly obtained from other operating activities, which includes fees and commissions for transactions. Competition in modern banking goes beyond the traditional interest rate activities to include non-interest income

[11] The use of the coefficients of cost of labor, interest expense and operating expense for calculating H-statistic is in line with the intermediation theory and bank production process proposed by Sealey & Lindley (1977).

activities.[12] The coefficient for *OI* is probably negative as the generation of other income may be at the expense of interest income.

5.0 Empirical Analysis and Discussion of Results

5.1 Empirical Analysis

All the bank level variables are collinear; this informs the reason why total assets are used as scaling factor and logarithm is taken to normalize data (see correlation matrix on Tables 1 and 2). The summary statistics of bank level variables is presented in Table 3.

This study follows a panel data analytic framework. Panel data analysis determines the relationship between variables while safeguarding bank specific characteristics, which is referred to as individual bank heterogeneity. Panel data estimates the fixed and random effects models; the fixed effects estimation assumes that there are time-invariant characteristics, which are unique to individual banks that otherwise should not be correlated with other bank characteristics. If this stochastic or error terms are correlated, then fixed effects is not suitable, then we need to model the relationship using random effects. This is the rationale for applying the Hausman specification test and other relevant econometric tests in this study to determine the plausibility of panel data estimation results.

Panel data estimation results are presented using two dependent variables; log of interest income to total assets (*lnII)* and log of operating income to total assets (*lnIR)* in four different model categories. Each dependent variable is estimated on a parsimonious model using fewer explanatory variables and an extended model that includes log of total loans to total assets (*lnTL)* and log of total deposits to total assets (*lnTD)* to account for

[12] Casu and Girardone (2006) support the view that it is almost irrelevant to distinguish between competition for interest and non-interest income because of improvements in technology, banks reliance on fee-based services is on the increase.

bank specific risk factors and omitted variable bias, if need be. Ordinarily, in regression estimation there is an assumption of a heteroscedasticity consistent standard errors, and our test results confirm that there is presence of heteroscedasticity consistent standard errors in our estimation (see Table 4 in the appendix)

Fixed effects estimation results are presented in Table 5, column 1 is the result of the parsimonious model using log of interest income to total assets as dependent variable, and column 2 is the result of the extended model, column 3 is the result of the parsimonious model using log of operating income to total assets as dependent variable and column 4 is the extended model. The four estimation results obtained in Table 5 have been tested against the same explanatory variables in Table 6 for the random effects model.

The Hausman specification test results presented in Table 7 indicates that for the model in column 1 of regression results using log of interest income to total assets as dependent variable, the random effects model in Table 6 column 1 is the most appropriate as opposed to the fixed effects model in Table 5, the same is applicable to the extended model in column 2. In other words, the Hausman specification test indicates that the random effects model in Table 6 is the appropriate if log of interest income to total assets is used as dependent variable. However, for the models in columns 3 and 4, using the log of operating income to total assets as dependent variable, the fixed effects model in Table 5 is the most appropriate as shown in Table 7 of the Hausman specification test.

A further diagnostic test is carried out to determine whether fixed time effects are needed when running a fixed effects model as presented in Table 8. As observed above a fixed effects model is most appropriate for the estimation of the models in columns 3 and

4 of Table 5. But the result of a time fixed effects test indicate that no time fixed effects are needed for the fixed effects estimation of log of operating income to total assets as dependent variable for both the parsimonious and the extended models.[13]

In order to determine whether the random effects model is plausible as indicated by the Hausman specification test for the models in columns 1 and 2, the Breusch and Pagan Lagrange Multiplier Test is applied as shown in Table 9. The results show that the random effects model is appropriate as opposed to an ordinary least squares regression. Therefore the results of the random effects model presented in column 1 and column 2 of Table 6 is the most appropriate for this analysis.

5.2 Discussion of Results

The decision rule for the Panzar and Rosse test for competitive conduct using the H-statistic is such that if $H < 0$ we conclude in favor of a monopoly, if $0 < H < 1$ there is evidence of a monopolistic competition, and if $H > 1$ we conclude in favor of a perfect competition. From the results in Tables 5 and 6, we conclude that the banking sector in Nigeria is monopolistic competition, and reject the null hypothesis of monopoly and perfect competition, since the values of H-statistics from all estimations fall between 0 and 1. In all cases, we observe that competition for interest income is much higher than competitiveness in the operating income stream. There is a tendency for banks to charge their customers arbitrary fees on non-interest revenue products and services than it is for

[13] In the case of the parsimonious model with *lnII* as dependent variable we reject the null hypothesis and therefore conclude that a time fixed effects is needed, but the Hausman specification test in Table 7 shows that the probability level is greater than 5%, so the random effects model is appropriate for the estimation.

interest revenue accounts. In other words, the competitive conduct of banks in Nigeria increases for interest income, which conforms to the intermediation theory of Sealey and Lindley (1977) and supported by the theoretical concepts in Panzar and Rosse (1987). The H-statistic for interest income as dependent variable under the fixed and random effects estimation are approximately 0.6 and 0.5 respectively, but for operating income as dependent variable the H-statistic falls to 0.3 and 0.1 for the fixed and random effects. This result corroborates the findings in Ajisafe and Akinlo (2013) for low competitiveness when gross earnings are used as dependent variable. Albeit, the result for interest income follows the finding from several European banking systems as reported in Bikker *et al* (2009). There is no doubt that the degree of competitiveness decreases as banks begin to move from interest based revenue to non-interest income streams, and this may be the reason for very low H-statistic in jurisdictions with less deregulated markets.[14]

The empirical results in Table 5 shows that the variations in operating income are significantly explained by the changes in staff cost and risk variable – total equity. Although, the explanatory power of the operating income model is far below that of interest income, the Hausman specification test suggests the plausibility of the result for the fixed effects model. The explanatory power of models in columns 3 and 4 increases as the number of control variables are increased to include total loans and total deposit ratios. In this estimation, a 1% increase in staff cost is associated with approximately 0.4 and 0.5 percent increase in operating income. The coefficient of staff cost has contributed the most to the level of competition in the banking sector; this implies that banks compete

[14] See P-R results for various countries in Bikker *et al* (2009), p. 34-35

by paying higher wages to generate a high amount of income in banking operations. The coefficient for staff cost indicates that banks employ high skilled or expensive labor to earn an increase in operating income.

The relationship between operating expense and operating income is negative but not significant, which is an indication that a bulk of the revenue earned is without much costs to the bank, this is typical of fee based revenue, the fees charged for the use of bank services does not change proportionately with respect to the expenditure outlay of the bank. Banks earn fees in foreign exchange transactions, electronic transfers and automatic teller machines without incurring any variable cost. The coefficient of operating expense indicates that for every 1% increase in operating expense, operating income decreases by .09 and .14 percent; as banks pay higher wages or spend more money on services, their revenue profile falls or vice versa.

The coefficient of interest expense changes from positive to negative as bank specific control variables are introduced into the model. As more risk based control variables enter the model the relationship between interest expense and operating income decreases. Interest expense is not significant in determining changes in operating income because a bulk of operating income are non-interest based income. However, total equity and non-interest income significantly affects changes in operating income. Total loans and total deposits are insignificant but the introduction of these control variables reduces the level of competition or H-statistic from 0.34 to 0.31, although very negligible difference.

From Table 6 columns 1 and 2, the result of interest income as dependent variable shows that interest expense contributes the highest value to the H-statistic. The implication of

this finding is that for a bank to earn a competitive advantage in interest income it must increase its interest expense above the market average; in other words a bank should pay more interest on deposits to earn more interest on loans, all things being equal. Invariably if a bank pays more interest on deposit, it increases the probability of attracting more loanable funds. In the main, every 1% increase in interest expense causes approximately 0.3 percent increase in interest income for both the parsimonious model in column1 and the extended model in column 2.

The coefficient of staff cost with respect to interest income is positive and increases as more control variables are introduced into the model, and the significance level is further improved from 10% to 1%. Operating expense is not significant for determining changes in interest income, although with positive coefficients. The coefficient of risk factor proxy – total equity, changes from positive to negative as total loans and total deposits enter the model as control variables, which is an indication that the more interest based transaction and revenue generated by the bank the less relevant total equity becomes.

The coefficient of non-interest income is significant to determining changes in interest income and improves from 10% to 5% when the control variables are introduced, and worthy of note is the significance of total loans in Table 6 column 2, which follows the expectation that the size of loan portfolio determines the magnitude of interest revenue. In this case 1% change in total loans increases interest revenue by 0.18percent. On the other hand, interest revenue declines as total deposit increases, the sign in Table 6 column 2 is negative, which follows a-priori, as more deposits are received and interest expense is paid, less interest revenue is obtained. A 1% increase in total deposit is associated with a 0.04% decrease in interest revenue. However, theory suggests that these deposits are

converted into loans to earn interest income, and that informs the reason why the coefficient is very low.

6.0 Conclusion

From the empirical analysis, this study concludes that the market structure of the Nigerian banking industry after the recapitalization policy and consolidation exercise conforms to a monopolistic competition as observed in many developed and emerging economies in the bank competition literature. The Panzar and Rosse tests for bank competition in the Nigerian banking sector have been conducted using interest income and operating income as dependent variables, to ascertain the difference between interest specific income effect on bank competition and an all encompassing variable that includes non-interest and fees based services - operating income. The regression results indicate that bank competitiveness declines as banks move form interest dependent revenue streams to an all embracing interest and non-interest revenue based income.

The findings of this study suggest for the Nigerian banking industry; that a bank's desire to increase operating income should be matched with an increase in personnel expenses. If the goal of management is to increase interest revenue, the bank should increase its interest expenditure outlay or compete efficiently to maximize its interest expense profile. In other words, this study also suggests that a bank that seeks to earn higher interest revenue must be willing to increase interest expenses. In the same vein, a bank whose long-term objective is to increase its competitive share of non-interest income, which includes income from fee based services, such bank would have a competitive edge with an increase in staff cost or personnel expenses, given that all other conditions are satisfied.

Nevertheless, this study has proved empirically within the constraints of available data that the recapitalization policy and subsequent bank consolidation exercise in the Nigerian banking sector did not change the competitive position of the industry. Albeit, the competitiveness of the banking industry in Nigeria is not any different from the expected levels in many developed and developing economies with proven record of successful banking business.

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Appendix

Table 1: Correlation Matrix for Bank level data

	II	IE	SC	OE	TE	OI	OPINC	TD	TL	TA
II	1.0000									
IE	0.9202	1.0000								
SC	0.8848	0.8343	1.0000							
OE	0.8733	0.8444	0.9429	1.0000						
TE	0.9143	0.8154	0.8142	0.7999	1.0000					
OI	0.8600	0.7733	0.8691	0.9001	0.8161	1.0000				
OPINC	0.9625	0.8512	0.9156	0.9079	0.8909	0.9257	1.0000			
TD	0.9604	0.8986	0.9108	0.9096	0.8762	0.8947	0.9529	1.0000		
TL	0.9550	0.8863	0.8845	0.8869	0.8770	0.8773	0.9506	0.9580	1.0000	
TA	0.9697	0.8978	0.9116	0.9066	0.9109	0.8957	0.9616	0.9912	0.9677	1.0000

Source: Bank Annual reports 2005 - 2014

Table 2: Correlation Matrix of Variables

	lnIR	*lnII*	*lnSC*	*lnIE*	*lnOE*	*lnTE*	*lnTL*	*lnOI*	*lnTD*
lnIR	1.0000								
lnII	0.5708	1.0000							
lnSC	0.2147	0.4597	1.0000						
lnIE	0.0929	0.6483	0.4506	1.0000					
lnOE	0.2386	0.4961	0.7883	0.5158	1.0000				
lnTE	0.0651	0.0383	-0.0949	-0.1035	-0.0937	1.0000			
lnTL	0.1584	0.1161	-0.2596	-0.0015	-0.2320	0.2044	1.0000		
lnOI	0.3549	0.2942	0.3197	0.1405	0.4799	0.0059	-0.1396	1.0000	
lnTD	0.1372	0.2041	0.2380	0.2631	0.2456	-0.2741	0.2132	0.1435	1.000

Note: Data is normalized by the natural logarithm of bank level ratios

Table 3: Summary statistics: Bank level data (Million Naira)

	mean	sd	min	max
Interest Income	87527.65	72849.70	4143	362579
Interest Expense	31101.28	24466.75	1953	118725
Staff Cost	22282.61	20106.53	1139	102542
Operating Expense	55210.97	44119.78	5008	234087
Total Equity	156031.10	127897.69	1278	522890
Non-Interest Income	25565.30	20168.23	3422	109743
Operating Income	86152.08	76973.84	2596	360065
Total Deposit	766584.17	668021.96	12380	3050853
Total Loans	465206.27	437267.88	1723	2178980
Total Assets	1080547.43	902660.74	19435	4342666
Observations	120			

Source: Bank Annual Reports, 2005 - 2014.

Table 4: **Modified Wald test for group-wise heteroskedasticity in fixed effects regression model**

	Parsimonious Model		Extended Model	
	lnII	*lnIR*	*lnII*	*lnIR*
Chi^2 (12)	540.66	364.77	935.02	562.86
Prob>chi^2	0.0000	0.0000	0.0000	0.0000

Note: The null hypothesis is homoscedasticity or constant variance in this case we reject the null hypothesis since Prob>chi^2 < 0.05 and conclude that there is presence of heteroscedasticity consistent standard errors in all models.

Table 5: Regression result for fixed effects model

	(1) log of Interest Income to Total Assets	(2) log of Interest Income to Total Assets	(3) log of operating income to total assets	(4) log of operating income to total assets
log of Staff Cost to Total Assets	0.276***	0.341***	0.385***	0.453***
	(0.0842)	(0.0828)	(0.138)	(0.140)
log of Operating Expense to Total Assets	-0.0141	-0.0337	-0.0911	-0.136
	(0.0918)	(0.0897)	(0.150)	(0.151)
log of Interest Expense to Total Assets	0.286***	0.237***	0.0443	-0.0093
	(0.0538)	(0.0535)	(0.0878)	(0.0902)
log of Total Equity to Total Assets	-0.0436	-0.0638*	-0.107*	-0.107*
	(0.0369)	(0.0380)	(0.0602)	(0.0641)
log of Non-Interest Income to Total Assets	0.0473	0.0657	0.159**	0.173**
	(0.0481)	(0.0463)	(0.0785)	(0.0781)

log of Total Loans to Total Assets		0.196*** (0.0646)		0.146 (0.109)
log of Total Deposit to Total Assets		0.0144 (0.153)		0.237 (0.258)
Constant	-0.385* (0.206)	-0.143 (0.209)	-0.825** (0.336)	-0.606* (0.353)
Observations	120	120	120	120
R^2	0.551	0.598	0.264	0.296
Adjusted R^2	0.481	0.527	0.149	0.170
Panzar – Rosse H-statistic	0.5479	0.5443	0.3382	0.3077

Note: Robust standard errors are displayed in parenthesis.
Significance levels: * p<0.10; ** p<0.05; *** p<0.01
Source: Bank Annual Reports 2005 – 2014

Table 6: Regression result for random effects model

	(1) log of Interest Income to Total Assets	(2) log of Interest Income to Total Assets	(3) log of operating income to total assets	(4) log of operating income to total assets
log of Staff Cost to Total Assets	0.129* (0.0658)	0.193*** (0.0676)	0.120 (0.100)	0.171* (0.102)
log of Operating Expense to Total Assets	0.0127 (0.0894)	0.0099 (0.0872)	-0.0231 (0.145)	-0.0212 (0.143)
log of Interest Expense to Total Assets	0.313*** (0.0478)	0.279*** (0.0484)	0.0275 (0.0754)	-0.0065 (0.0764)
log of Total Equity to Total Assets	0.0171 (0.0344)	-0.0174 (0.0363)	0.0161 (0.0554)	-0.0108 (0.0593)

log of Non-Interest Income to Total Assets	0.0806* (0.0448)	0.0911** (0.0439)	0.217*** (0.0720)	0.227*** (0.0714)
log of Total Loans to Total Assets		0.182*** (0.0615)		0.214** (0.0990)
log of Total Deposit to Total Assets		-0.0401 (0.144)		0.0622 (0.230)
Constant	-0.537*** (0.203)	-0.292 (0.208)	-1.254*** (0.331)	-0.961*** (0.345)
Panzar & Rosse H-statistic	0.4547	0.4819	0.1244	0.1433

Total No. of observations: 120 – balanced panel
Note: Robust standard errors are displayed in parenthesis.
Significance levels: * p<0.10; ** p<0.05; *** p<0.01
Source: Bank Annual Reports 2005 - 2014.

Table 7: Hausman specification test for fixed random

	Parsimonious Model		Extended Model	
	lnII	*lnIR*	*lnII*	*lnIR*
Chi^2(5)	10.12 (0.0719)	20.31 (0.0011)		
Chi^2(7)			13.31 (0.0648)	18.11 (0.0115)

Note: Prob > Chi^2 in parenthesis

Decision Rule for Hausman Specification Test: If this is Prob > Chi^2 < 0.05 (i.e. significant) use fixed effects. Tests whether the unique errors (*ui*) are correlated with the regressor, the null hypothesis is they are not.

Table 8: Test for Time fixed effects: to see if time fixed effects are needed when running a fixed effects model

	Parsimonious model		Extended Model	
	lnII	*lnIR*	*lnII*	*lnIR*
F(9, 94)	2.38 (0.0179)	1.52 (0.1537)		
F(9, 92)			1.69 (0.1021)	1.12 (0.3550)

Note: Prob>F in parenthesis

Decision Rule: The Prob>F is > 0.05, we fail to reject the null that the coefficients for all years are jointly equal to zero, therefore no time fixed- effects are needed in this case.

Table 9: Breusch and Pagan Lagrangian multiplier test for random effects

	Parsimonious Model		Extended Model	
	lnII	lnIR	lnII	lnIR
chibar2(01)	4.80	2.65	7.16	0.82
Prob > chibar2	0.0142	0.0517	0.0037	0.1822

Decision Rule: If Prob > chibar2 is less than 0.05, reject the null hypothesis and conclude that the random effects model is appropriate as opposed to the alternative of an ordinary least squares model (OLS).

For the extended model with *lnIR* as dependent variable we fail to reject the null hypothesis and conclude that random effects is not appropriate. There is no evidence of significant differences across countries, therefore you can run a simple OLS regression.

However, there is no need to run OLS, since the Hausman specification test has already rejected random effects and suggests fixed effects as the best fit.