

WHAT DRIVES BANKING INDUSTRY COMPETITION IN DEVELOPING COUNTRIES?

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A competitive banking industry leads to an efficient allocation of financial resources, consequently increasing investment and economic growth. However, pervasive market inefficiencies and outmoded business practices often deter competition in the banking industry of developing countries. The present study examines the determinants of bank competition in such nations for the period 1995-2014 and compares that with high income countries. Employing both fixed-effects and GMM estimations and using two different measures of bank competition, we find greater diversification, credit risks and economic freedom to promote competition in developing countries while higher capitalization, profitability and cost efficiency increases market power.

Keywords: Lerner Index, Boone Indicator, Diversification, Cost Efficiency, Panel Data
JEL Classification: G21, C23, L1, O16

1. INTRODUCTION

Over the past two decades the combination of regulatory reform, financial innovation, and technological change has substantially restructured the business of banking across the world. Banks now operate in more markets, offer new products, and engage in a broad range of financial services and instruments.¹ How this changing landscape of banking has shaped the banking industry structure is an issue of extreme

¹ For instance, in the US, the Gramm–Leach–Bliley (henceforth GLBA) Act of 1999 by repealing much of the Glass–Steagall Act of 1933, created incentives for commercial banks to enter newer lines of business. At the same time, the GLBA (also called the Financial Services Modernization Act of 1999) allowed various types of financial institutions besides commercial banks to freely merge and compete for loans. Likewise, in the European Union various measures like the Second banking directive, Financial Services Action plan, the EU White Paper on Financial, were adopted aimed at eliminating the barriers or obstacles (legal, fiscal, institutional etc.) that protect national markets from outside competition, make retail markets more open and establish a single market in financial services.

importance. In a broader sense, understanding the overall determinants of banking industry structure of a nation is extremely important on several other grounds.

A competitive environment stimulates banks to become more efficient by reducing overhead costs, enhancing overall bank management, improving risk management, and providing new bank products and services. The degree of competition in the banking sector is critical for the efficiency of the production of financial services, the quality of financial products and innovation in the sector (Frimpong et al., 2016). Sound competition lowers prices and improves quality, thereby contributing to the prosperity of consumers and companies alike. Furthermore, competition fosters innovative behavior, forces banks to improve their efficiency, thus promoting the access of households and firms to financial services and external finance (Bikker et al., 2007; Claessens and Laeven, 2004). At the same time, too much competition among banks could foster insolvency of some banks and instability of the entire banking system. Excessive competition emerging from financial reforms may encourage banks to pursue riskier policies in taking on more credit risk in their loans portfolio (which could eventually generate bank failure) in order to maintain their profits level.

Given the importance of this issue, the present study examines the underlying determinants of banking industry structure by using an extensive dataset of more than 100 nations for the period 1995-2014. Such an analysis is crucial for governments and bank regulators when it comes to formulating effective policies and fostering domestic banking competition. Specifically, we focus on the determinants of banking industry competition in developing countries for which there is scant literature, and compare that with high income nations. In many developing countries, pervasive market inefficiencies and outmoded banking practices exist that allow some existing banks to realize high interest margins (Claessens et al., 2001). There are also significant informational asymmetries that increase the cost of acquiring soft information by banks, on the basis of which a large share of potential borrowers are identified. These increase the cost of financing for borrowers, especially for small and new firms. In this context, greater competition in the banking industry of developing countries can increase efficiency by reducing informational bottlenecks and costs of credit for borrowers. A more competitive banking industry also leads to more efficient allocation of financial resources, consequently increasing investment to enhance economic growth in a nation.

Previewing our key findings, we find greater diversification, credit risks and economic freedom to promote competition in developing countries while higher capitalization, profitability and cost efficiency increases market power.

The rest of the paper proceeds as follows. Section 2, discusses the evolution of the literature on banking industry competition. Section 3, presents the measures of banking industry competition and discusses its various determinants. Section 4, discusses the results. Finally, section 5 concludes by addressing the paper's policy implications.

2. EVOLUTION OF THE LITERATURE ON BANK COMPETITION

Empirical approaches to measure the degree of banking competition follow two paradigms – the structure–contact–performance (SCP) paradigm and the relative efficiency (RE) paradigm, that are based on an inverse relationship between market concentration and competition. The SCP paradigm examines whether a highly concentrated market causes collusive behavior among larger banks resulting in an increase in market power and therefore higher market performance (higher prices and bank profitability), whereas the RE paradigm investigates whether it is the efficiency of larger banks that enables them to earn relatively higher profits because of lower costs and therefore increase their market share in the process. The SCP paradigm has its roots in the theory of industrial organization where the competitive features of industry are inferred from structural characteristics that influence firm behavior and performance. Market structure is typically indicated by various measures including market shares, concentration ratios for the largest sets of banks, or a Hirschman–Herfindahl index. Other research, however, suggests that the number of banks, the Herfindahl and other concentration indexes are not, in themselves, sufficient indicators of the degree of competitive behavior.

A more recent empirical framework for measuring bank competition is the New Empirical Industrial Organization (NEIO) methodology, which utilizes profit-maximizing comparative static conditions (see the survey of Bresnahan, 1989). These measures are developed from (static) theory of the firm models under equilibrium conditions and typically use some form of price mark-up over a competitive benchmark. A widely used empirical measure in the NEIO framework is the Lerner index of market power, the disparity between price and marginal cost expressed as a percent of price, given the fact that the divergence between product price and marginal cost of production is the essence of monopoly power.² It is the mark-up of price (average revenue) over marginal cost and the divergence of price from perceived marginal revenue that captures market power. The higher the mark-up, the greater is the realized market power and less competitive is the banking industry.³

An alternative approach, developed by Panzar and Rosse (1987) – is the H-statistic that focuses on the degree to which changes in the average cost of different inputs leads to subsequent changes in average revenues provided that the industry is in a long-run equilibrium. The greater is the transmission of cost changes into price changes, in either

² This is based on the Bresnahan–Lau approach proposed by Lau (1982) and Bresnahan (1982, 1989) that allows for the estimation of the degree of competition using aggregate industry data, and estimates demand, supply and price equations simultaneously, to obtain an indicator of the market power of banks.

³ The index values range from a maximum of 1 to a minimum of zero, with higher numbers indicating greater market power and hence less competition. The Lerner index represents the extent to which a particular bank has market power to set its price above marginal cost. A zero value indicates perfect competition and no monopoly power.

direction, the more competitive the market is deemed to be since costs would then primarily determine price – not market concentration. The Panzar and Rosse (1987) methodology employs bank-level data and allows for bank-specific differences in production functions, provided that banks are examined under long-run equilibrium (see discussions in Ariss, 2009 and Carbo et al., 2009).⁴

A third empirical measure used in the literature is the Boone indicator (see Boone, 2008), which measures the effect of efficiency on performance, in terms of profits and market share. The rationale behind the indicator is that higher profits are achieved by more-efficient banks (those with lower marginal costs) that impair the performance of inefficient firms and this is reflected in lower profits or smaller market shares (Castellanos and Garza-Garcia, 2013).⁵ An increase in the Boone indicator implies a deterioration of the competitive conduct of financial intermediaries. Some authors have pointed out an advantage of Boone's indicator is that it is less data intensive than other measures (van Leuvensteijn et al, 2007), and an increase does reflect a change in competition (Castellanos and Garza-Garcia, 2013).

Turning to a succinct survey of the recent empirical literature, Delis (2012) focuses on examining the impact of financial reforms and the quality of institutions for 84 nations over the period 1992-2005. Measuring the degree of market power by using both the Lerner Index and the Boone Indicator, the author finds financial liberalization policies to reduce the market power of banks in developed countries with advanced institutions. Both banks size and the extent of capitalization is found to significantly increase market power. De Guevera et al. (2005) examine the determinants of the degree of market power in five high income European countries (Germany, France, Italy, Spain and the United Kingdom) for the period 1992-1999. Using bank-level data and again the Lerner Index, the size of banks and their operating efficiency, default risk and economic cycle significantly explain the index of market power. However, concentration is found to reduce market power. Carbo et al. (2009) explain cross country differences in banking sector competition by using different measures (Lerner Index, H-statistic, net interest margins-to-assets, return-on-assets) for 14 European countries over 1995-2001. They find differences in cost efficiency and diversification activities have a significant influence on the measures of competition, as do differences in real output growth and inflation.

Reviewing a few recent country-specific studies, Frimpong et al. (2016) estimates the Lerner index for banks in Ghana for the period 2001-2010, and find bank capitalization to reduce market power. However, bank size, fee income, loan loss provision ratio and inflation rate do not have any significant influence on bank

⁴ A detailed discussion on the relative merits and demerits of the two approaches are provided in Shaffer (2004).

⁵ It is calculated as the elasticity of profits to marginal costs. To obtain the elasticity, the log of profits (measured by return on assets) is regressed on the log of marginal costs. The estimated coefficient (computed from the first derivative of a trans-log cost function) is the elasticity.

competition in Ghana. De Guevera and Maudos (2007) study the banking industry of Spain for the period 1986-2002 and find the Lerner index of market power is significantly explained by size, efficiency and specialization, while concentration is found to be insignificant. Fungacova et al. (2010) explain the determinants of market power in the Russian banking industry over the period 2001-2006. Using again the Lerner index, greater bank size, asset concentration, loans to industrial organizations, industrial growth and investor risk increases banks market power whereas both a rising share of non-performing loans and loan loss provisions reduce market power.

Some influential studies that use the Panzar and Rosse (1987) approach and the corresponding H-statistic include Claessens and Laeven (2004) who use bank-level data for the period 1994-2001 and estimate the degree of competition in 50 countries' banking systems. The authors find that banking systems with greater foreign bank entry and lack of entry and activity restrictions have a higher competitiveness score. Bikker et al. (2007) explain bank competition across 76 countries for the period 1995-2004 using the H-statistic to find a country's institutional framework, especially antitrust policies, as a key factor in improving banking competition. The same applies for reducing impediments to foreign investments. However, both the number of banks and bank concentration do not significantly influence competition. Ariss (2009) use the H-statistic to examine the degree of market power in the banking industry of the Middle East and North Africa (MENA) nations for the period 2000-2006. The author finds efficiency of banks, capitalization and profitability to significantly reduce competition whereas higher economic development and foreign competition promotes a competitive banking environment. Rezitis (2010) investigates competitive conditions in the banking sector of Greece for the period 1995-2004. Again using the H-statistic, the author finds mergers and acquisitions to reduce the level of competition in the Greek banking industry.

Clearly the empirical literature is marked by the use of various measures of bank competition as well as their determinants, varying country coverage, and different time period of analysis that is reflected in differing and diverse findings. In this backdrop, the present study provides a very topical examination of the issue using data on a comprehensive set of developing countries encapsulating the last two decades.

3. DATA AND VARIABLE DESCRIPTION

Data on banking industry competition as well as other industry specific variables and macroeconomic determinants are sourced from the World Bank's Global Financial Development database.

3.1. Measuring Bank Competition

At the aggregate banking industry-level analysis using country-specific data, the best proxy for competition is the Lerner index of the price-marginal cost margin (Lerner,

1934), obtained by using aggregated interest rate information. The advantage of this measure is its availability across a large sample of countries, as is the case here. Figure 1 shows the annual averages of Lerner Index for 1995-2014, not only for the full-sample but also for high, middle and low income countries.⁶ This time period encapsulates the period of the global financial crisis, the years leading to the crisis as well as the post-crisis one. The overall trend is slightly upward rising and shows the degree of market power to be somewhat lower in high income nations, compared to that in middle- and low income countries. This implies the banking industry in advanced nations is more competitive than in the other groups of nations. On the other hand, it has remained less competitive in low income nations. Pointedly, during the global financial crisis and its aftermath, the Lerner index value has increased in high income nations, suggesting the extent of competition to decrease, possibly due to the mergers and acquisitions of failed and struggling banks by other larger banks.

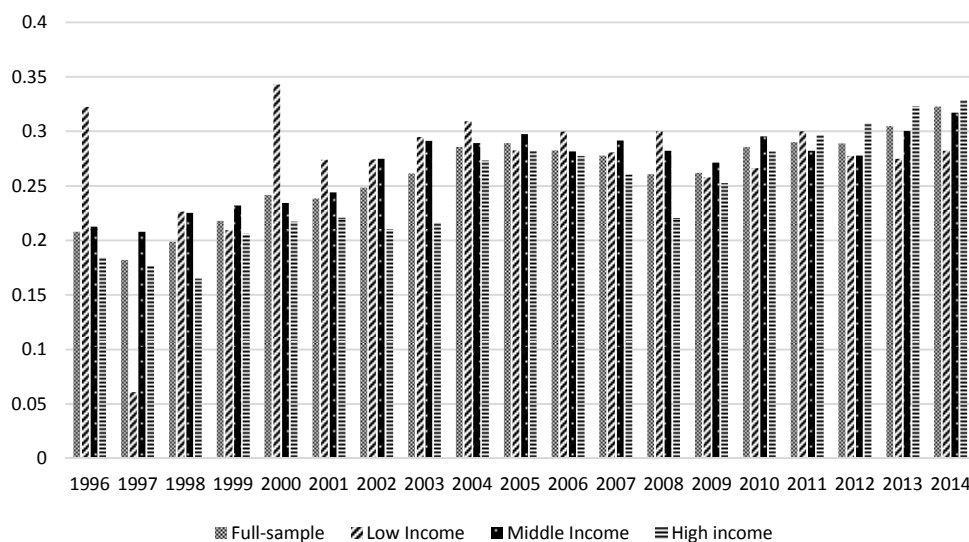


Figure 1. Annual Average of Lerner Index

As an alternative measure we also use the Boone indicator. Figure 2 below shows the yearly averages of this measure, again for the full sample as well as that in high-, middle- and low income countries. A higher negative value here denotes a higher level of competition. We see a flat to somewhat declining trend that is suggestive that the banking industry has been slightly less competitive over time.

⁶ Categorization of nations according to income groups follows that of the World Bank.

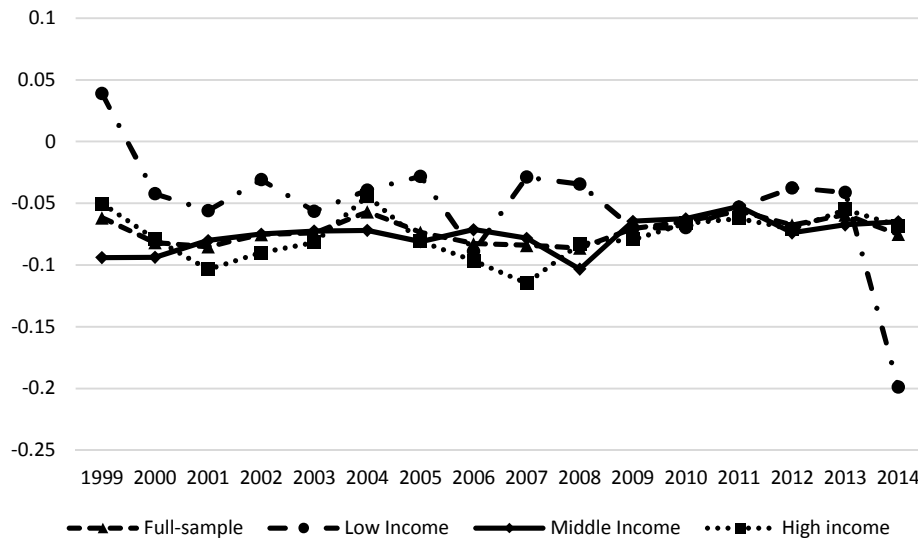


Figure 2. Annual Average of Boone Indicator

3.2 Banking Industry-specific Determinants of Bank Competition

Capitalization: is measured by total equity capital to assets ratio in each nation. Well-capitalized banks are likely to set higher margins or have access to a cheaper source of funds due to scale economies, informational asymmetries, and moral hazard issues. Banks with more capital can impound the otherwise effective role of institutions in enhancing competition (see Delis, 2012). Higher capitalization will lead to improvement of buffer for risk absorption, which could increase market power. Similarly, well capitalized banks have higher market power in a less competitive environment, suggesting that banks pay less for deposits because depositors view these banks as safe (Frimpong et al., 2016). Thus a positive relationship is hypothesized between capitalization and the Lerner Index.

Profitability: is measured by bank return on assets (ROA) defined as banks' after-tax net income to yearly averaged total assets. It can be argued that banks are able to command higher profitability ratios when operating under more monopolistic conditions and have a negative impact on competition (see Ariss, 2009).

Diversification: is defined as banks' non-interest noninterest related activities as a percentage of total income (net-interest income plus noninterest income). Noninterest related income includes net gains on trading and derivatives, net gains on other securities, net fees and commissions and other operating income. As banks expand their range of services it is expected to promote competition in not only the newer lines of business but also in the traditional niche areas of loan and deposit services.

Cost efficiency: is measured as banks cost-to-income ratio that is the share of operating expenses of banks as a share of sum of net-interest revenue and other operating income. The operating efficiency achieved in banks management is one of the most important factors in explaining the differences in market power among banking across nations (De Guevara et al., 2005). It is expected in more efficient banking industry (those with lower values of cost to income ratio) enjoy higher margins, almost certainly as a consequence of their lower marginal costs, and are less competitive.

Industry concentration: is measured by the assets of three largest commercial banks as a share of total commercial banking assets. Its effect on market power is ambiguous. On the one hand, the SCP approach argues that a concentrated market structure is associated with higher prices and profits, thereby reducing competition (Bikker et al., 2007). On the other hand, two alternative theories suggest that market concentration need not reduce banking industry competition. The contestability theory states that a concentrated banking market can still behave competitively, as long as the entry barriers for potential newcomers are limited (Baumol, 1982; Baumol et al., 1982). The efficiency hypothesis postulates that the most efficient banks gain market share at the cost of less efficient banks (see Demsetz, 1973). According to this theory, bank efficiency is the driving force behind market concentration, resulting in lower prices and a more competitive industry.

Industry risks: is measured by banks nonperforming loans to gross loans (henceforth NPLs). Higher NPLs is expected to reduce market power because of the losses involved. Furthermore, greater risk could divert depositors from the bank and hence increase the bank's costs of attracting clients (Fungacova et al., 2010).

3.3. Interindustry Competition

The degree of competition from other forms of financial intermediation (capital markets, nonbank financial institutions, insurance companies) typically plays a role in determining banking system competitiveness (Claessens and Laeven, 2004). This is captured as follows:

Financial structure: is measured by the ratio of the total assets of the banking system to GDP. This variable also proxies for the banking industry size in each nation.

Life insurance premium volume as a fraction of GDP: life insurance premiums not only reflect the demand for life insurance products but also for more sophisticated financial services in general. It captures the degree of substitution, competition and dependence on indirect i.e. bank financing compared to direct financing in a nation.

3.4. Macroeconomic and Institutional Determinants

A country's underlying macroeconomic conditions can have a profound influence on the degree of competition in the banking industry. Higher economic growth encourages the entry of more banks (both domestic and foreign) into the industry, thereby,

increasing competition. In rebuttal to the supply-side factor, in times of economic expansion (and therefore of increased demand for bank financing) banks may enjoy greater relative margins that impede competition (De Guevara et al., 2005). The percent change in real GDP from one year to the next is used to measure economic growth. We also control for economic development, measured as the logarithmic value of real GDP per capita; and nation's inflation rate, defined as the percent change in consumer price index, as other macroeconomic determinants.

Lastly, Economic freedom is used as a measure of socio-economic institutional control variable. It indicates how a country's policies rank in terms of providing economic freedom. It is a composite of ten indicators ranking policies in the areas of trade, government finances, government interventions, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation, and black market activity. Higher scores indicate policies more conducive to competition and economic freedom. To the extent greater economic freedom allow banks to extent their different functions without any bureaucratic red-tape and engage more freely in different services, we expect increased economic freedom to promote banking industry competition and reduce market power. Table 1 shows the summary statistics of all variables.

Table 1. Summary Statistics

Measures of bank competition	<i>N</i>	μ	σ	Min	Max	Source
Lerner Index	2326	0.259	0.156	-1.609	1.076	GFD
Boone Indicator	2525	-0.072	0.157	-2.000	2.129	GFD
Banking industry-specific determinants						
Capital-to-assets	1683	9.603	4.031	1.5	30.6	GFD
Non-Performing Loans	1715	7.268	7.560	0	74.1	GFD
Diversification	3211	37.714	14.689	0	92.229	GFD
Cost-to-Income	3214	55.531	17.467	0	218.087	GFD
Return-on-Assets	3156	1.399	1.632	-9.876	9.908	GFD
Bank Concentration	2650	72.768	20.081	17.287	100	GFD
Interindustry competition						
Bank Assets-to-GDP	3470	52.032	43.420	0.501	263.126	GFD
Life Insurance premium-to-GDP	2832	1.418	2.163	0.000	15.784	GFD
Macroeconomic determinants						
Real GDP growth	3678	0.072	0.128	-1.019	1.397	WDI
Log(Real GDP per capita)	3815	8.130	1.625	4.242	11.974	WDI
Inflation	3332	0.073	0.185	-0.590	6.497	WDI
Economic Freedom	3187	59.064	11.896	1	90.5	Heritage Foundation

Note: μ – mean, σ – standard deviation, *n* – number of observations. GFD – Global Financial Development; WDI – World Development Indicators.

Table 2. Fixed Effects and GMM Results

Variables	[1] Full- sample	[2] Developing countries	[3] High Income	[4] Full- sample	[5] Developing countries	[6] High Income
Lerner Index(t-1)				0.171 (1.49)	0.343 (1.56)	0.056 (0.87)
Bank Assets-to-GDP	0.000 (0.13)	0.001 (0.69)	0.000 (-0.47)	0.000 (0.07)	-0.001 (-0.34)	-0.002 (-0.91)
Capital-to-assets	0.001 (0.31)	0.004* (1.85)	-0.004 (-0.74)	0.005 (0.48)	0.001 (0.21)	0.027* (1.88)
Non-Performing Loans	-0.002* (-2.07)	-0.002* (-1.99)	0.000 (-0.31)	0.005 (0.85)	0.002 (0.48)	0.015 (1.44)
Diversification	-0.001 (-1.6)	-0.001** (-2.35)	0.000 (0.02)	-0.001 (-0.53)	-0.001 (-0.54)	-0.004* (-1.74)
Cost-to-Income	-0.003*** (-5.54)	-0.003*** (-5.41)	-0.003*** (-3.87)	-0.003*** (-3.58)	-0.003** (-2.02)	-0.002 (-0.8)
Return-on-Assets	0.017*** (2.51)	0.012* (1.68)	0.029*** (3)	0.025** (2.07)	0.014** (2.13)	0.062** (2.08)
Bank Concentration	-0.001 (-1.6)	-0.001* (-2.08)	0.000 (0.77)	0.000 (0.04)	0.000 (-0.31)	0.000 (0.03)
Life Insurance premium-to-GDP	0.008** (2.02)	0.017 (1.36)	0.006 (1.22)	-0.044 (-0.49)	0.030 (0.26)	0.057 (0.72)
real GDP growth	-0.051 (-1.25)	-0.002 (-0.04)	-0.059 (-1.06)	0.063 (0.69)	-0.044 (-0.38)	-0.010 (0.05)
Log(Real GDP per capita)	-0.044 (-1.2)	-0.035 (-0.83)	0.023 (0.37)	0.134* (1.81)	0.075 (0.65)	0.265 (1.17)
Inflation	0.006 (0.09)	-0.101** (-2.07)	0.273** (2.32)	-0.508 (-1.13)	0.061 (0.24)	0.081 (0.08)
Economic Freedom	-0.003** (-2.42)	-0.004** (-2.21)	-0.002 (-1.06)	-0.009 (-1.26)	-0.006 (-1.04)	-0.003 (-0.15)
Constant	0.998*** (3.01)	0.91*** (2.9)	0.262 (0.41)	-5.447 (-0.61)	-3.863 (-0.98)	-12.796 (-1.5)
N	1225	618	607	1220	614	606
No. of countries	106	58	48	106	58	48
R ²	0.2868	0.3997	0.2823			
F-stat.	20.1	25.66	15.05	5.95	13.36	6.1
No. of instruments				27	27	27
AR(1)				-2.42	-2.53	-2.23
p-value				0.016	0.016	0.06
AR(2)				-1.42	-0.58	-1.2
p-value				0.155	0.562	0.23
Hansen p-value				0.131	0.709	0.55

Note: Terms in brackets denote z-stats based on robust standard errors clustered in countries. *, **, *** indicates significance at the 10%, 5%, 1% level. Bold coefficients denote statistically significant ones.

4. RESULTS

We start with the complete sample of 206 nations in the World Bank Group's Global Financial Development database. However, the data is riddled with missing observations on the banking-industry specific variables for several nations over the years of study.

We include as many countries and years as possible to maximize on the sample size. Hence, the final the panel dataset is unbalanced and boils down to 124 nations.

The static framework uses a fixed effects estimation model that controls for the effect of time-invariant unobserved heterogeneity across countries, captured by country-specific dummies. Moreover, the use of country-specific effects addresses the omitted-variables bias problem. Also the fixed effects model allows controlling for country-invariant but time variant unobserved factors by using time dummies. This is especially relevant in light of several institutional and regulatory changes in the banking sector over time in most nations.

$$Y_{it} = \alpha_0 + a_j (X_{it}^j) + a_k (X_{it}^k) + \mu_i + \lambda_t + \varepsilon_{it} , \quad (1)$$

where Y_{it} denotes the Lerner Index in the banking industry of country i in period t ; (X_{it}^j) denotes a vector of country-specific banking-industry specific variables; (X_{it}^k) represents a vector of macroeconomic variables. i represents each country and t each year; μ refers to country fixed effects, λ is time fixed effects and ε_{it} is an independently and identically distributed error term.⁷

Column 1 of Table 2 presents the results for the full-sample. Greater cost efficiency increases market power and hence impedes competition across nations, similar to the findings by Delis (2012) and on European countries by Carbo et al. (2009), De Guevera et al. (2005). The opposite applies for NPLs, consistent with that of Fungacova et al. (2010). The negatively significant coefficient indicates that higher credit risks arising from poor quality loans reduce banks price-marginal cost margins and hence improve competition in the banking industry. On the other hand, greater profitability strengthens banks margins thereby reducing bank competition, much like the findings of Ariss (2009) on MENA nations. Life insurance premium-to-GDP is negatively significant indicating that greater development of other forms of financial services reduces market power in the banking industry and promotes competition within the industry.⁸ Bank assets- to-GDP, capital-to-assets, bank diversification, and concentration ratios are statistically insignificant. The same applies for the macroeconomic variables. Economic freedom significantly lowers banks margins and increase competition. Consistent with theoretical priors, policies that promote overall competition in a nation also improve banking industry competition.

⁷ The fixed effects estimation further allows the unobserved country specifics to be arbitrarily correlated with the determinants of Lerner Index, and under the assumption of strict exogeneity it also takes into account the state- specific differences.

⁸ As additional explanatory variables we also used the ratio of stock market capitalization-to-GDP to control for the degree of competition from capital markets; and the percent share of foreign banks in the host nation. However, both variables were statistically insignificant and reduced the sample size substantially. Hence, the final results presented here exclude them.

Columns 2 and 3, next provides a comparative perspective by presenting the results for the panel of developing countries and high income nations, respectively. The former are all nations categorized by the World Bank as either upper middle income, lower middle income or low income. In high income nations, both cost efficiency and profitability lowers bank competition, in line with the findings for the full-sample. Interestingly, the different determinants of competition exhibit most significance for developing countries. Following theoretical priors, greater capitalization increases banks market power that lower competition in these nations, similar to the findings of Delis (2012). Matching the results for the full-sample, NPLs increase bank competition in developing countries. Likewise, the results for banks cost efficiency and profitability mirror that of the full-sample and in high income nations. Pointedly, greater diversification reduces market power and hence fosters competition in the banking industry of developing countries (similar to that of Carbo, 2009; De Guevara and Maudos, 2007). This has key implications. The banking industry in developing countries is often characterized by lack of competition. In such situations introducing reforms like deregulation measures encouraging banks to enter newer lines of business will instill more competition in the banking industry. Higher asset concentration also reduces market power supporting the contestability and efficiency theories. It also ameliorates concerns that a more concentrated banking industry need not be anti-competitive in developing countries. This finding is in line with Claessens and Laeven (2004).

Turning to the macroeconomic controls, higher inflation rates in developing countries lower market power and increase competition. Contrasting such findings inflation significantly increases bank market power in high-income nations. This is because high inflation rates compel banks to increase their product prices (for example, raise interest rates above interest payments) and also reduce overhead costs to stay competitive leading to high market power. Dissecting the results for both high income and developing countries clearly reveal that competition in the banking industry of developing nations is most sensitive to banking-industry specific conditions.

Berger et al. (2000), suggest that banking systems might be characterized by informational opacity, networking, and relationship-lending. All these elements cause bank rents and market power to persist over time. Such dynamic nature of bank competition is captured by a lagged dependent variable. Also cross-country regressions may suffer from endogeneity among the explanatory variables. In dynamic panels, a fixed effect regression is not suitable as the lagged market power term is correlated with the error term. This is called the dynamic panel bias (Nickell, 1981), thus leading to inconsistent estimates. We employ the two-step system-GMM estimation developed by Arellano and Bover (1995), Blundell and Bond (1998) adjusted with the Windmeijer (2005) correction for standard errors. This methodology essentially regresses levels and changes in the Lerner index on the lags of the same variable as well as other explanatory variables using lagged levels as instruments. These internal instruments help to eliminate bias resulting from possible endogeneity of independent variables. However, a key challenge using the systems-GMM methodology is that the number of instruments tends

to explode with the number of time periods. Instrument proliferation can overfit endogenous variables and fail to expunge their endogenous components, a telltale sign being high Hansen test p-values. We circumvent this methodological challenge in two ways. Following Roodman (2009a, b), we limit the lags in GMM-style instruments and also collapse the instruments. By keeping the instrument set small, we minimize the over-fitting problem and maximize the confidence that one has in the more efficient two-step systems-GMM estimator.

$$Y_{it} = \alpha_0 + \delta Y_{i,t-1} + a_k (X_{it}^k) + a_j (X_{it}^j) + \mu_i + \lambda_t + \varepsilon_{it} . \quad (2)$$

Columns 4-6 present the results for the full-sample, developing countries and high income, respectively. In all three regressions, the lagged dependent variable is statistically insignificant, suggesting no persistence of market power. Consistent with the results for the fixed effects model, both cost efficiency and profitability increases market power in the banking industry of nations in the full-sample as well as in developing countries. Moreover, greater capitalization and ROA increases market power of banks in high income nations. Turning to the macroeconomic variables, economic development increases market power in the full-sample while the other variables do not seem to play a significant role.⁹

4.1. Results for the Pre-crisis and Post-crisis Period

Table 3 provides a comparison of the results before the crisis (1995-2007) with that during the crisis and its aftermath (2008-2014). With no evidence of significant persistence of market power, we revert to our benchmark fixed-effects estimation. In the pre-crisis period, greater cost-efficiency, profitability, economic development and competition from the insurance sector increases market power in the banking industry. In developing nations, as the size of the banking industry grows it increases market power, which suggests the industry might be dominated by few large banks. Higher economic freedom again increases competition. In high income nations, in the pre-crisis period, higher economic growth reduces market power and increases competition while the opposite holds for both bank profitability and economic development.

Interestingly, during the global financial crisis and its aftermath, banking-industry market power is more sensitive to changes in the banking-industry specific determinants. Greater capitalization, asset concentration, cost efficiency and profitability increase market power thereby reducing banking industry competition for the full-sample of

⁹ AR(1) and AR(2) are the Arellano-Bond tests for first and second order autocorrelation of the residuals. One should reject the null hypothesis of no first order serial correlation and not reject the null hypothesis of no second order serial correlation of the residuals. In all specifications, the requirements are met as suggested by the p-values of the AR(1) and AR(2) tests. These imply that the GMM results are consistent. The Hansen test of over identifying restrictions further suggests that the instruments used in all the specifications are appropriate.

nations. The opposite applies for both NPLs and economic development. Results for banks' capital-to-assets ratio are especially meaningful. The post-crisis period has been marked by regulatory measures in most nations to re-capitalize banks. While such measures are extremely important to restore banks financial strength it is detrimental to increase competition in the industry.

Table 3. Results for Pre- and Post-crisis

Variables	Pre-crisis			Post-crisis		
	[1] Full- sample	[2] Developing countries	[3] High Income	[4] Full- sample	[5] Developing countries	[6] High Income
Bank Assets-to-GDP	0.000 (0.44)	0.003** (2)	0.000 (0.75)	0.000 (-0.05)	-0.001 (-1.05)	0.000 (0.3)
Capital-to-assets	-0.005 (-1.21)	0.000 (0.14)	-0.013 (-1.47)	0.005* (1.95)	0.008*** (2.7)	0.001 (0.27)
Non-Performing Loans	-0.002 (-1.15)	-0.002 (-1.37)	0.002 (0.72)	-0.002* (-1.65)	-0.001 (-0.55)	-0.003*** (-2.54)
Diversification	-0.001 (-1.32)	-0.002*** (-3.22)	0.000 (0.62)	0.000 (0.09)	-0.001* (-1.85)	0.000 (0.62)
Cost-to-Income	-0.002* (-1.89)	-0.001 (-0.92)	-0.001 (-0.88)	-0.004*** (-6.27)	-0.004*** (-6.98)	-0.003*** (-4.12)
Return-on-Assets	0.02** (2.24)	0.014* (1.83)	0.051*** (2.87)	0.015*** (3.42)	0.011* (1.98)	0.015** (2)
Bank Concentration	-0.001 (-0.68)	-0.001 (-0.83)	0.001 (0.91)	0.001* (1.73)	0.001* (1.71)	0.000 (0.24)
Life Insurance premium-to-GDP	0.012* (1.8)	0.032* (1.86)	0.009 (1.11)	-0.001 (-0.07)	0.003 (0.24)	-0.002 (-0.15)
real GDP growth	-0.132* (-1.91)	-0.038 (-0.4)	-0.188** (-2.14)	0.045 (1.52)	0.008 (0.18)	0.066* (2.07)
Log(Real GDP per capita)	0.131* (1.88)	0.004 (0.04)	0.204*** (2.51)	-0.161*** (-2.62)	0.019 (0.21)	-0.174** (-1.78)
Inflation	-0.024 (-0.29)	-0.130 (-1.46)	0.210 (1.14)	0.082 (1.15)	0.052 (0.76)	0.084 (0.8)
Economic Freedom	-0.006*** (-2.41)	-0.009*** (-2.84)	-0.004 (-1.11)	0.000 (0.11)	0.000 (0.17)	0.002 (0.82)
Constant	-0.406 (-0.7)	0.768 (1.04)	-1.474** (-2.02)	1.713*** (3.02)	0.262 (0.36)	1.966* (1.9)
N	680	315	365	545	303	242
No. of countries	92	48	44	101	55	46
R ²	0.210	0.353	0.250	0.387	0.382	0.492
F-stat.	10.4	18.44	13.44	16.51	22.65	23.59

Note: Terms in brackets denote z-stats based on robust standard errors clustered in countries. *, **, *** indicates significance at the 10%, 5%, 1% level. Bold coefficients denote statistically significant ones.

Results for developing countries largely mirror that of the full-sample in the post-crisis period. Additionally, diversification in banks business model again increases competition. The significant impact of industry risk, cost efficiency, profitability and economic development also holds in high income nations. Moreover, higher economic growth lowers bank competition in high income nations, indicating demand for credit to outweigh the supply-side effect of increased bank entry. Economic development changes sign both for the full-sample and in high income nations, post-crisis, and increase competition. This suggests, in the aftermath of the crisis, more economic affluence encourages different financial services provided by banks and increase competition. Moreover, economic development often surrogates institutional quality that significantly increases competition.

4.2. Results using Boone Indicator

For purposes of robustness checks will also use the Boone Indicator of banking industry competition as our dependent variable. Results are presented in Table 4. For the full-sample, both greater capitalization and profitability lower industry competition. However, as the size of the banking industry expands it promotes competition. Greater diversification and lower profitability promotes competition in developing countries, consistent with the findings using the Lerner index. Higher economic growth also increases competition.

Gleaning at the results for high income nations, higher NPLs and industry size increase competition. On the contrary, a more capitalized banking industry impedes competition in high income nations.

Columns 4-6 next present the results for the pre-crisis period. Again, higher capital-to-asset ratio lowers competition in the full-sample and in high income nations while industry size is beneficial for promoting competition. Greater competition from non-banking financial services, like insurance, reduces competition in the banking industry of high income nations and in the full-sample. Results for banks cost efficiency and industry risk in the pre-crisis period in high income nations resonate that using the Lerner index. Higher profits reduce competition in the full-sample and in developing countries. Higher economic growth increases competition in developing countries (and for the full-sample), again matching the earlier findings for the pre-crisis period using the Lerner index.

In the post-crisis period (Columns 7-9), banks cost efficiency is significant with greater efficiency reducing competition in the full-sample and in developing countries. For the latter group of nations, diversification again increases competition in the banking industry exemplifying the necessity of banks to venture into non-interest income based activities to promote industry competition. The same applies for economic freedom. On the other hand, interindustry competition enhances market power. Bank profits in high income nations again lower competition as is also the case for the full-sample of nations.

5. CONCLUSION

Extant literature provides rather inconclusive evidence on the implications of banking-industry specific conditions on the market structure of banking industries across nations. Using country-level banking industry-specific data encapsulating the last two decades for a broad range of more than 100 nations, this study examines the underlying determinants of competition in the banking industry, with particular emphasis on developing countries. Certain findings warrant summarizing.

The results reveal that more efficient banks (i.e. with lower value of cost to income ratio) enjoy higher margins, almost certainly as a consequence of their lower marginal costs. Higher profits of the banking industry also reduce competition. These two variables are most consistently significant, both across different income groups and over time. Among the other balance sheet variables, greater capitalization increases market power of banks in developing nations, while both higher share of NPLs and non-interest income are conducive to instill competition in such nations. The findings here have key policy implications.

The results for banks' capital-to-asset and return-on-assets ratios present a conundrum in developing countries. Post-crisis, there is an emphasis worldwide to re-capitalize banks and increase their profitability to restore their financial stability. However, such efforts could be detrimental to boost competitive elements in the banking industry. On the other hand, the last two decades have witnessed several regulatory reforms in banking around the globe that has essentially allowed banks to enter several newer lines of business and services. The results for diversification in developing nations imply, the banks that are more specialized in traditional loan and deposit services enjoy more market power. From a public policy standpoint, entering nontraditional services such as off-balance-sheet activities including derivatives trading, venture capital, fund management, underwriting, insurance and other fee or commission-based services, would instill a more competitive environment in the banking industry. This finding is especially notice worthy for banking regulatory and supervisory bodies in developing countries.

The recent global financial crisis was also marked by a rise in NPLs in banks' balance sheet. Post-crisis there is emphasis on improving banks quality of credit. While NPLs weaken banks financial position, the loan losses reduce banks margins and divert customers from banks with greater loan losses. Again, these results pose a trade-off for central banks in developing countries. While it is imperative to reduce NPLs and clean-up banks loans portfolio, such efforts may not support a more competitive banking industry. On the other hand, higher asset concentration is not detrimental to promote banking industry competition in such nations. We also find evidence that banking industry competition in developing countries is procyclical, suggestive that achieving sound macroeconomic conditions are beneficial in promoting competition. The same applies for higher economic freedom. Finally, we find evidence that non-banking financial services sector, like insurance, is complementary to the banking industry in the

sense it promotes banks margins by forcing banks to improve on the quality of their services and reduce overhead costs.

APPENDIX

A1. List of Countries

Albania; Algeria; Argentina; Armenia; Aruba; Australia; Austria; Azerbaijan; Bahrain; Bangladesh; Belarus; Belgium; Bhutan; Bolivia; Bosnia and Herzegovina; Botswana; Brazil; Brunei Darussalam; Bulgaria; Burundi; Cameroon; Canada; Chile; China; Colombia; Costa Rica; Croatia; Cyprus; Czech Republic; Denmark; Dominican Republic; Ecuador; Egypt, Arab Rep.; El Salvador; Estonia; Fiji; Finland; France; Gabon; Georgia; Germany; Ghana; Greece; Guatemala; Honduras; Hong Kong SAR, China; Hungary; Iceland; India; Indonesia; Ireland; Israel; Italy; Japan; Jordan; Kazakhstan; Kenya; Korea, Rep.; Kuwait; Kyrgyz Republic; Latvia; Lebanon; Lesotho; Lithuania; Luxembourg; Macao SAR, China; Macedonia, FYR; Madagascar; Malaysia; Malta; Mauritania; Mauritius; Mexico; Moldova; Morocco; Mozambique; Namibia; Netherlands; New Zealand; Nigeria; Norway; Oman; Pakistan; Panama; Paraguay; Peru; Philippines; Poland; Portugal; Romania; Russian Federation; Rwanda; Samoa; Saudi Arabia; Senegal; Serbia; Seychelles; Sierra Leone; Singapore; Slovak Republic; Slovenia; South Africa; Spain; Sri Lanka; St. Vincent and the Grenadines; Swaziland; Sweden; Switzerland; Tajikistan; Tanzania; Thailand; Tunisia; Turkey; Uganda; Ukraine; United Arab Emirates; United Kingdom; United States; Uruguay; Uzbekistan; Venezuela, RB; Vietnam; Yemen, Rep.; Zambia.

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