

Article

Competition and Regulation: The Case of the UK Banking Industry

Eleonora Muzzupappa ^{1,2}

¹ King's Business School, King's College London, 30 Aldwych, London WC2B 4BG, UK; eleonora.muzzupappa@kcl.ac.uk; Tel.: +44-(0)207-848-8746

² SEAM, University of Messina, Piazza Pugliatti 1, 98100 Messina, Italy

Abstract: This study examines the impact of the Basel Accords on competition within the UK banking sector, considering variations based on bank size. The Basel Accords, designed to enhance financial stability, introduce provisions that may affect competition dynamics. Empirical analysis reveals divergent outcomes: large banks tend towards monopolization, while other banks shift towards a more competitive environment. Large banks benefit from regulatory barriers and technological advancements, while other banks face challenges from increased compliance costs. These findings highlight the complex relationship between regulation and competition in banking, emphasizing the need for balanced regulations that promote stability while fostering healthy competition.

Keywords: banking system; competition; regulation

MSC: 91B54

1. Introduction

This paper evaluates the impact of one of the primary stability-oriented regulations, known as the Basel Accords (Basel hereafter), on competition levels within a market-based financial system, specifically within the UK banking sector. It also examines whether this impact varies based on the size of the banks. The banking sector has historically been heavily regulated due to its crucial role in the economy, with its stability considered a matter of public interest. Banks allocate capital efficiently and provide essential services like payment and settlement. Commercial banks, especially, conduct activities like deposit-taking and lending, vital for money creation and economic function. However, their involvement in various activities poses risks such as financial fragility and exposure to credit, markets, liquidity, interest rates, and operational risks. Regulation is crucial in mitigating these risks, protecting depositors, and ensuring overall financial stability, thereby maintaining confidence in the banking sector and safeguarding the broader economy (Dow, 1996 [1]). The Basel regulation aims to promote global supervision and enhance financial stability while fostering competition among banks (BCBS, 2014 [2]). This regulation achieves its objectives through three key pillars: establishing the optimal level of bank capital (Pillar I), mandating supervisory review for compliance with capital requirements (Pillar II), and encouraging market discipline through transparency (Pillar III). Financial stability is a multifaceted concept encompassing the safety and soundness of the financial system, as well as the stability of the payment and settlement system (Lastra, 2006 [3]). Competition in the banking sector serves as a crucial indicator of banks' performance and is often viewed as a potential substitute for regulation due to the discipline it imposes on market participants (Bikker and Bos, 2009 [4]). Empirical research has demonstrated that regulatory frameworks significantly influence competition, thereby shaping banks' economic outcomes. Angelini and Cetorelli (2003 [5]) studied the impact of the regulatory process that led to the establishment of the Single Banking License on competition dynamics. This study identifies this regulatory process as a factor that positively affects competition in



Citation: Muzzupappa, E.

Competition and Regulation: The Case of the UK Banking Industry. *Mathematics* **2024**, *12*, 1126. <https://doi.org/10.3390/math12081126>

Academic Editor: Ionut Florescu

Received: 21 February 2024

Revised: 27 March 2024

Accepted: 5 April 2024

Published: 9 April 2024



Copyright: © 2024 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

the Italian banking industry. Some studies are consistent with the view that tighter entry restrictions tend to limit competition. In this vein, Barth, Caprio, and Levine (2001 [6]) provide documentation for 107 countries regarding the different regulatory restrictions that were imposed on commercial banks in 1999. These restrictions encompassed various entry and exit barriers and practices. Similarly, Claessens and Laeven (2004 [7]) show that entry restrictions on commercial banks can reduce competition. Barth, Caprio, and Levine (2004 [8]) found that stricter entry requirements reduce bank efficiency, leading to higher interest rate margins and overhead expenditures, while limiting foreign bank participation tends to increase bank fragility. In a study exploring the impact of capital requirements on bank competition and stability, Gudmundsson, Ngoka-Kisinguh, and Odongo (2013 [9]) discovered a significant non-linear relationship between core capital and competition.

Competition is considered essential for financial stability, as banking systems with higher levels of competition are believed to be less prone to systemic crises (Claessens and Leaven, 2004 [7]; Beck, Demirgüç-Kunt, and Levine, 2006 [10]; Schaeck, Cihak, and Wolfe, 2007 [11]; OECD Competition Committee [12], 2010; Caggiano, Calice and Leonida, 2015 [13]). Therefore, regulators face the challenge of crafting banking regulations that promote stability without stifling competition, which is also vital for the system's resilience (World Bank, 2013 [14]). Despite existing regulations, the global financial crisis (GFC) exposed significant flaws in the regulatory framework, leading to calls for new measures to prevent future crises (FSA, 2009 [15]; Lastra and Wood 2010 [16]; Davis, 2011 [17]). Stricter capital requirements and enhanced supervision are advocated as crucial steps towards fostering banking stability. However, implementing such regulations may have unintended consequences (Jomini, 2011 [18]; Acharya, Schnabl and Suarez, 2013 [19]; Molyneux, 2017 [20]). For instance, stringent regulations could increase costs for banks to enter or remain in the market, potentially dampening competition dynamics. Likewise, financial regulation has an impact on the competition–stability trade-off (Beck, De Jonghe, and Schepens 2013 [21]).

Cross-country analysis suggests a negative correlation between competition and stability-oriented regulations, indicating that Basel regulations may raise entry and operational costs for banks (Baker and Wurgler, 2015 [22]). Additionally, compliance costs, including investments in data collection, IT systems, and staff training, may disproportionately affect smaller banks, reducing their competitiveness. Therefore, regulatory provisions can impact the competitive landscape by altering economic actors' incentives and revealing vulnerabilities in the regulatory framework when applied to the real economy. This study examines the impact of Basel regulations on competition within the UK banking system, which serves as an example of a market-based financial system with a significant reliance on securities markets for firms' financing decisions. In this system, the market's role in transforming societal savings into firm financing, corporate control, and risk management is emphasized alongside that of banks (Levine, 2002 [23]). The UK's market-based financial system is closely intertwined with its expanding financial sector, displaying a propensity for higher risk-taking and a primary focus on profit-driven activities that extend beyond traditional banking functions, reflecting a profit-oriented approach. This study's findings suggest that in the UK, the implementation of Basel alters the competition dynamics within the banking sector. The implementation of the Basel framework overall meets the aim of the regulation, as it fosters competition dynamics. However, this impact diverges when distinguishing between large banks and other banks: competition slightly decreases among large banks while it increases among other banks. The size of banks matters when it comes to financial regulation. Beck, Demirgüç-Kunt, and Maksimovic (2005 [24]) individuate the size of a firm as one of the determinants of financial and legal constraints to growth.

Large banks are often involved in the rule-making process, making the system prone to regulatory capture as well as regulatory arbitrage (Acharya, Schnabl and Suarez, 2013 [19] Molyneux, 2017 [20]). Large banks also benefit from implicit safety net protections; too-big-to-fail banks are bailed out in the event of a crisis (Molyneux, 2017 [20]). Moreover, bank size and capitalization are factors that modify the relationship between competition and stability

(Tabak, Fazio and Cajueiro, 2012 [25]). Basel fosters less competitive dynamics among large banks, benefiting them as they exploit regulatory barriers to maintain dominance and invest in technologies to cope with regulatory burdens.

The remainder of this paper is organized as follows: Part One provides a brief overview of the UK banking system; Part Two and Part Three present the empirical analysis.

2. Theoretical Background

The UK Banking System

The UK banking system operates within a market-based financial framework. In the UK, the securities market plays a prominent role in financing decisions, with a significant portion of transactions conducted through markets rather than traditional banking channels. This evolution aligns with the UK's deepening financial sector, reflecting a shift towards market-based systems as the economy develops. However, this does not diminish the importance of the banking sector, which is widely recognized as one of the largest and most profitable in the world. It encompasses a diverse range of financial institutions, including major retail banks, investment banks, and building societies. With its extensive global presence, robust regulatory framework, and innovative financial services, the UK banking sector consistently generates substantial profits and contributes significantly to the country's economy. Historically, the UK banking system has experienced significant structural changes driven by regulatory and economic factors. What was once a fragmented landscape, where each financial institution was limited to specific activities, has evolved into a more consolidated structure based on the universal banking model (Davies and Richardson, 2010 [26]). This shift has led to a highly concentrated banking structure dominated by a few major players, which now offer a diverse range of services beyond traditional banking activities. The move towards universal banking has been driven by the quest for new revenue sources, resulting in a higher proportion of non-interest income in banks' earnings (Gola and Roselli, 2009 [27]; Davies and Richardson, 2010 [26]). Additionally, the UK banking system has become increasingly internationalized, with a significant presence of foreign banks and operations conducted abroad, particularly in London, a global financial hub. Over the past few decades, the UK banking sector has experienced significant growth, with its size expanding substantially relative to other sectors of the economy. This growth underscores the sector's pivotal role, with total assets now far exceeding the country's GDP, highlighting the substantial influence of banks within the UK economy (Bush, Knott, and Peacock, 2014 [28]). The UK banking system emphasizes profit-making activities and operates within globally interconnected financial markets, indicating a risk-taking orientation. This inclination is further highlighted by examining the ownership structure and function of the banking systems in the UK. With predominantly private ownership, the UK banking system is geared towards profit-oriented objectives, fostering competition and driving towards a concentrated universal banking model. This transition towards profit-driven activities, alongside endeavors to explore new revenue streams and diversify risks, underscores the UK banking system's inherent risk-taking nature. In essence, the UK system operates with a profit-driven mindset, shaping distinct approaches to risk management and financial operations. The UK banking system's profit-oriented focus, evident in its global market presence and private ownership, underscores its risk-taking orientation. This orientation is further accentuated by its pursuit of new revenue streams and risk diversification, shaping its distinct approach to risk management and financial operations (Gola and Roselli, 2009 [27]).

3. Data Description

The data utilized in this analysis are sourced from BankScope, a comprehensive database widely recognized for its extensive coverage of financial institutions worldwide. This study aims to isolate the distortions that Basel may have had on banking competition. For this reason, we analyze a period ranging from what can be defined as the first codified series of stability-oriented rules for banking and preceding the post-crisis regulations aimed

at correcting system distortions that have led to or exacerbated the effects of the financial crisis. For this reason, the period under scrutiny spans from 1989 to 2013. This timeframe provides a comprehensive view of the banking landscape, allowing for an in-depth analysis of trends, patterns, and developments over a significant historical span. By encompassing nearly two-and-a-half decades, the examination period enables a thorough exploration of long-term dynamics and the impact of various economic and regulatory factors on banking performance. Table 1 provides the list and description of the variables used in this study.

Table 1. List and description of variables.

Variable	Description
Revenues	In the P-R model the dependent variable is revenues, which indicates the total income and excludes non-interest revenues.
Personnel expense	The ratio of annual personal expenses total assets is used as an approximation of the wage rate. The variable indicates the cost of labour.
Physical capital expenditure	The ratio of other non-interest expenses to fixed assets, is used as a proxy for the price of physical capital expenditure. The variable indicates the funds used to buy physical assets.
Average funding rate	The ratio of interest expenses to total funding is a proxy for the average funding rate. The variable indicates the cost of fund.
Credit risk	The ratio of customer loans to total assets, indicates the credit risk. The variable represents the exposure of the bank to the counterparty’s risk.
Leverage	The ratio of equity two total assets accounts for the leverage. The variable indicates the corporate governance adopted by the bank.
Funding mix	The ratio of customer deposits to the sum of customer deposits and short-term funding. The variable indicates important features of the funding mix.
Basel	The total regulatory capital ratio. The variable represents the ratio of capital to risk-weighted asset.
Size	The total assets. The size is given by the amount of total assets held by the banking system in a economy.

From the descriptive statistics in Table 2, it appears that the sample under analysis is likely to consist of two distinct groups of firms. The results suggest the existence of a subsample of large banks across the UK sample, which constitutes a particular category of banks. These two groups of banks are likely to behave differently from each other, indicating clustering. By splitting the sample into ‘large banks’ and ‘other banks’, it appears that there is a small number of large banks that hold the largest portion of the total assets. Large banks appear to be more profitable than other banks. This is likely due to the more profitable activities in which large banks engage, activities that go beyond traditional lending. In addition, large banks face lower input factor prices than other banks. This is not surprising, as large banks exploit economies of scale. Finally, it is interesting to note that large banks retain a significantly lower amount of regulatory capital than other banks. This aligns with the aim of Basel II, which introduced internal models (IRB) for risk calculation, enabling banks to calculate regulatory capital based on their actual risk exposure.

Table 2. Descriptive statistics.

Size: Variable	UK Banks					
	All Banks		Large Banks		Other Banks	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
(log) Revenues _{it}	3.61	2.49	8.33	2.08	3.14	1.99
(log) Personnel expense _{it}	−4.49	1.46	−5.44	1.44	−4.38	1.42
(log) Physical capital expenditure _{it}	3.86	2.59	8.29	1.57	3.23	2.02
(log) Average funding rate _{it}	−3.49	1.24	−4.41	1.51	−3.39	1.17
(log) Credit risk _{it}	−1.35	1.42	−1.26	1.37	−1.35	1.43
(log) Leverage _{it}	4.07	1.10	3.83	1.02	4.09	1.10

Table 2. Cont.

Size: Variable	UK Banks					
	All Banks		Large Banks		Other Banks	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
(log) Funding mix _{it}	−0.56	1.12	−0.83	1.40	−0.54	1.09
(log) Basel _{it}	2.84	0.51	2.70	0.33	2.87	0.54
Size _{it}	55509	557458	688791	1914483	3474	7947
# of observations		6111		464		5647

4. Empirical Methodology

The hypothesis being explored suggests that UK banks adopt varying approaches to meet Basel requirements based on their size and business orientation. Large banks are more likely to adopt the internal-ratings-based models (IRBs) (Pérez Montes et al., 2018 [29]), which allows banks to calculate their credit-risk-based capital by using their internal assessment to determine the likelihood of the counterparty’s default. These models also enable banks to determine their regulatory capital based on their actual risk exposure. The main advantage of these models is that banks can save capital, which is likely to result in a lower amount of capital required compared to the Basel I rule. Therefore, our hypothesis is that large banks are less likely to be affected by the capital requirements imposed by the Basel Accords compared to other banks.

Specifically, it is proposed that the implementation of Basel regulations provides competitive advantages to large banks at the expense of other banks within the system. The model assumes that in a contestable market, entry to and exit from the market are facile, resulting in prices aligning with marginal costs. This study assesses the level of competition using the Panzar and Rosse statistic, which measures a firm’s market power by analyzing how changes in input prices influence revenue equilibrium (Panzar and Rosse, 1987 [30]). The statistic is the sum of the elasticities of the revenues to the input factor prices. In the following model:

$$\begin{aligned}
 (\log)\text{Revenues}_{it} = & \beta_1(\log)\text{Personnel expenses}_{it} + \beta_2(\log)\text{Physical capital expense}_{it} \\
 & + \beta_3(\log)\text{Average funding rate}_{it} + \beta_4(\log)\text{Credit risk}_{it} + \beta_5(\log)\text{leverage}_{it} \\
 & + \beta_6(\log)\text{Funding Mix}_{it} + \mu_i + \mu_t + \varepsilon_{it},
 \end{aligned} \tag{1}$$

where μ_i , μ_t , and ε_{it} are the individual effect, the time effect, and the random error term, respectively. The Panzar and Rosse statistics is calculated as the sum of the parameters β_1 , β_2 , and β_3 ; the degree of competition is calculated as

$$\beta_1 + \beta_2 + \beta_3 = 1 \rightarrow \text{Perfect Competition} \tag{2}$$

$$\beta_1 + \beta_2 + \beta_3 = 0 \rightarrow \text{Monopoly} \tag{3}$$

$$\beta_1 + \beta_2 + \beta_3 \in (0, 1) \rightarrow \text{Monopolistic Competition.} \tag{4}$$

The idea is that, in a perfectly competitive market, an increase in input prices results in proportional increases in both marginal costs and total revenues. Conversely, in a monopoly scenario, an increase in input prices leads to higher marginal costs, reduced equilibrium output, and consequently lower total revenues. The model is based on the revenues function of individual firms, in its reduced form, by focusing solely on input factor prices, rather than employing a more complex structural model (Bikker and Bos, 2008 [4]). The dependent variable is the bank’s output, commonly measured as the ratio of total interest revenue to total assets. Key independent variables include unit prices of input factors, such as the ratio of annual interest expenses to total funds (average funding rate), the ratio of personnel expenses to the total balance sheet (personnel expenses price), the ratio of personnel expenses to the number of employees, and the ratio of physical capital expenditure and other expenses to fixed assets (capital expenditure price). Consistent with the literature, the estimating model incorporates various bank-specific factors as control

variables, including balance-sheet ratios reflecting bank behavior and risk profiles: the ratio of customer loans to total assets (indicative of credit risk), the ratio of customer deposits to short-term funding (which captures key features of the funding mix), and the ratio of equity to total assets (serving as a proxy for leverage). This set of control variables is crucial, especially when comparing the estimated parameters of the Panzar and Rosse statistic between the subset of large banks and other banks. In particular, the presence of a proxy for credit risk controls the estimated parameters to account for systematic differences between the two subsamples in terms of risk levels, which are likely to be higher for the subset of large banks. On the other hand, the proxy for debt, leverage, controls the parameters for the likely higher debt levels in the subset of other banks. Finally, the proxy for funding mix controls the estimating model for differences in the business models that the two subsets of banks are likely to have.

The validity of the H statistic depends on the industry being in long-run equilibrium. Empirical evidence indicates that if the industry is not in long-run equilibrium, the H statistic tends to be biased towards zero (Goddard and Wilson, 2009 [31]). To address this issue, a two-step procedure is typically employed. Before assessing competition, it is necessary to test for equilibrium, ensuring that returns rates across banks are not correlated with input prices, as they would be in a competitive market. The explanatory variables for the equilibrium test regression mirror those used in the competition regression, but the dependent variable is now the logarithm of return on assets (ROA), which we take as a measure of profitability:

$$\begin{aligned}
 (\log)ROA_{it} = & \alpha_1(\log)Personnel\ expenses_{it} + \alpha_2(\log)Physical\ capital\ expense_{it} \\
 & + \alpha_3(\log)Average\ funding\ rate_{it} + \alpha_4(\log)Credit\ risk_{it} + \alpha_5(\log)leverage_{it} \\
 & + \alpha_6(\log)Funding\ Mix_{it} + \tau_i + \tau_t + \omega_{it}
 \end{aligned} \tag{5}$$

The assertion is that equilibrium is maintained if the hypothesis $\alpha_1 + \alpha_2 + \alpha_3 = 0$ is not rejected. Equation (1) aids in testing the hypothesis under consideration. Moreover, it facilitates the expansion of the model to examine the direct influence of the Basel framework on revenues. For this purpose, consider the following model, where we enhance the set of predictors by incorporating the (logarithm of) capital requirements:

$$\begin{aligned}
 (\log)Revenues_{it} = & \beta_1(\log)Personnel\ expenses_{it} + \beta_2(\log)Physical\ capital\ expense_{it} \\
 & + \beta_3(\log)Average\ funding\ rate_{it} \\
 & + \beta_4(\log)Credit\ risk_{it} + \beta_5(\log)leverage_{it} + \beta_6(\log)Funding\ Mix_{it} + \beta_7(\log)Basel_{it} + \mu_i + \mu_t \\
 & + \varepsilon_{it}.
 \end{aligned} \tag{6}$$

The idea is that since Basel is an additional cost to banks (Baker and Wurgler, 2015 [20]), it may act as barriers to entry in the market. Moreover, the cost imposed by Basel is not independent of the bank’s size. Since large banks are more likely to adopt the IRB models, they are less likely to be impacted by the burdens on capital requirements imposed by Basel. The more banks can lower these costs, the higher the opportunity they have to consolidate monopoly positions.

Based on the previous considerations, we propose to augment the PR test as follows:

$$\beta_1 + \beta_2 + \beta_3 + \beta_7 = 1 \rightarrow \text{Perfect Competition} \tag{7}$$

$$\beta_1 + \beta_2 + \beta_3 + \beta_7 = 0 \rightarrow \text{Monopoly} \tag{8}$$

$$\beta_1 + \beta_2 + \beta_3 + \beta_7 \in (0, 1) \rightarrow \text{Monopolistic Competition} \tag{9}$$

5. Empirical Results

The outcomes pertaining to the UK banking sector are presented in Table 3. All models are estimated using a two-way fixed-effect model, and standard deviations are robust to autocorrelation and heteroscedasticity. In Column (1), the analysis related to the equilibrium test is reported. The null hypothesis of joint significance of the parameters of interest is rejected at the 99% confidence level, providing evidence in support of the

long-run equilibrium hypothesis. Columns (2) and (3) present the results for the basic contestability analysis. The findings in Column (2) indicate that the contestability parameter value is 0.583. Both the hypotheses of monopoly and perfect competition are rejected at the 1% significance level, suggesting that the UK banking sector is best characterized by monopolistic competition, consistently with previous studies on competition in the UK (Molyneux, Lloyd-Williams, and Thornton, 1994 [32]) and on the impact of financial deregulation on competition in the UK (Matthews, Murinde, and Zhao, 2007 [33]). When expanding the set of regressors to include the (log of) the Basel variable, the PR coefficient is 0.732. The testing procedure results indicate that monopoly and competition are still rejected, with the latter at the 5% confidence level, consistent with the hypothesis that the Basel variable enhances the degree of competition in the UK. As expected, the Basel variable exhibits a notably strong negative impact on revenues. Results differ if the analysis considers the subsample of large and other banks. In Table 4, Columns (1) and (2) report results for large banks; Columns (4) and (5) report the analysis for the remaining banks. The impact of the Basel variable upon revenues has a very low impact on the subsample of large banks; on the contrary, other banks have a much stronger impact. The analysis indicates that the introduction of the Basel variable slightly diminishes the level of competition, as evidenced by the H statistic decreasing from 0.972 to 0.894. However, this change does not significantly alter the behavior of large banks, as they continue to operate within a competitive framework. As for the other banks, they operate within a monopolistic competition framework. Unlike for large banks, for other banks, the introduction of the Basel variable improves the competition dynamics, with the H statistic increasing from 0.537 to 0.609. Overall, the introduction of Basel results in a divergence in the values of the H statistics for large banks, shifting towards monopoly, while other banks move towards competition instead.

Table 3. Panzar and rosse analysis full sample.

Model:		(1)	(2)	(3)
Dependent Variable:		(log) ROA _{it}	(log) Revenues _{it}	
(log) Personnel expense _{it}		0.300 ** (0.125)	−0.404 *** (0.102)	−0.643 *** (0.120)
(log) Physical capital expenditure _{it}		−0.237 * (0.139)	0.582 *** (0.073)	0.701 *** (0.110)
(log) Average funding rate _{it}		0.056 (0.073)	0.405 *** (0.076)	0.673 *** (0.075)
(log) Basel _{it}				−0.451 *** (0.136)
R ²		0.163	0.943	0.935
Panzar and Rosse analysis.	Coefficient:	0.119	0.583	0.732
	$\alpha_1 + \alpha_2 + \alpha_3 = 0$	0.430 (0.512)		
Equilibrium test				
	$\beta_1 + \beta_2 + \beta_3 = 0$		27.53 *** (0.000)	48.460 *** (0.000)
Monopoly				
	$\beta_1 + \beta_2 + \beta_3 = 1$		14.08 *** (0.000)	6.520 ** (0.014)
Competition				

***, (**), [*] stands for statistical significance at 1% (5%) [10%] level.

Table 4. Panzar and rosse analysis by size.

Model:	(1)	(2)	(3)	(4)
Sample:	Large Banks		Other Banks	
(log) Personnel expense _{it}	−0.625 *** (0.061)	−0.576 *** (0.075)	−0.403 *** (0.118)	−0.656 *** (0.129)
(log) Physical capital expenditure _{it}	1.091 *** (0.090)	1.134 *** (0.101)	0.541 *** (0.083)	0.517 *** (0.079)
(log) Average funding rate _{it}	0.506 *** (0.081)	0.336 *** (0.065)	0.399 *** (0.076)	0.748 *** (0.082)
(log) Basel _{it}		−0.147 * (0.070)		−0.503 *** (0.146)
R ²	0.958	0.969	0.889	0.782
Panzar and Rosse analysis:	0.972	0.894	0.537	0.609
Monopoly $\beta_1 + \beta_2 + \beta_3 = 0$	163.5 *** (0.000)	206.0 *** (0.000)	16.16 *** (0.000)	25.04 *** (0.000)
Competition $\beta_1 + \beta_2 + \beta_3 = 1$	0.140 (0.714)	2.900 (0.107)	12.04 *** (0.000)	10.320 ** (0.000)

***, (**), [*] stands for statistical significance at 1% (5%) [10%] level.

6. Concluding Remarks

This paper investigates the impact of Basel regulations on competition within the UK banking sector, considering the potential variations based on bank size. The Basel Accords, aimed at enhancing financial stability, introduce regulatory provisions that may inadvertently affect competition dynamics within the banking industry. The empirical analysis reveals that the implementation of Basel regulations leads to divergent outcomes for different segments of the banking sector. Specifically, it creates a divide between large banks, which tend to move towards a monopoly, and other banks, which shift towards a more competitive environment. While large banks benefit from regulatory barriers and technological advancements, smaller banks face challenges due to increased compliance costs. The findings of this study extend beyond the scope of the economy under study, as they have implications for financial stability. Policymakers may need to review existing regulations to assess whether they disproportionately benefit larger banks or impose undue burdens on smaller banks. Reforming regulations to promote a level playing field can help smaller banks compete more effectively. These findings underscore the complex interplay between regulation and competition within the banking sector and highlight the importance of crafting regulations that balance stability objectives with fostering healthy competition. From the above, an important caveat suitable for further research arises: in the long term, this structure can transform into an oligopoly (Vavoura, 2022 [34]), especially if the number of large banks decreases and banks do not differentiate their products. Moreover, it is important to highlight that the Panzar and Rosse model assumes that the number of banks remains constant across the sample period. This hypothesis is somewhat strong, given that we know banks enter and exit this market. Moreover, consolidation processes may occur via takeovers or IPOs. Understanding these dynamics is crucial for comprehending the role of the Basel Accords in competition. We defer this important question to further research.

Funding: This research received no external funding.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Dow, S.C. Why the Banking System Should be regulated? *Econ. J.* **1996**, *106*, 698–707. [[CrossRef](#)]
2. Basel Committee on Banking Supervision. History of the Basel Committee. 2014. Available online: <http://www.bis.org/bcbs/history.pdf> (accessed on 4 April 2024).
3. Lastra, R.M. *Legal Foundations of International Monetary Stability*; Oxford University Press: Oxford, UK, 2006; pp. 34–106.
4. Bikker, J.A.; Bos, J.W.B. *Bank Performance: A Theoretical and Empirical Framework for the Analysis of Profitability, Competition and Efficiency*. *Routledge International Studies in Money and Banking*; Routledge: Oxfordshire, UK, 2009.
5. Angelini, P.; Cetorelli, N. Effect of Regulatory Reform on Competition in the Banking Industry. *J. Money Credit Bank.* **2003**, *35*, 663–684. [[CrossRef](#)]
6. Barth, J.R.; Caprio, G.; Levine, R. The Regulation and Supervision of Banks around the World: A New Database. In *Integrating Emerging Market Countries into the Global Financial System*; Litan, R.E., Herring, R., Eds.; Brookings-Wharton Papers on Financial Services; Brookings Institution Press: Washington, DC, USA, 2001; pp. 183–241.
7. Claessens, S.; Leaven, L. What drives bank competition? Some international evidence. *J. Money Credit Bank.* **2004**, *36*, 563–583. [[CrossRef](#)]
8. Barth, J.R.; Caprio Jr, G.; Levine, R. Bank Regulation and Supervision: What Works Best? *J. Financ. Intermediation* **2004**, *13*, 205–248. [[CrossRef](#)]
9. Gudmundsson, R.; Ngoka-Kisinguh, K.; Odongo, M.T. *The Role of Capital Requirements on Bank Competition and Stability: The Case of the Kenyan Banking Industry*; KBA Centre for Research on Financial Markets and Policy Working Paper 05; Kenya Bankers Association (KBA): Nairobi, Kenya, 2013.
10. Beck, T.; Demirgüç-Kunt, A.; Levine, R. Bank Concentration, Competition, and Crises: First Results. *J. Bank. Financ.* **2006**, *30*, 1581–1603. [[CrossRef](#)]
11. Schaeck, K.; Cihak, M.; Wolfe, S. Are More Competitive Banking Systems More Stable? *J. Money Credit Bank.* **2007**, *41*, 711–734. [[CrossRef](#)]
12. OECD Competition Committee. *Competition, Concentration and Stability in the Banking Sector*; OECD: Paris, France, 2010.
13. Caggiano, G.; Calice, P.; Leonida, L. Early warning systems and banking crises in low-income countries: A multinomial logit approach. *J. Bank. Financ.* **2014**, *47*, 258–269. [[CrossRef](#)]
14. World Bank. The Role of the State in Promoting Bank Competition. In *Global Financial Development Report*; World Bank: Washington, DC, USA, 2013; pp. 81–100.
15. Financial Services Authority. *The Turner Review: A Regulatory Response to the Global Banking Crisis*; Financial Services Authority: London, UK, 2009.
16. Lastra, R.M.; Wood, G. The crisis of 2007–2009: Nature, Causes, and Reactions. In *International Law in Financial Regulation and Monetary Affairs*; Cottier, T., Jackson, J.H., Lastra, R.M., Eds.; Oxford University Press: Oxford, UK, 2010; pp. 9–27.
17. Davis, S.I. *Risk, Regulation and Profitability: Reconciling Banking's Key Strategic Challenges*; Searching Finance, Ltd.: Dallas, TX, USA, 2011; pp. 7–12.
18. Jomini, P. Effects of Inappropriate Financial Regulation. *Eur. Cent. Int. Political Econ.* **2011**, *17*, 1–17.
19. Acharya, V.; Schnabl, P.; Suarez, G. Securitization without Risk Transfer. *J. Financ. Econ.* **2013**, *107*, 515–536. [[CrossRef](#)]
20. Molyneux, P. Are banks public utilities? Evidence from Europe. *J. Econ. Policy Reform* **2017**, *20*, 199–213. [[CrossRef](#)]
21. Beck, T.; De Jonghe, O.; Schepens, G. Bank Competition and Stability: Cross-country Heterogeneity. *J. Financ. Intermed.* **2013**, *22*, 218–244. [[CrossRef](#)]
22. Baker, M.; Wurgler, J. Do Strict Capital Requirements Raise the Cost of Capital? Banking Regulation and the Low-Risk Anomaly. *Am. Econ. Rev.* **2015**, *105*, 315–320. [[CrossRef](#)]
23. Levine, R. Bank-Based or Market-Based Financial Systems: Which Is Better? *J. Financ. Intermediation* **2002**, *11*, 398–428. [[CrossRef](#)]
24. Beck, T.; Demirgüç-Kunt, A.; Maksimovic, V. Financial and legal constraints to growth: Does firm size matter? *J. Financ.* **2005**, *18*, 445–459. [[CrossRef](#)]
25. Tabak, B.M.; Fazio, D.M.; Cajueiro, D.O. The relationship between banking market competition and risk-taking: Do size and capitalization matter? *J. Bank. Financ.* **2012**, *36*, 3366–3381. [[CrossRef](#)]
26. Davies, R.; Richardson, P. Evolution of the UK Banking System. *Bank Engl. Q. Bull.* **Q4 2010**, *Q4*, 321–332.
27. Gola, C.; Roselli, A. The UK Banking System and Its Regulatory and Supervisory Framework. In *Palgrave Macmillan Studies in Banking and Financial Institutions*; Molyneux, P., Ed.; Springer: Berlin/Heidelberg, Germany, 2009.
28. Bush, O.; Knott, S.; Peacock, C. Why is the UK banking system so big and is that a problem? *Bank Engl. Q. Bull.* **Q4 2014**, *Q4*, 385–395.
29. Pérez Montes, C.; Trucharte Artigas, C.; Cristófoli, M.E.; Lavín San Segundo, N. The impact of the IRB approach on the risk weights of European banks. *J. Financ. Stab.* **2018**, *39*, 147–166. [[CrossRef](#)]
30. Panzar, J.C.; Rosse, J.N. Testing For 'Monopoly' Equilibrium. *J. Ind. Econ.* **1987**, *35*, 443–456. [[CrossRef](#)]
31. Goddard, J.; Wilson, J. Competition in Banking: A disequilibrium Approach. *J. Bank. Financ.* **2009**, *33*, 2282–2292. [[CrossRef](#)]
32. Molyneux, P.; Lloyd-Williams, D.M.; Thornton, J. Competitive conditions in European Banking. *J. Bank. Financ.* **1994**, *18*, 445–459. [[CrossRef](#)]

-
33. Matthews, K.; Murinde, V.; Zhao, T. Competitive conditions among the major British banks. *J. Bank. Financ.* **2007**, *31*, 2025–2042. [[CrossRef](#)]
 34. Vavoura, C. How Trade Dampens the Impact of Financial Frictions in the Presence of Large Firms. *Economies* **2022**, *10*, 266. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.