CONCENTRATION AND COMPETITION IN ETHIOPIAN BANKING INDUSTRY(A PANEL DATA ANALYSIS)

By

GEBEYEHU, Hailemariam Nega

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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ABSTRACT

The paper aims to investigate the degree of concentration and competition (market contestability) in the Ethiopian commercial banking industry using the Panzar-Rosse (P-R) Model. It also aims to empirically test for misspecification of the P-R model. The impact of different control variables on income types and thereby on competition is also examined. Finally, the paper attempts to formulate a testable hypothesis whether different income types are substitutes or compliments.

All commercial banks operating in Ethiopia are considered for the analysis. Panel Random Effect Bootstrap Estimation is employed using quarterly data from 2002/03 (QIII) to 2014/15 (QIV). A total of 16 econometric panel models are estimated. In calculating prices of labor, physical capital and funds the most widely recommended proxies are used in the course of estimation.

The results indicated that though the industry was highly contestable in early periods of the analysis, it still remains highly concentrated. The competition appears to be higher among private banks, though it endogenously comes from the existence of Commercial Bank of Ethiopia.

Following Bikker et al (2006), we tested for misspecification of the empirical P-R Model and proved that the use of dependent variables scaled by asset sizes is biased towards competitive market conditions. Credit ceilings are found to have negative and significant influence on income statements of banks and then on competition. We could not find significant evidence about the impact of NBE bills on income and competition.

Finally, we have formulated a testable hypothesis in identifying whether the relationship between income components is a substitute or compliment type. As far as the information we have, this is the first formulation in the analysis of income statement of banks from microeconomic theory perspective. Our results indicated that interest and non-interest components of income are non- compliments in the Ethiopian commercial banking industry.

Based on our findings we would like to forward recommendations to policy makers and researchers. For policy makers, as our findings showed a non-favorable outcome of credit ceilings on income and competition, we recommend as much as possible such policies must be taken as last option and for a very short period. For researchers, we recommend the use of unscaled dependent variables in identifying market structure of the banking industry. Moreover, we would like to encourage researchers to test our newly formulated hypothesis in the banking industry so that we can get feedback.

Keywords: competition, Panzar-Rosse, Commercial Banking, Panel GLS, Ethiopia

CHAPTER ONE

1. INTRODUCTION

1.1.   BACKGROUND OF THE STUDY

It has been argued that banks play an important role in the process of economic growth and development. Traditionally, banks transfer money from surplus groups (savers) to deficit groups (borrowers). In this process, savers can earn an interest/income for their deposit and borrowers get money to start/expand their business or buy anything they want. The banking sector's role as a source of finance for productive investment and an accelerator of economic growth has been stressed by different economists. For instance, Pagano (1993) suggested three ways in which the banking sector might affect economic growth. First, it can increase the productivity of investments. Second, an efficient financial sector reduces transaction cost and thus increase the share of saving channeled into productive investments. Third, financial sector development can promote savings. Moreover, Schumpeter (1934) argues that in a well-functioning financial system entrepreneurs will have a better opportunity to fund their new ideas and hence encourage technological innovation. To reap these benefits from the banking system the structure, competitiveness and efficiency of the system is vital.

Like in other sectors, competition in the banking sector has different strands. Proponents of competition argue that the degree of competition in the financial sector can matter for the efficiency of production of financial services and for the quality of financial products and the degree of innovation in the sector (Claessens etal, 2004:563).Moreover, in the absence of competition, banks with highest market power will earn more rents by charging higher interest rates on business loans and this might lead to financial instability as higher interest rates may increase the riskiness of loan portfolios (Allen etal, 2008:5).On the other hand, excessive bank competition has proven to be a bad omen to financial stability as witnessed in the 1997 East Asian financial crisis. In support of this, Keeley (1990) documented that increased competition in the 1980s eroded monopoly rents and led to an increase in bank failures in the United States. Xavier(2001) argued that regulators have traditionally tried to

restrict competition in banking sector with the aim of avoiding excessive risk-taking. Though there are different arguments regarding bank competition, it is believed that normal competition is desirable. Normal in the sense that the competition will not have a negative effect on the workings of an economy.

Knowing the fact that competition is necessary, regulatory bodies are very concerned about the degree of concentration in the banking sector. For instance, if there is high concentration in the banking industry, depositors would have less return/interest income/for their deposits and borrowers would be charged high lending interest rates. Hence, this will affect the economy negatively by making the cost of funds higher for investors resulting in higher output prices for buyers. Past empirical studies on the relationship between bank concentration and monopoly power did not reach with similar argument. In Traditional Industrial Organization theory, by looking at the market structure (concentration index) of the industry we can easily infer about the competitiveness nature (conduct) of the industry. In this case, the market with high concentration is characterized by absence of competition and vice versa. But, this paradigm misses the competitive outcome that might come with a concentrated market. In the New Industrial Organization (NEIO) theory, there may be a competitive outcome even in a highly concentrated market if the market is contestable. A market is contestable; if there is a relatively free entry and exit in the industry, low sunk cost etc. (see Baumol etal, 1982 for more).Therefore, policy toward bank consolidation cannot rely solely on structural measures (Shaffer, 1994).

Different scholars try to measure the degree of banking competition by using alternative methods of measurement. Generally, there are two types of methods that help to measure competition in banking industry: structural and non – structural methods (the detail is presented in the literature part).

1.2.   STATEMENT OF THE PROBLEM

In Ethiopia, the financial sector constitute of the banking, microfinance and insurance companies of which the banking sector plays the dominant role. According to the National Bank of Ethiopia (2015) report, banking sector takes 92.8 percent of asset, 76.8 percent of capital and 57.7 percent of total branch network from the financial sector. Currently, there are 18 commercial banks (2 public and 16 private) and 1 specialized bank (Development Bank of Ethiopia) operating in the country under one regulatory body, the National Bank of Ethiopia (NBE, 2014). Development Bank of Ethiopia (DBE) is the specialized bank because unlike other commercial banks, DBE doesn't mobilize deposits and its source of funding is long term government bonds. Hence, the bank does not compete with commercial banks in mobilizing deposits. In addition, the bank only provides long term credit to priority projects and is not profit oriented.

In the last decade, the National Bank of Ethiopia undertook different policy measures that have a direct/indirect impact on bank competitiveness. These include, credit cap (2009), revision of minimum paid up capital (2011) and National Bank of Ethiopia (NBE) Bill purchase (2011).The credit cap policy which was introduced in 2009 limited the outstanding credit of commercial banks. The policy was only applied to private banks as public bank lending was towards priority sectors and policy makers believed that limiting their credit would have a higher negative impact on the economy. The policy came into effect in order to contain the rampant inflation at the time. The credit cap policy was lifted in 2011 but followed by another policy called NBE Bill purchase. The NBE bill purchase policy function in such a way that when private banks disburse a loan to the economy, they should buy the NBE-bill with the 27 percent of their total planned disbursement. The NBE bill purchase policy believed to have an effect on competition in the industry as commercial banks would compete more for collecting deposit in order to fulfill their NBE-bill obligation. In the same period, the minimum paid-up capital requirement to establish a bank was changed from Ethiopian Birr (ETB) 70 million (USD 4.3 million) to 500 million (USD 25 million). NBE introduced this in order to strengthen the stability of domestic commercial banks. All the above polices might have an effect on the level of competition in Ethiopian banking industry but have not been studied so far.

In addition, the banking industry in Ethiopia can be characterized by the existence of high concentration even after the sector was opened to private sector in 1991. Concentration in financial sector can be measured by looking at n-banks Asset Concentration Ratio (ACR) and n-banks Deposit Concentration Ratio (DCR). If we look at the share of assets held (5 banks ACR) and deposit mobilized (5 banks DCR)by the five Ethiopian largest banks, it is 84.4and 83.8 percent, respectively, at the end of June 2014(ibid).Though concentration levels have come down recently, they still exceeds the world average(see Table 1)[1]. By looking at the level of concentration in the sector, some argue that the banks in Ethiopia are operating in the absence of competition. However, even in the presence of market concentration, there might exist competitive outcomes (see Jackson, 1992). In the case of Ethiopia, there is no empirical study that relates concentration and competitiveness. In other words, there is no study about the contestability of the banking sector. Hence, the level and trend of bank concentration and competition in Ethiopia must be analyzed comprehensively. In this regard, over time concentration in the industry will be related with its competitiveness in order to infer about contestability of the banking industry.

Table 1: Five Banks Asset and Deposit concentration in Ethiopia

Particulars	Asset	Deposit	World (ACR)
2007	90.8	90.5	85.6
2008	89.4	88.4	85.2
2009	89.2	86.3	84.0
2010	86.0	84.2	83.5
2011	86.9	85.0	81.1
2012	88.0	85.3	NA
2013	85.7	84.6	NA
2014	84.4	83.8	NA

Source: Own computation based on NBE & GFDD data base

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[1] It would be very nice if the comparison in bank concentration is done between Ethiopia and other developing countries. But, the researcher cannot find a data for those countries after the year 2011, the same for world average.

Fig 1: 5 Banks ACR & DCR in Ethiopia: Trend
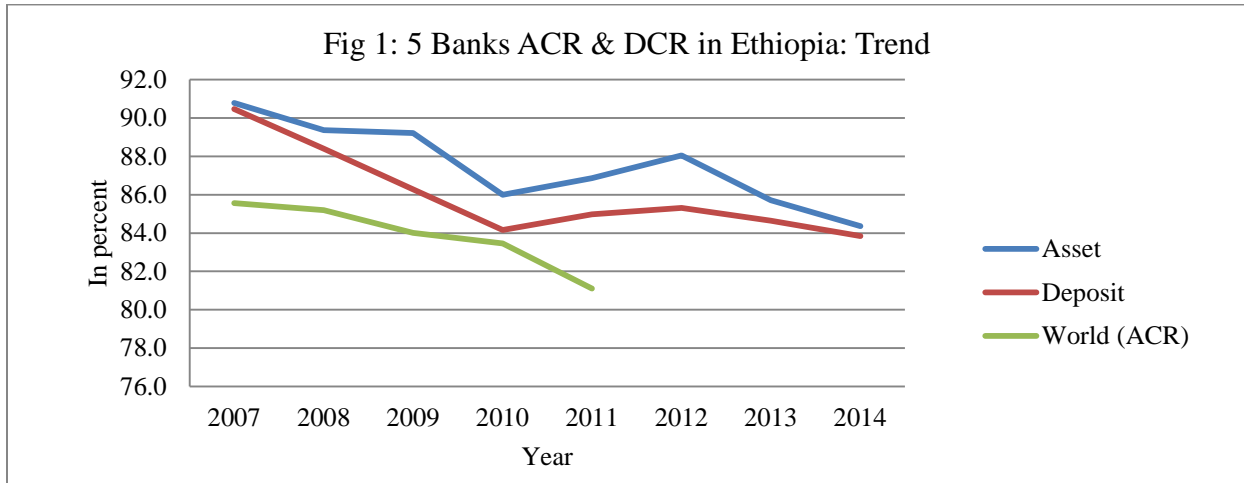
Furthermore, in the Growth and Transformation Plan (GTP) II period (2015/16-2019/20), the Ethiopian government believes that mega projects like establishment of sugar corporations, rail way construction, and hydroelectric dams etc. will speed up economic growth and development of the country. But, these projects will not come into effect if there is inadequate funding. Hence, banks in Ethiopia are expected to efficiently mobilize savings /deposits from the economy in order to avail enough credit for projects. This clearly shows us the importance of the sector. In this process, the level of competition in the banking sector matters and hence knowing the level of banking sector competitiveness is of paramount importance for future policy measures.

Finally, although the nature of concentration and competition in the banking industry is deeply studied in developed economies, a limited number of studies have been done in developing countries. Moreover, to the best of researcher knowledge, there is only one published research work in the case of Ethiopia. But, the study used a time period from 2000 until 2007 and also concluded the industry is incontestable without conducting any tests. Moreover, the study only estimates the static competition level and did not consider the dynamics. Hence, the current study uncovers the static and dynamic nature of concentration and competition in the Ethiopian banking industry by including the recent time period. In the same fashion competition in private banks is analyzed. Moreover, the effect of different policy and control variables on banking competition is ascertained.

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1.3. OBJECTIVE OF THE STUDY

1.3.1. GENERAL OBJECTIVE

Drawing from the aforementioned problems, the research mainly examines the static and dynamic change in concentration and competition (market structure) in the Ethiopian banking industry.

1.3.2. SPECIFIC OBJECTIVES

More specifically the research identifies the extent of market contestability in the Ethiopian banking industry. Moreover, the level of competition among private banks, by excluding public banks from the sample, and impact of policy and other control variables on competition in the banking industry is investigated in this study. The study also tests the Bikker etal (2006) hypothesis which says using scaled dependent variable is biased towards competitive market structure. Finally, the study formulates a testable hypothesis regarding the relationship between traditional and non-traditional banking activity

1.4. SIGNIFICANCE OF THE STUDY

The study help for many purposes concerning about competitiveness in Ethiopian commercial banking industry. More specifically, it provides helpful information for; the regulatory body (National Bank of Ethiopia), investors, both who are already engaged in and planning to join the sector in Ethiopia, bank managers. Moreover, by filling the information gap that prevailed in the country regarding commercial banks competition level it can be used by other researchers who intend to conduct research on the same or related areas.

1.5. ASSUMPTIONS

For conducting this research manageably assumptions needs to be considered. The research assumed; Banks are multi-product firms, the objective of a bank is profit maximization or cost minimization and there exists free entry into and exist from the banking industry

1.6.   SCOPE OF THE STUDY

The overarching aim of the research work is to find out the concentration and competition of commercial banks operating in Ethiopia. To achieve this objective 19 commercial banks operating in the country are included in the study. And the time span cover from FY 2002/03 to 2014/15 and the frequency of data is on quarterly basis.

1.7.   LIMITATION OF THE STUDY

The study faces lack of time in relation with data and financial constraints. Given the limitation the researcher exerts the maximum effort to meet the research objectives.

1.8.   ORGANIZATION OF THE STUDY

The research paper is organized in five chapters. The first chapter includes the introduction parts where the background, statement of the problem, objective, significance, assumptions and scope of the study is covered. In the second chapter both theoretical and empirical literatures reviewed, in deep, which is related to the problem under study. Following the literature review section, the methodology and data discussion appears in chapter three. Under the methodology: data type, source, model specification and estimation procedure are discussed in detail.   Chapter four presents the finding of the study analyzed using both descriptive and econometric analysis. In the last chapter conclusion and policy implications are presented based on the finding of the study.

CHAPTER TWO

2. SURVEY OF LITERATURE

2.1. THEORETICAL SURVEY

This part presents the theoretical review of literatures regarding definition and alternative measurements of banking sector competition and concentration. Moreover, it reviews the different theories about the nexus between bank competition/concentration and bank fragility /stability.

Definition

Competition can be defined as the state of rivalry among suppliers of a product. Depend on the level of competition any industry/market is classified as perfectly competitive, monopolistically competitive, oligopoly or monopoly.

2.1.1. MEASUREMENT OF COMPETITION IN BANKING

Banking sector competition can be measured based on two different methods: structural (Traditional IO, market structure is exogenous) and non-structural (NEIO, market structure is endogenous). In the first case, structure-conduct-performance (SCP) and Efficient Structure Hypothesis (ESH) are the dominant theories in measuring the level of bank competition. In the SCP approach, the degree of competition is easily inferred from the level of concentration in the industry, in which competition is minimal in highly concentrated market and vice versa.

Due to lack of empirical result that fully support traditional IO theoretical framework (eg: contestable market), the New Industrial Organization (NEIO) theory forward different method for measuring the level of competition in an industry by making market structure an endogenous variable which will be determined by a model. In the NEIO theory market structure cannot be determined by simply looking at the number of firms or level of concentration in the industry. The Panzar-Rosse H-statistics (Panzar and Rosse, 1987) and the Bresnahan Index (Bresnahan, 1982) are the two prominent methods that are used to empirically test bank competition based on the NEIO theory. Both methods assume that banks are profit maximizer and market structure of

an industry is endogenously determined from profit maximization condition. The PR method is highly applied for measuring competition in banking sector.

The Panzar _ Rosse Test (H – Statistic)

Panzar and Rosse [1977, 1987] developed a test for competitive market conditions based on a reduced-form revenue equation of the firms. The test was based on empirical observation of the impact of variations in factor input prices on firm-level revenues.

This test was derived from a general banking market model[2], which determines the equilibrium output and the equilibrium number of banks, by maximizing profits at both the bank level and the industry level. This implies, first, that bank i maximizes its profits, where marginal revenue equals marginal cost [Bikker, 2004).

$$R'_i(y_i, n, z) = C'_i(y_i, IP_i, t_i) \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

$$R^*_i(y^*, n^*, z) = C^*_i(y^* \, IP_i, t_i) \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (2)$$

Market power is measured by the extent to which a change in factor input prices (∂IP_i) is reflected in equilibrium revenues (∂R^*) earned by bank i. In order to identify the nature of the market structure (monopoly or oligopoly, monopoly competition or perfect competition) the Panzar and Rosse model (P-R) provides a measure called the H- statistic. They show that sum of elasticity of the total revenues, with respect to changes in banks input prices, allows inference about the banks competitive conduct.

$$H = \sum_{t=1}^{m} \left(\frac{\partial R^*_i}{\partial IP_{it}} \right) \frac{IP_{it}}{R^*_i} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots. (3)$$

Where: where: R_i – revenue function of bank i,

C_i – cost of bank i,

y_i – output of bank i,

n – Number of banks,

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[2]Cournot oligopoly model with profit maximization by collusive Cournot oligopolies

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IP_i – factor of input prices of bank i,

m – Number of factor input prices,

z_i – vector of exogenous variables that shift the revenue function,

ti – vector of exogenous variables that shift the cost function.

The estimated value of the H-statistic ranges between $-\infty$ and 1. Moreover, Panzar and Rosse (1987) have shown that in market equilibrium, perfect competition is indicated by the H-statistic equal to unity. Due to the fact that, under perfect competition an increase in input prices and thus in average costs should lead to a proportional price increase and (at the firm level) to a proportional rise in revenues. Under monopoly, an increase in input prices will increase marginal costs, reduce equilibrium output and consequently reduce total revenues and the H-statistic is negative or equal to zero. If the market structure is characterized by monopolistic competition, the H-statistics will lie between zero and unity (see Table 2).

Table 2: Interpretation of the Panzar-Rosse H-Statistic

Values of H-Statistic	Competitive Environment
H<= 0	Monopoly or perfectly collusive oligopoly
0 < H <1	Monopolistic competition
H= 1	Perfectly Competitive

The nature of the estimation of the H-statistic means that one is especially interested in understanding how revenues react to variations in the cost figures.

However, Bikker, Spierdijk and Finnie (2007) provided empirical evidence that the level of competition in the banking industry in the existing empirical P-R literature is systematically overestimated. The reason for the misspecifications is that most studies use different definitions of the appropriate variable to represent banks' revenue (different definitions of the dependent variable in the P-R model). It should be stressed that Bikker et al provided empirical evidence to show that the scaled P-R model is mis-specified. The reason for this misspecification is that most studies use scaled versions of bank income as the dependent variable in the P-R model and work with revenues divided by total assets. However, scaling changes the nature of the model fundamentally, since it transforms the revenue equation into a price equation.

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2.1.2. COMPETITION IN BANKING: GOOD OR BAD?

Measuring competition is not an end for policy purpose. Theories relate the level of competition in banking industry with financial stability and/ fragility. Though there is a belief about a positive effect of normal competition on stability of the financial sector and hence on economic development, still there is no an unambiguous argument on the relationship between bank competition and the resultant effect on stability and / fragility in the sector. Proponents of competition relate banking competition with stability in the financial system. The theoretical model of Boyd and De Nicolo (2005) showed that a bank operating under less competitive system will take higher risk in their loan portfolio as banks charge higher interest rate for borrowers (will create moral hazard).Supporting this, Cetorelli (2001) stated that monopoly in banking would lead to lower interest rate for saver and higher interest rate for borrower and hence distort entrepreneurial incentives toward the undertaking of excessively risky projects. This collectively will lead to instability in credit market and systematic failure. Moreover, less competition in banking will let banks to engage in risky activities (due to too-Big- to fail incentive) and hence will have a high probability to fail (Brian A, etal, 2014).

Contrary to the above argument, opponents of competition relate banking competition with financial crisis. Different theoretical models based on Charter-value of banking predicted that bank competition will lead to instability. In this view, as summarized by Beck (2008), profits provide buffer against fragility and provide incentives against excessive risk taking in a more competitive banking system. In support of this, Xavier (2010) put two channels how bank competition creates instability. The first channel is through worsening the coordination problem of depositors/investors which will foster bank run. The second channel is by letting banks to take high risk in their portfolios.

2.2. EMPIRICAL LITERATURE

Given different implication of the level in bank concentration and competition, many empirical studies have been conducted at different time and economy. Hence, by dividing the countries into developed and developing economies, selected empirical literatures on bank competition and concentration is presented in this section.

The degree of banking competition, including overtime change and determinants, in developed economy is comphrensively studied from early periods to present. Shaffer (1993) and Nathan etal (1989) tested the degree of market power in Canadian banking industry with different method of measurement. The first one employed the Bresnahan's index (with relatively long time series data) while the latter used a Panzar-Rosse method. Both find banks in Canada is characterized by the existence of contestability (competition though it is highly concentrated).

Claessens etal (2004) tries to determine what derives bank competition internationally, using 50 countries banking system and employing the PR method. They found that a banking system with greater foreign bank entry and fewer entry and activity restrictions will have a competitive outcome. Furthermore, they did not find a negative relationship between competitiveness measurement and concentration which implies contestability matters for the existence of competition rather than structure of the market.

Most studies in the European banking industry found that banks in the region are operating under monopolistic competitive market structure. For instance, Christos etal (2006) for EU, Coccorese (2002) for Italian, Hempell (2002) for Germany, Hondroyiannis et.al (1999) for Greek, Yildirim etal (2002) for central and eastern Europe, Molyneux et al. (1994), DeBandt etal (2000) for group of European countries.

With regard to the level of banking competition in developing countries different studies were conducted. A recent research work by Haytem etal (2015) showed that less competition in the banking sector leads to a more resilient banking sector in developing countries. The researchers first derived the level of competition in Libyan Banking industry using concentration index and then relate it with the level of banking stability proxied by non-performing loan. Their empirical result supported the "Competition-fragility" view of banking literature. The study of Samuel

(2013) also found a monopolistic competition structure across African sub regional banking markets.

In the way to determine the market structure of banking industry in Zambia Simpasa (2013) found that Zambian banks earned their revenue under conditions of monopolistic competition. The finding is supported by the estimate of the Lerner index which suggests that the degree of competitiveness may not be as low as previously understood. Similar with this, Rufus etal, (2013) showed that Nigerian banks are operating under monopolistic competitive market structure. He employed a PR methodology with dynamic Generalized Method of Moments technique for the period spanning from 1990 to 2009. The estimated H-statistics found in the range between 0.09 and 0.11 which is near to monopoly type market structure.

Bing etal (2013) reported that competition of banks in china has been increasing after 1980's progressive financial reforms. Their result is contrary to previous works that are done in China and this is due to different methodology employed in estimating the level of bank competition. They used Profit Elasticity (PE) approach while earlier studies used either PR or Lerner Index.

A cross-country study by Diego etal (2010) found that banking sector competition, using non-structural measure, in the Middle East and North Africa (MENA) region is lower relative to other regions and has not been improved in recent years. The regions worse credit information environment and lower market contestability are considered as a reason for the low level of banking sector competition.

Anthony etal (2008) analyzed the existence of market power in Ghanaian banking industry by calculating Lerner index of banks for the period 2001 to 2006 and found that banks in Ghana possess a market power. Bank size, efficiency of banks with respect to staff costs, the macroeconomic environment and time are the contributing factors for the evidence of market power in Ghanaian banks. Another study by Thierry etal (2005) for the period 1998 to 2003, using PR methodology, found a rather monopolistic competitive market structure for Ghanaian Banks.

David etal (2005) estimate the level of competition in Uganda banking sector using a Panzar Rosse methodology for a quarterly panel dataset of 15 banks from March 1999 to June 2004.

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Their result suggested that the Ugandan banking sector is characterized by monopolistic competition. Moreover, they reported banking competition in Uganda has increased after privatization of state owned banks and consolidation is taken place in the sector. Similarly, Jennifer etal (2014) found the positive effect of financial liberalization on banking sector competition in sub-Saharan countries and it, indeed, enhances financial stability.

Given the structural change undertaken in Africa banking sector, Florian (2014) examined the changes in competition in seven West African countries using 3 different competition indicators (PR, Lerner index and Boone indicator).He found that competition in the region is increasing in the last decades due to the expansion of African banking groups in the referred period.

THE CASE OF ETHIOPIA

As best of the researcher knowledge, there is only one research done regarding competition in Ethiopian banking industry. Zerayehu etal (2013) tries to determine the degree of bank competition, using P-R approach, in Ethiopia by only calculating static H-statistics from the period 2000 to 2007. They find monopolistic competitive market structure. But they failed to show how competition is changing overtime, to use un-scaled dependent variable as they used a scale variable in the left hand side of the model, to use appropriate input prices (which is the heart of P-R model and to use to-date data in their analysis. Moreover, they conclude the market is incontestable without conducting a test.

To sum up, studies regarding the level of competition in banking industry revealed that most markets both in developed and developing economy operate under Monopolistic competitive market structure. Moreover, empirics showed that existence of competition in banking industry in a concentrated market.

Misspecification Test/Methodological

Bikker etal (2006), using sample of more than 18,000 banks in 101 countries over 16 years, demonstrated that the level of competition in the existing Panzar- Rosse(P-R) *empirical literature* is systematically overestimated and that the tests on both monopoly and perfect competition are distorted. This is due to the use of bank revenues divided by total assets (price of asset) as dependent variable and/ including scale variable in the P-R model instead of unscaled bank revenues. If we used scaled dependent variable, the estimated elasticity's appear to be price-to-price rather than Revenue-to-Price elasticity (which is the original PR measure of elasticity).

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CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. DATA TYPE AND SOURCE

The study used secondary type of data. The study used audited commercial banks financial statement, National Bank of Ethiopia banking database, World Bank database and IMF data base. In addition, different Books, Internet and journals are used.

3.2. METHOD OF DATA ANALYSIS

In the way to show competition in Ethiopian Banking industry, we used both descriptive and econometric analysis.

3.2.1. DESCRIPTIVE ANALYSIS

The researcher uses descriptive statistics for the analysis of the collected data. It is used because of its simplicity & clarity to see what is going on in the industry at a glance and helps to support the finding we get in econometric analysis. The analysis of the secondary data generated from different sources is graphically represented with the help of excel

3.2.2. ECONOMETRIC ANALYSIS

In order to answer the important question we posed in the introduction section, the paper employed the following data and model.

3.2.2.1. DATA

The span of our data source covers the time period 2002/03 to 2014/15. We used quarterly data taken from all commercial banks operating in the country. (The list of banks is available in appendix1). We then classify the period into 3 subs – periods. We do this for two reasons: first it helps us to see the trend of competition over time. Second, it makes our estimation more powerful as the data become balanced in the whole sample period.

Following previous literatures and theoretical foundations, we included three dependent and different independent variables.

Dependent Variables include Total income, Interest income and ratio of Total income to Total Asset.

Explanatory Variables basically includes Price of Labor, Price of Capital and Price of Fund. But in addition to these variables we also used other control variables like ratio of Non-performing loan to loan, share of non-interest income, share of total asset, Loan to deposit ratio and dummies (policy variables and ownership of the bank).All variables are in logarithm form except the dummies.

The main variables in P – R specification is ***price of inputs*** which includes price of labor, price of capital and price of fund that helps to calculate the elasticity of Revenue to input prices. Hence, the researcher used proxies for those variables that are recommended in lots of literature. In literatures, while estimating the H- Statistic, they failed to find the exact proxies due to lack of data. But this paper address the problem of proxies (price of inputs) as the researchers exert a maximum effort to collect the data's. The data's and variables include;

1. ***Price of Labor (PL):*** In literature it is peroxided by the ratio of total salary expenses to total asset. But, it is not the exact price paid for the employees. Bikker etal and others suggested using ratio of total salary expense to total number of employees as the proxy for price of labor is best; this paper does that. As we used quarterly data, we didn't simply divide the quarterly salary expenses by the total employees which are reported by banks' balance sheet. What we do is: as salary expenses is a flow concept, we subtracts the existing quarter total salary expense from its previous quarter which gives the exact expenses paid to employees in that quarter. Mathematically,

   $$SQ_t = SQ_t^* - SQ_{t-1}$$
   Where: SQ_t is total salary expense paid in that quarter
   SQ_t^* is total salary expense paid up to that quarter
   SQ_{t-1} is total salary expense paid upto the previous quarter

   Then, $PL = SQt / L$
   Where; L is total number of employees (labor) in that quarter.

2. ***Price of Capital (PK):*** Mostly, because of lack of data, it is peroxided by dividing Depreciation by fixed asset or by dividing non – interest expenses by fixed asset. But, dividing general expense by number of branch is the best proxy for price of capital as suggested by previous literatures. Hence, we used the recommendation and calculate price of capital as;

   PK = General expense / number of branches

3. ***Price of fund (PF):*** No problem with this proxy in previous works as well.it is calculated by dividing total interest expense by total deposit. But in our case we take care when divide the variables because we used quarterly data. So, we follow the same step that used in calculating quarterly salary expenses. Finally, we calculate price of fund as;

   PF = interest expense / total deposit

3.2.2.2. Model Specification

We have followed the model developed by Panzar and Rosse (1982), with slight adjustment. In general the Panzar – Rosse revenue test is based on a reduced – form revenue equation relating gross revenue to vector of input prices and other control variables. The empirical reduced- form revenue equation of the P-R model is written as

$$\ln(R_{it}) = \sum_{i=1}^{m} \beta_i \ln(IP_{it}) + \sum_{i=1}^{n} \gamma_i CV_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3)$$

Where; R_{it} is revenue

IP_{it} is vector of input prices

CV_{it} is other control variables that are expected to affect revenue

β_i is elasticity of revenue to input prices.

Then Panzar and Rosse used the sum of input price elasticity's (which is represented by H – statistic) to reflect the competitive structure of the market (necessary condition).

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Condition: $H = \sum_{i=1}^{3} \beta_i$

If H < or = 0, then the market is characterized by Monopoly

If 0 < H < 1, then the market is characterized by Monopolistic Competition

If H = 1, then the market is characterized by Perfect Competition

3.2.2.3. ESTIMATION PROCEDURE

Theoretically, a nice model is the one which passes through three necessary steps. That is, pre estimation test, model estimation and post estimation test (Diagnostic test).

A) Pre Estimation Test (Unit Root Test)

In panel data analysis unit root test is the basic test in order to select estimation method. If the variables have a unit root, then applying panel VAR is best method other than random/fixed effect. Therefore, we have tested stationarity of variables using Levin–Lin–Chu unit root test.

B) Estimation of the Models

After testing for unit root of the variables, we specified and estimated the models using fixed effect as all the variables found stationary. For robustness check, we also estimate fixed effect and compare the results with random effect. Using the general model of regression suggested above in equation 1 and employing Random effect, we have estimated sixteen different models as follows.

Model A (Three models)

Model A is used to see overtime change in market structure (degree of competition) of banking industry in Ethiopia. First we divide the sample period (2002/03 – 2014/15) into three sub periods by making the period suitable for analysis. The sub periods include;

Period 1 – from 2002/03 quarter three to 2008/09 quarter two

Period 2 – from 2008/09 quarter three to 2010/11 quarter one

Period 3 – from 2010/11 quarter two to 2014/ 15 quarter four

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Then, we estimated three similar but not identical models. They are similar in the sense that all the models estimated by taking total income as dependent variable and price of inputs as a major independent variable. They are not identical because they take different control variables in the course of estimation. The general form for the models is;

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma \ln(CV_{it}) + \varphi_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\text{(2)}$$

Where; $\ln(TI_{it})$ is Total income of bank "i" at time "t"

$\ln(PL_{it})$ is price of Labor in bank "i" at time "t"

$\ln(PK_{it})$ is price of capital in bank "i" at time "t"

$\ln(PL_{it})$ is price of fund in bank "i" at time "t"

$\ln(CV_{it})$ is control variables for bank "i" at time "t"

φ_i is Bank fixed effect and time invariant factors

ε_{it} is error term

$\beta_1, \beta 2, \beta 3$ and γ are elasticity's

This is the general model (Model A) which is used to estimate three different models.

Model B (Two Models)

The purpose of Model B is to test whether Non interest income is a *substitute or complement* for Interest income. In microeconomic theory a good is substitute for another good if they have negative and significant cross price elasticity. For instance, Coffee and Tea are substitutes, whereas tea and sugar are complement goods. But, in banking literature, there was *no priori test* that identifies the exact relationship between interest and non-interest income. The two models[3] which are used to test the claim are;

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[3]Two models because we divide the period in to two sub periods

$$\ln(II_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(lii_{it}) + \gamma_2 \ln(sta_{it}) + \gamma_3 \ln(snii_{it})$$
$$+ \varphi_i + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\, (3)$$

Where; $\ln(lii_{it})$ is lag of interest income of bank "i" at time "t"

$\ln(sta_{it})$ is share of total asset of bank "i" from the industry at time "t"

$\ln(snii_{it})$ is share of non-interest income from the total income at time "t"

From the model our interest is γ_3. After estimating this model well and looking at γ_3, we can decide whether interest and non-interest income are complement or substitute.

Rule: If we get γ_3 positive and significant, then they are complements

If we get γ_3 negative but insignificant, then they are substitutes but not perfect

If we get γ_3 negative and significant, then they are substitutes.

Model C (Four Models)

Here we estimated four models in order to test the *claim of Bikker etal (mis-specification of P-R Model)* which is proposed in 2006. They suggest that using scaled dependent variable instead of un-scaled dependent variable is biased towards perfect competition. This is due to, based on their assumption, scaled dependent variable represent price rather than revenues, and the result (H – Statistic) will be price- price elasticity rather than revenue – price elasticity. [4]

Having this we estimated, to test their claim, four models as follows;

$$\ln(II_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma \ln(snii_{it}) + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\, (4)$$

$$\ln(IITA_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma \ln(snii_{it}) + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\, (5)$$

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(nl_{it}) + \gamma_2 d1 + \gamma_3 d2 + \varepsilon_{it} \dots\dots\, (6)$$

$$\ln(TITA_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\, (7)$$

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[4] For mathematical proof you can refer the work of BIkkeretal 2006

Where; nl_{it} is the ratio Non – performing loan to total loan of bank "i" at time "t"

d1 is dummy for representing type of the bank. That is;

d1 = 1, if the bank is public bank

= 0, if the bank is private bank

d2 is dummy for representing credit cap

d2 = 1, if there is a credit cap in the period

= 0, if there is no credit cap

First, the result from equation (4) is compared to that of equation (5). The rule is; If we get different H-statistics, we can confirm the claim of bikker etal especially if the latter H – statistic is biased towards competitive environment. Moreover, we again compare the result from equation (6) and equation (7) so as to make the conclusion more concrete. The rule is the same with the above.

Model D (Three Models)

Three models are estimated for two purposes. First, it is used to see whether competition is lower or higher among private banks alone by dropping public banks from the sample. Second, it is used; how competition among private banks is changing. The estimated models include;

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(lti_{it}) + \gamma_2 \ln(sta_{it}) + \gamma_3 \ln(snii_{it})$$
$$+ \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(lti_{it}) + \gamma_2 \ln(sta_{it}) + \gamma_3 \ln(snii_{it})$$
$$+ \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (9)$$

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(sta_{it}) + \gamma_2 \ln(nl_{it}) + \varepsilon_{it} \dots\dots\dots (10)$$

Equation (8) is the model which used to compute degree of competition by taking both private banks and public banks into account. Whereas equation (9) & (10) are models used to compute degree of competition among private banks only by dropping public banks from the sample.

After estimating the models, first we compare (8) & (9) to see whether there is a difference in degree of competition when we drop public banks from the sample. Then (9) & (10) are compared to see over time change in competition among private banks.

Model E (Three Models)

This model is estimated to see the effect of Non- Performing Loan (nl) on banks' ability to generate income. It is done in two ways. By taking total income as a dependent variable, two models are estimated to see the effect of nl on total income and overtime change in the effect of nl on total income, if there exists.in addition to these models one additional model is estimated to see the effect of nl on interest income. The models are,

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(lti_{it}) + \gamma_2 \ln(nl_{it}) + \varepsilon_{it} \dots \dots \dots (11)$$

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(nl_{it}) + \gamma_2 \ln(snii_{it}) + \gamma_3 d2$$
$$+ \varepsilon_{it} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (12)$$

$$\ln(II_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma_1 \ln(sta_{it}) + \gamma_2 \ln(nl_{it}) + \varepsilon_{it} \dots \dots . (13)$$

Our interest in this model is γ_2 from (11) & (13) and γ_1 from (12).

Model F (One Model)

The model is used to test whether NBE policy have positive or negative impact on banks' ability to generate income thereby on degree of competition. Basically, we are interested to see the effect of credit cap on income generation capacity of banks. And we can compare the effect with that of NBE bill, as it will have serious policy implication. The model is;

$$\ln(TI_{it}) = \beta_1 \ln(Pl_{it}) + \beta_2 \ln(Pk_{it}) + \beta_3 \ln(Pf_{it}) + \gamma d2 + \varepsilon_{it} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (14)$$

Our interest is the coefficient of d2. If we get γ negative, credit cap negatively affected income generating capacity of banks.

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C) Post-Estimation (Diagnostic Check)

In panel data models, mostly, cross-sectional interdependence test has to be undertaken to confirm the fitness of estimated model. Hence, after estimating the models, the researcher checked for the validity of the models by testing cross-sectional interdependence using Breush – Pegan Lagrangian Multiplier test.

CHAPTER FOUR

4. DATA ANALYSIS AND PRESENTATION

4.1. DESCRIPTIVE ANALYSIS

4.1.1. OVERVIEW OF ETHIOPIAN BANKING INDUSTRY

The history of modern banking system of Ethiopia dated back to Emperor Minilik II when agreement is reached between the emperor and Mr.MaGillivray, representative of the British owned National Bank of Egypt, on the establishment of Bank of Abyssinia in 1906. Then after Emperor Haile Selassie come to power Bank of Abyssinia is legally replaced by Bank of Ethiopia and became the first indigenous banks for Ethiopia as well as Africa. Bank of Ethiopia have dual role both as commercial bank and central bank until it split into National Bank of Ethiopia (as a central bank) and Commercial Bank of Ethiopia in 1963. During the H/Selassie era the banking sector was open to foreign banks with requirement of at least 51 percent domestically owned. As a result there was 1 state owned, 1 private owned and 2 foreign owned commercial banks operating in the country until nationalized by communist government in 1974. The communist government merging three private owned banks in 1976 to make Addis Bank and further merge Addis Banks with state owned commercial banks in 1980 to make one state owned commercial banks. Following the downfall of Derg regime banking sector is liberalized for private sector as a result currently there are 1 central bank, 18 commercial banks (of which 2 of them are government owned) and one special bank operating in the country, Development Bank of Ethiopia. However, still the sector is closed for foreign banks (National Bank of Ethiopia website).

The current banking system of Ethiopia is dominated by public owned bank, Commercial Bank of Ethiopia. Commercial Bank of Ethiopia (CBE) has a share of around 67 percent of commercial banks total assets and total deposits each, 62 percent of total loan extended by commercial banks, and 37 percent of total commercial banks capital as of June 2014. Moreover, CBE dominate the sector in terms of branch expansion. The total number of bank branch as of June 2014 is 2,176 of which 856 branches are owned by CBE (39 percent of total commercial banks branch). In addition, from total bank account holder of 13,044,228, CBE has a share of

around 63 percent (8,187,070 account holders). This is mainly due to current government development model, democratic developmental state; in which government highly participates in the production as well as distribution of selected goods and services, which government believe essential for economic growth and in which private sector fails to do it with expected efficiency and magnitude. As a result during the same period from total banking sector credit, 64 percent is goes to government and public enterprise whereas the rest goes to other sectors (private and cooperative). However, in terms of deposit only 18 percent of bank deposit is come from government and public enterprises.

The other peculiarity of Ethiopia banking system is the high profitability of the sector mainly due to ample potential of the sector and the restriction of foreign banks that give domestic banks the opportunity to earn high profit. During the last four fiscal years (2009/10-2013/14) income after tax of commercial banks observed to be greater than 2 percent of their total assets.

Table 3: Ratio of selected financial performance indicators

(Ratio's are expressed in percentage)

Particulars	2009/10	2010/11	2011/12	2012/13	2013/14
Income after tax to total assets	2.01	2.03	1.93	2.18	2.23
Total expense to total income	47.37	51.53	40.60	46.77	53.09

Source: Authors computation based on National Bank of Ethiopia database

Total expense to total income ratio is calculated to look at the amount of expense incurred to produce 100 unit of income (since ratio is calculated in percentage). On average, the ratio of total expense to total income for the last four years is found to be 47.9. Implying, on average 47.9 Birr of expense is required to earn 100 Birr income. Even the recent data for 2013/14 shows ratio of total expense to total income is 53.09 implying commercial banks outlay Birr 53.09 to produce output equal to Birr 100. This in turn shows us how much the sector is profitable.

4.1.2. CONCENTRATION IN ETHIOPIAN BANKING INDUSTRY

Ethiopian banking industry can be characterized by high concentration. If we take Top three[5] banks concentration ratio, though it is declining over time still there is high concentration on Asset and Deposit (Table 4).The concentration is declining because the number of banks joined to the industry was increased as the sector is highly profitable. Bank entry in Ethiopia has been historically fairly easy as the Minimum paid-up capital (ETB 70 Million) was relatively low if we compare it with the new requirement (ETB 500 Million). In early period lack of skilled manpower was the problem rather than financial requirement. But, concentration by itself will not tell us the level of competition in the industry since the industry can be characterized by competition in the presence of high concentration if the market is contestable.

Table 4: Top Three banks Concentration ratio

Period	Asset	Deposit	Loan
2001/02	0.91	0.91	0.81
2002/03	0.90	0.89	0.80
2003/04	0.89	0.88	0.78
2004/05	0.87	0.87	0.76
2005/06	0.85	0.84	0.73
2006/07	0.85	0.82	0.68
2007/08	0.80	0.80	0.65
2008/09	0.78	0.78	0.61
2009/10	0.78	0.74	0.55
2010/11	0.74	0.72	0.56
2011/12	0.75	0.73	0.56
2012/13	0.80	0.75	0.55
2013/14	0.76	0.74	0.56
2014/15	0.73	0.73	0.54
Average	*0.82*	*0.80*	*0.65*

Source: Own computation based on National Bank of Ethiopia data base

4.1.3. COMMERCIAL BANKS INCOME COMPOSITION IN ETHIOPIA

Generally, Income of a bank is divided into two: Interest (II) and Non-interest income (NII). The first one is generated by giving traditional banking activity which is from disbursing a loan to the economy. Whereas the latter includes the income that is earned from forex, commission and charge this is beyond the traditional banking activity.

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[5] The banks include Commercial Bank of Ethiopia, Awash International Bank and Dashen Bank

As it is shown under Table 5 & Fig 2, Generally, The share of interest income was much higher than Non-interest income in early times. But the trend shows that share of NII is increasing overtime and starts to decline after it reaches the pick on the year 2011/12. If we look at the share by type of banks: on average, public banks Non-interest income was higher than that of private banks. But the share of Non-interest income at private banks starts to dominate onwards the year 2010/11 until 2011/12. Though the share of NII at private banks starts to decline after 2012/13, still the share at private banks is higher than that of public banks.

More specifically, the share of NII from total income at newly established banks are higher than that of old established banks[6] in recent periods. The share of NII at private banks (both old & new) starts to dominate interest income onwards the year 2010/11 where there was a credit cap policy in the specified period. The highest record was on the year 2011/12 in which newly established banks earned 60.0 percent of their income from NII. The trend shows that public banks are getting their income mainly from traditional banking activities (giving loan) whereas private banks, especially newly established, earn their most income from non-primary banking activities. Currently public banks income is mainly composed of interest income which is around 70 percent and the remaining 30 percent from NII. On the other hand, newly established banks earn their most income in the form of NII and it is around 51.0 percent and the part 49.0 percent is comes from interest income. Moreover, newly established banks are more responsive for NBE policy. This is explained in the period of credit cap where their income composition shows a quick shift from interest income to NII that is from 42.0 to 51.0 percent.

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[6] We have categorized banks depend on the year of establishment.

(In percent)

Period	Commercial Bank of Ethiopia(CBE)	Private Banks		
		All	Old	New
2001/02	24.5	32.3	32.3	-
2002/03	33.8	27.8	27.8	-
2003/04	48.3	36.4	36.4	-
2004/05	46.4	37.7	37.7	-
2005/06	53.4	37.5	37.5	-
2006/07	53.3	33.0	37.9	3.9
2007/08	54.4	32.1	33.8	26.9
2008/09	48.1	37.9	38.1	36.8
2009/10	36.2	47.6	41.6	59.5
2010/11	43.6	53.2	52.0	54.1
2011/12	49.7	58.5	55.5	60.0
2012/13	41.6	49.3	41.3	52.9
2013/14	29.7	47.6	36.9	51.0
2014/15	27.3	46.4	35.72	50.43

Source: Own computation based on National Bank of Ethiopia data base

Figure 2: Trend in Share of Non-interest income
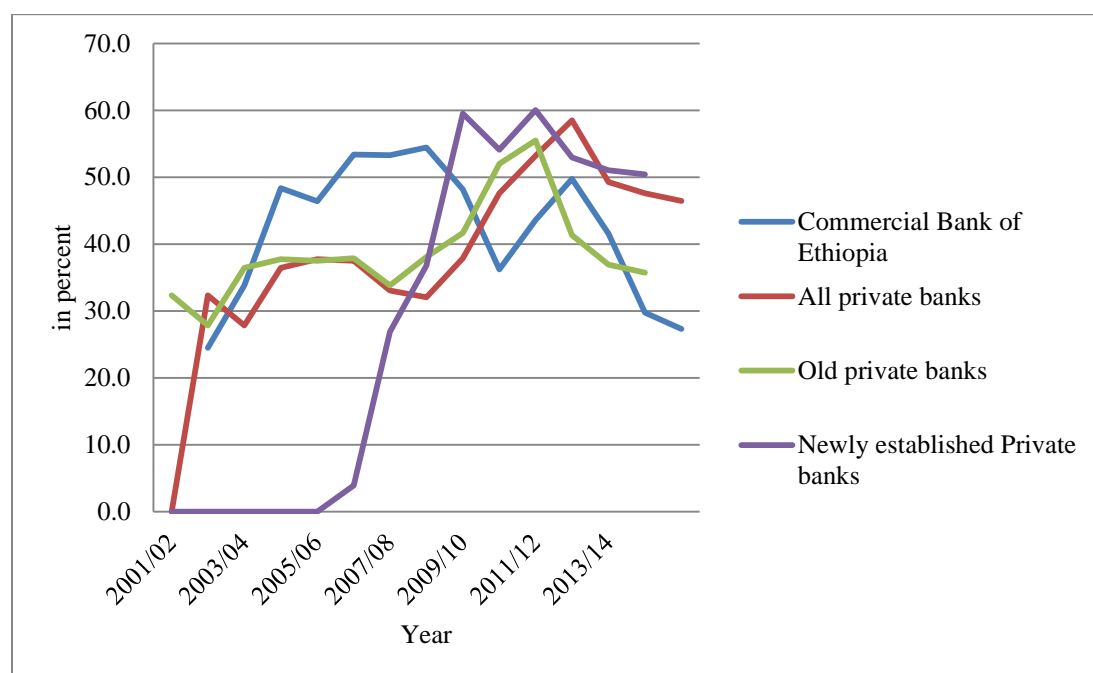
Source: Own computation based on National Bank of Ethiopia data base

4.2. ECONOMETRIC ANALYSIS

4.2.1. UNIT ROOT TEST

Before conducting the estimation of the models, we first test for stationarity of the variables using Levin-Liu-Chu (LLC) Test. And all the variables are found to be stationary. The result of the test is presented in Appendix 2.

4.2.2. RESULT AND DISCUSSION

4.2.2.1. Competition and Contestability Test (Model A)

The econometric model with three different specifications was run on a pooled data set of the 17 banks to obtain a general picture of the competitive structure of the Ethiopian banking industry over the sample period of 2002/03 – 2008/09, 2008/9-2010/11, and 2010/11 – 2014/15.We also looked at the trend of changes in competitive conditions. Appendix 3 reports the model results. In this model we used Total income as a dependent variable.

As it is shown under table 6, H-statistic is declining overtime. It was 0.7 for the period 2002/03-2008/09 and slightly declined to 0.6 on the period 2008/09 – 2010/ 11 and finally becomes –0.2 (= 0 with χ^2 test) for the recent period. The result shows that competition in Ethiopian banking industry is relatively high in earlier periods. As it is presented in Table 10, Policy of NBE like Credit cap and NBE bill purchase are the reasons for the declining trend in competition. The coefficient of D_2 in two regressions found negative and significant showing the negative impact of credit cap on banks power to generate income thereby on competition.

Interestingly, the coefficient of Price of fund is found to be positive and significant for the period 2002/03 – 2008/09 and 2008/9-2010/11. But its sign become negative for the period 2010/11 – 2014/15. This is explained by; if firms operate under competitive market the increase in price of fund will increase their revenue by increasing either the price of loan or quantity of loan. Therefore, the effect of price of fund in total income becomes positive. But, theoretically, if banks operate under monopoly and set prices so as to maximize profits; it will choose prices such that its gross revenue responds in the opposite direction as a change in unit costs. This means bank could have earned high profit by shrinking even without a change in input prices. Therefore, the increase in unit costs leads to a decrease in revenue. The negative coefficient in our case is

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appeared when the market is under monopoly. From microeconomic theory, Total revenue is increased by increasing either price or output depends on the demand of the product. Borrowing this theory, when there was a credit cap banks cannot increase the amount of loan (output) beyond some level. Moreover, as banks were operating under monopoly, they cannot increase price of their output as much if they would operate under competitive market. These two reasons make the coefficient of price of fund negative.

Table 6: Summary of H - Statistics from Model A

Period	Value of H- Statistics
2002/03 Q III – 2008/09 QII	0.7
2008/09 Q II – 2010/11 Q I	0.6
2010/11 QII – 2014/15 Q IV	-0.2

Source: Own computation based on Model A results

Now let's combine what we get in the descriptive and econometric analysis. In the descriptive part, we observe Concentration was higher at earlier periods though it is declining. And according to the above finding, we reject the monopoly and perfect competition hypotheses for the period 2002/03 to 2008/09 and 2008/09 to 2010/11 and conclude that banks in Ethiopia seem to earn their revenues as if under the conditions of monopolistic competition. The results suggest that a highly concentrated banking market do not seem to lead to anti-competitive conduct as suggested by the traditional SCP hypothesis, since the current analyses consistently reject the existence of collusive behavior. These results seem to be compatible with ***contestable markets theory (CMT),*** if we can assume that incumbent banks set their prices close to the competitive level because of potential competition; otherwise higher prices will attract potential entrants with hit-and-run strategies. These results are also consistent with the expectation that liberalization and deregulation of Ethiopian financial markets have increased the competitive conditions in banking industry.

To conclude about the market structure, we test the hypothesis proposed by Panzar and Rosse. The test is based on elasticity of revenue to sum of input prices. The test rejects both monopoly and perfect competition for the first two sample periods but can't reject the presence of monopoly in the last sample period.

4.2.2.2. Interest Vs Non- Interest Income (Substitute or complement products)? (Model B)

As it is discussed in descriptive part, the share of non-interest income is increasing overtime and in some period its share was higher than that of interest income. This raises the question that has to be answered: is non-interest income substituting or complement with interest income? To do this, we have estimated model B1 by using share of non-interest income (SNII) as an explanatory variable while interest income as a dependent variable (Appendix 4: model B1).And our interest is the coefficient of SNII.

Table 7: Coefficient of Share of Non-interest Income (SNII) in Model C

Period	Coefficient of SNII	Decision
Early Periods	Negative and insignificant	Substitute
Recent Periods	Negative and significant	Substitute (relatively perfect)

Source: Own computation based on result of Model C1

The table above shows that Interest and Non-interest income are ***Non-complement*** products. More specifically, non- interest income seems a perfect substitute for interest income in recent times than early periods. Early periods are relatively fair for banks to earn interest income and therefore banks don't go deep to shift their activities from interest to non-interest income.

4.2.2.3. Mis-specification of Empirical P-R Model test

This test is undertaken to check whether the claim of Bikker etal (2006) is valid or not. Moreover it is used to argue against the result of Zeray etal (2013) that used scaled dependent variable in their way to compute competition of banks in Ethiopian banking industry. So, we estimated 4 models in order to test the claim of Bikker etal. The results confirm that using scaled dependent variable is biased towards competitive structure as the P-R H- Statistics become price – price elasticity rather than Revenue- price elasticity. The Table below is the summary of the model results. (The detail is presented under appendix 5).

Table 8: Summary result of H- statistics that used to test mis-specification of P-R model

Dependent Variable	Value of H-statistics
Scenario I	
Interest Income	0.5
Interest Income / Total Asset	0.8
Scenario II	
Total Income	-0.1
Total Income / Total Asset	0.4

Source: Own computation based on result of Model C2

Hence, we empirically test the claim of Bikker etal and find an evidence of using scaled dependent variable is a biased estimation to determine the stance of banking market structure in an economy.

4.2.2.4. Competition among Private Banks (Model D)

Here we drop public banks from the sample and see the level of competition among private banks. Furthermore, we compared the result with model A to see the effect of public banks in the overall banking market structure. The result, Table 10, shows that competition among private banks is increasing overtime. This competition is endogenously comes from the existence of Commercial Bank of Ethiopia (CBE) in the industry. This can be explained by; CBE's recent time activities like aggressive branch opening & introduction of new deposit mobilizing schemes make private banks to increase their participation in different banking activities so as to stay in the business. But in early period competition is relatively high when we look the whole sample. For the detail you can refer Appendix 6.

Table 9: Summary of competition result among private banks and comparison with Model A

Period	Value of H-statistics	
	Among private banks	In all banks (Model A)
Early Periods	0.5	0.7
Recent Periods	0.6	-0.2

Source: Own computation based on result of Model D & A

4.2.2.5. How Non- Performing loan affects Income of Banks? (Model E)

Mostly non-performing loan is expected to decrease income of a bank. We have estimated 3 models in order to check the effect of NPL on income of a specific bank. The regression result shows that non-performing loan have a non-negative effect on Total income and negative effect

on interest income (Appendix 7). As it is shown under Figure 3 NPL affects total income of a bank positively. But the effect can be divided into to two: significantly and insignificantly. In early times the effect was not significant but significant in current periods.

When there is NPL it is automatic for interest income to decline but the effect on total income is depend on the magnitude of an increase in Non- Interest income. Banks doesn't give credit for nothing; they accept collateral before disbursing the loan. And this collateral will be sold if the borrowers default to payback the amount he/she borrowed. This is where the effect of NPL on Non-interest income comes on. Banks sell the collateral and record it as non-interest income in their income statement. This way NPL always have positive effect on non-interest income. The non-negativity effect of NPL on Total income is then depending on banks' ability to sell the collateral in a good price or not. If they sell with a better price that they would get from collecting interest income then it will more than compensate the loss of interest income and by effect increase total income significantly (positive and Significant). On the other hand, if they sell the collateral in a price that is almost equal to the loss they incur from not collecting the interest income then the effect of increase in non-interest income becomes insignificant.

As per the interview made with officials at different commercial banks, in early period banks were not selling the collateral in a good price than current times. This confirmed the econometric result that NPL have positive & insignificant effect in early times and positive & significant in current times on Total income. Diagrammatically;

Figure 3: The effect of Non-performing Loan on Interest, Non- Interest and Total Income
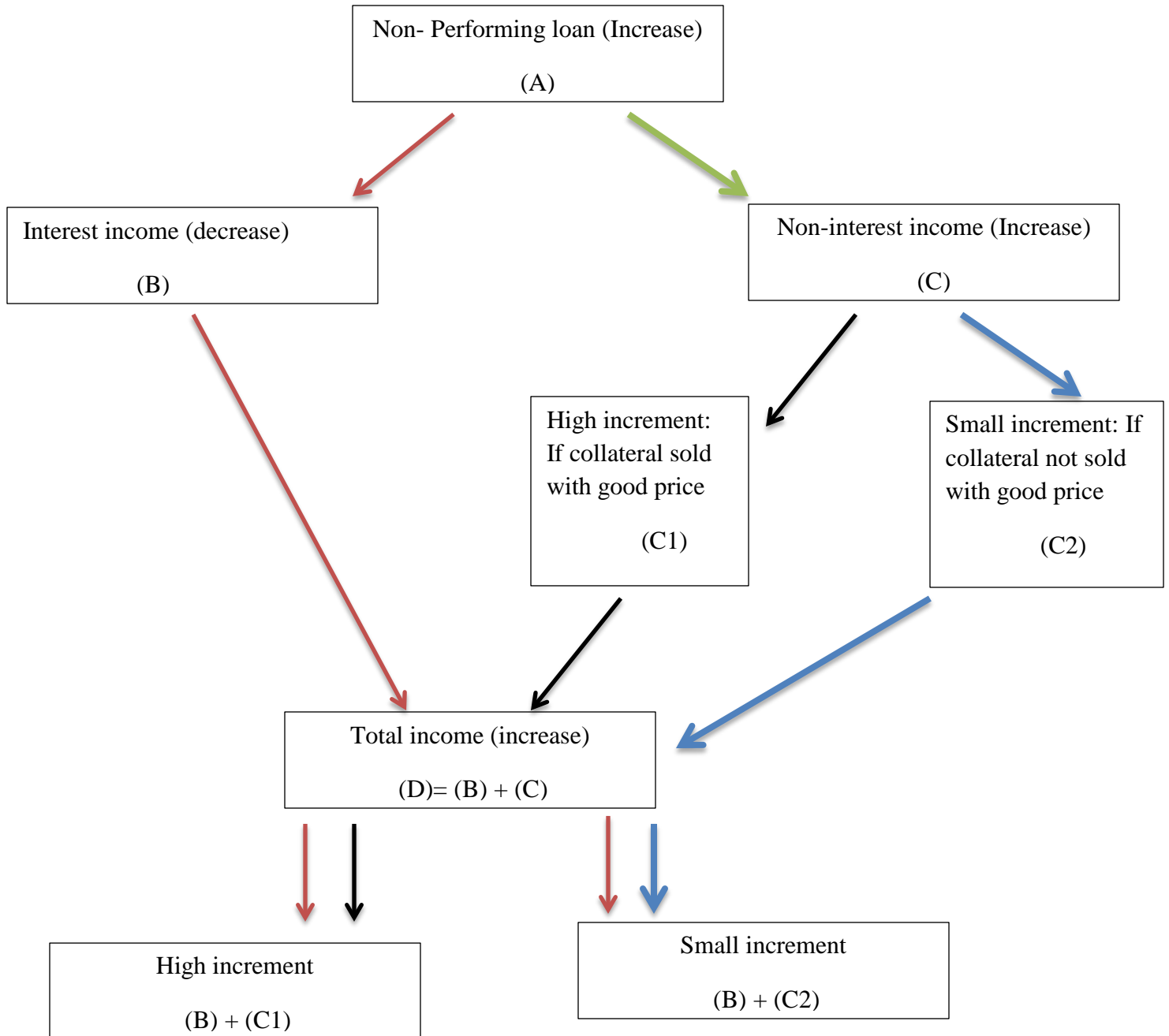
4.2.2.6. The Effect of NBE policy on Banks Income Statement

As it is in many countries, NBE is given the mandate to license and regulate banks & other financial institutions by Article 14 of NBE establishment proclamation N0.591/2008. Consequently, NBE issues a directive, policy or procedure in order to control the efficient functioning of commercial banks. And these policies have either positive or negative effect on banks performance. In the last decade, there are three major NBE policies which are expected to affect banks income statement and competition in the industry directly or indirectly. These include Credit cap, NBE Bill purchase and Minimum paid-up capital required for establishing a bank. We have tested the effect of Credit cap and NBE bill purchase on banks income statement. The result of regression shows that both Credit Cap (D2) and NBE Bill purchase (D1) have a non-positive effect on banks revenue, especially on interest income. (See appendix 8 for the detail). Credit cap limit banks not to give a credit more than some boundary and hence it lowers the amount of interest income they would earn if there is no a limit. Regarding the effect of NBE Bill purchase (insignificant), though it is not restrictive as that of Credit Cap, it lowers the interest income they would earn if they disburse the total loan (including the 27 %) to the sector they want.

Table 10: The effect of Credit Cap and NBE Bill purchase on Banks Income statement

Policy	Effect on Income statement
Credit cap	Negative and significant
NBE Bill purchase	Negative

Source: Own computation based on Model F

Model Diagnosis / Post-estimation Test

Estimation of P-R H- statistics is valid if the models we estimated above pass the diagnostic test. In panel data analysis, cross-sectional dependence is a threat for using random/ fixed effect models. As we estimated the models using fixed effect, we need to check cross sectional dependence after the estimation. The result of the test shows that, all the models estimated above have no problem of Cross-sectional interdependence.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

The paper tries to see the nature and trend of market structure in Ethiopian banking industry over the period 2002/03 to 2014/15 and finds the following points.

The Descriptive Analysis confirmed that Ethiopian banking industry is highly concentrated though it is declining overtime. Looking at income composition of commercial banks, now days newly established Private Banks earn their income mostly from non-traditional banking activity in the form of non-interest income. Whereas public banks income is mainly composed of interest income which shows public banks are relatively stable since the bank which depends on non-interest income is highly vulnerable for the economy movement.

The econometric analysis found out that the Ethiopian banking industry is *contestable* in the sense that though the industry has been highly concentrated there is an evidence of competition. Moreover, it depict the competition is declining over time. The result further confirmed competition is high among private banks. With respect to the effect of policy on banking competition, Credit cap had a negative impact on banks income statement and hence on competition. Non-Performing Loan have positive effect on total income and negative effect on interest income. Moreover, the effect on total income is significant in recent periods as banks gain more from selling the collateral than what they loose from not collecting the loan. The claim of Bikker etal (2006) about Mis-specification of empirical P-R is correct and biased towards competition as the elasticity becomes Price –Price if we used scaled dependent variable rather than Revenue- Price elasticity when we use unscaled dependent variable. Regarding the effect of ownership (dummy) on banks income statement, public banks get more income than private banks as they have the highest market share. There is persistence in revenue of a bank as model results show a significant effect of lagged dependent variable. Finally, the study introduced an approach to test the relationship between interest and Non-interest income. By applying the approach in Ethiopia banking industry, Interest and Non- interest Income has found to be non-*complement* products.

5.2. RECOMMENDATION

The Analysis part gives a clear picture that National Bank of Ethiopia policy, specially related to commercial banks' lending activity, have a negative impact on competition in the banking industry and caution must be taken while formulating a policy. Furthermore, National Bank of Ethiopia have to be fair enough both for private and public banks while introducing policy that could limit part of banking business like lending activity. In analyzing bank competition, it is good to use unscaled dependent variable rather than the extensive empirical scaled dependent variable as the scaled dependent variable is biased towards competitive results. To empirically test the relationship between Interest and Non-interest income in the banking industry, the study recommend the use of share of non-interest income as an independent variable and interest income as the main dependent variable by taking into account other control variables depending on the structure of banking industry in that specific country.

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APPENDIXES

Appendix 1: List of sampled banks

No.	Name of the Bank	Year of Establishment (G.C)
1	Commerial Bank of Ethiopia (CBE)	1963
2	Construction and Bussiness Bank (CBB)	1975
3	Awash International Bank (AIB)	1994
4	Dashen Bank (DB)	1995
5	Bank of Abyssinia (BoA)	1996
6	Wegagen Bank (WB)	1997
7	United Bank (UB)	1998
8	Nib International Bank (NIB)	1999
9	Cooperative Bank of Oromia (CBO)	2004
10	Lion International Bank (LIB)	2006
11	Zemen Bank (ZB)	2008
12	Oromia International Bank (OIB)	2008
13	Bunna International Bank (BUIB)	2009
14	Berhan International Bank (BIB)	2009
15	Abay Bank S.C (AB)	2010
16	Addis International Bank (AdIB)	2011
17	Debub Global Bank S.C (DGB)	2012
18	Enat Bank S.C. (EB)	2012

Source: National Bank of Ethiopia

Appendix 2: Unit Root test Results

Appendix 2A: Unit Root test results for TI, II,TITA and IITA

Appendix 2A1: Unit Root test result for total income(ti)

Levin-Lin-Chu unit-root test for TI

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

           Statistic   p-value

	Statistic	p-value
Unadjusted t	-8.9846	
Adjusted t*	-3.0727	0.0011

Appendix 2A2: Unit Root test result for interest income (II)

Levin-Lin-Chu unit-root test for II

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

           Statistic   p-value

	Statistic	p-value
Unadjusted t	-6.7736	
Adjusted t*	-2.3423	0.0096

Appendix 2A3: Unit Root test result for total income/ total asset (TITA)

Levin-Lin-Chu unit-root test for TITA

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

	Statistic	p-value
Unadjusted t	-20.7152	
Adjusted t*	-14.0112	0.0000

Appendix 2A4: Unit Root test result for interest income / total asset (IITA)

Levin-Lin-Chu unit-root test for IITA

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

	Statistic	p-value
Unadjusted t	-17.1854	
Adjusted t*	-10.9503	0.0000

Appendix 2B: Unit Root test results for Price of Labor (PL), Price of Capital (PK) & Price of Fund (PF)

Appendix 2B1: Unit Root test result for Price of Labor (PL)

Levin-Lin-Chu unit-root test for PL

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

            Statistic   p-value

	Statistic	p-value
Unadjusted t	-12.1889	
Adjusted t*	-6.0905	0.0000

Appendix 2B2: Unit Root test result for Price of Capital (PK)

Levin-Lin-Chu unit-root test for PK

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

            Statistic   p-value

	Statistic	p-value
Unadjusted t	-12.4906	
Adjusted t*	-5.8286	0.0000

Appendix 2B3: Unit Root test result for Price of Fund (PF)

Levin-Lin-Chu unit-root test for PF

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

                        Statistic   p-value

 Unadjusted t   -6.0211

 Adjusted t*   -2.4441   0.0073

Table 2C: Unit Root test results for NPL to loan, Share of nii & share of bank asset to the industry

Table 2C1: Unit Root test result for NPL to loan

Levin-Lin-Chu unit-root test for NL

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

                        Statistic   p-value

 Unadjusted t   -7.3349

 Adjusted t*   -2.6169   0.0044

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Table 2C2: Unit Root test result for Share of non-interest income to total income

Levin-Lin-Chu unit-root test for SNII

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

                        Statistic   p-value

 Unadjusted t   -8.1212

 Adjusted t*   -2.4133   0.0079

Table 2C3: Unit Root test result for share of bank asset to the industry asset

Levin-Lin-Chu unit-root test for STA

Ho: Panels contain unit roots   Number of panels =   8

Ha: Panels are stationary   Number of periods =   32

                        Statistic   p-value

 Unadjusted t   -7.1083

 Adjusted t*   -2.0983   0.0179

Appendix 3 (Model A): Trend of Bank Competition

	(Model A1) (2002/03- 08/09) Ti	(Model A2) (2008/09- 10/11) ti	(Model A3) (2010/11 – 14/15) ti
Pl	0.365*** (6.31)	0.208** (2.64)	0.429*** (3.53)
Pk	0.161*** (5.08)	0.0571* (2.11)	0.147** (3.10)
Pf	0.260*** (4.45)	0.371*** (4.33)	-0.730** (-2.76)
Lti	0.499*** (11.16)		
Sta	0.435*** (10.56)	0.833*** (23.75)	
Snii	0.229*** (3.65)	0.496*** (7.83)	
Nl		0.0760*** (6.51)	
d2		-0.268+ (-1.74)	-0.314*** (-3.48)
_cons	3.572*** (5.15)	14.91*** (14.93)	9.155*** (5.20)

t statistics in parentheses

$^{+}p< 0.10$, $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

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Appendix 4 (Model B): Model that used to test the type of product of II & NII

	(Model B1)	(Model B2)
	(2002/03 – 2010/11)	(2010/11- 2014/15)
	ii	ii
Pl	0.399^{***}	0.316^{+}
	(7.07)	(1.82)
Pk	0.149^{***}	0.0923^{+}
	(4.80)	(1.78)
Pf	0.295^{***}	-0.566^{**}
	(5.17)	(-2.75)
Lii	0.490^{***}	0.684^{***}
	(11.26)	(15.21)
Sta	0.445^{***}	
	(11.32)	
Snii	-0.0493	-0.670^{***}
	(-0.79)	(-3.78)
_cons	4.504^{***}	1.235
	(6.52)	(0.53)

t statistics in parentheses

$^{+}p< 0.10$, $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

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Appendix 5 (Model C): Model used to test misspecification of Empirical P-R model

	(Model C1) ii	(Model C2) iita	(Model C3) Ti	(Model C4) tita
Pl	0.720***	0.211**	0.413***	0.0841
	(6.93)	(3.15)	(3.30)	(1.11)
Pk	0.0804[+]	0.0780**	0.155**	0.135***
	(1.77)	(2.66)	(3.21)	(4.69)
Pf	-0.203	0.624***	-0.677*	0.340**
	(-0.79)	(3.77)	(-2.47)	(2.60)
Snii	-0.241*	-0.237***		
	(-2.59)	(-3.94)		
Nl			0.0587[+]	
			(1.76)	
d1			1.504**	
			(2.99)	
d2			-0.321***	
			(-3.44)	
_cons	10.09***	-3.512***	9.184***	-4.706***
	(6.53)	(-3.51)	(5.06)	(-4.52)
N	140	140	140	140
R^2	0.348	0.286		
adj. R^2	0.257	0.186		
F	16.28	12.20		

t statistics in parentheses
[+] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 6 (Model D): Model to see bank completion in private banks

	(Early periods)	(Recent periods)
	ti	ti
Pl	0.523***	0.416***
	(5.27)	(5.35)
Pk	0.138***	0.159***
	(3.86)	(3.39)
Pf	-0.156**	0.294***
	(-3.25)	(3.64)
Sta	0.771***	0.305***
	(21.69)	(3.90)
Nl	0.0640***	
	(5.53)	
Lti		0.633***
		(13.47)
Snii		0.298***
		(3.37)
_cons	9.256***	0.463
	(11.48)	(0.56)

t statistics in parentheses

$^{+}p< 0.10, ^{*}p< 0.05, ^{**}p< 0.01, ^{***}p< 0.001$

Appendix 7 (Model E): The effect of NPL on interest and total income

	(E1) ti	(E2) ti	(E3) Ii
Pl	0.245***	0.188*	0.323***
	(3.40)	(2.37)	(5.83)
Pk	0.111**	0.0665*	0.137***
	(2.98)	(2.49)	(4.71)
Pf	0.0740	0.356***	0.362***
	(1.15)	(4.08)	(7.18)
Lti	0.893***		
	(30.73)		
Nl	0.0361	0.0723***	-0.140***
	(0.99)	(6.26)	(-4.59)
Sta		0.875***	0.518***
		(37.93)	(12.63)
Snii		0.494***	
		(7.62)	
Lii			0.453***
			(10.73)
_cons	-1.265+	14.62***	6.363***
	(-1.75)	(14.78)	(8.15)

t statistics in parentheses
$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Appendix 8 (Model F): Model estimated to see the impact of Credit cap and NBE Bill Purchase on Banks income statement & competition

	(Model F1)	(Model F2)
	ti	ti
Pl	0.429^{***}	0.388^{***}
	(3.53)	(3.75)
Pk	0.147^{**}	0.0879^{*}
	(3.10)	(2.45)
Pf	-0.730^{**}	0.207^{+}
	(-2.76)	(1.79)
d2	-0.314^{***}	-0.381^{+}
	(-3.48)	(-1.72)
Sta		0.788^{***}
		(18.73)
Nl		0.0813^{***}
		(5.10)
d1		-0.0994
		(-0.82)
_cons	9.155^{***}	14.09^{***}
	(5.20)	(10.21)

t statistics in parentheses

$^{+}p< 0.10,$ $^{*}p< 0.05,$ $^{**}p< 0.01,$ $^{***}p< 0.001$

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