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LINKING BANK COMPETITION, FINANCIAL STABILITY, AND ECONOMIC GROWTH◆

Shahzad IJAZ[1*], Arshad HASSAN[2], Amine TARAZI[3], Ahmad FRAZ[4]

[1, 2, 4]*Capital University of Science & Technology, Islamabad, Pakistan*
[3]*Laboratoire d'Analyse et de Prospective Economiques, Université de Limoges, Limoges, France*

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Abstract. This paper investigates the effect of bank competition and financial stability on economic growth by examining panel-data from 38 European countries over 2001 to 2017. Bank competition is measured with the Boone indicator, and bank stability with Z-scores and non-performing loan ratio, all at the country level. This study employs a fixed-effect estimator, as well as a system generalized method of moment (GMM) estimator to control unobserved heterogeneity, endogeneity, the dynamic effect of economic growth, and reverse causality in its estimation. Results show that bank stability significantly contributes to economic growth in Europe. Economic growth falls during crisis periods (both the global financial crisis and the local banking crisis), highlighting the importance of a resilient banking system during crisis periods. Moreover, empirical outcomes show that lower banking competition supports economic growth and increases financial stability. This study provides a framework for banks and regulators to boost economic growth through the channel of banking stability.

Keywords: bank stability, bank competition, economic growth, system GMM, global financial crisis, local banking crisis, bank Z-score, non-performing loans, channeling effect.

JEL Classification: G21, G28, O52.

Introduction

The financial markets play a vibrant role in economic activities (Schumpeter, 1912). In particular, a wide range of research in recent years analyzes the character of financial markets in the context of economic activity, enriching early empirical work such as Gurley and Shaw (1955) and McKinnon (1973). Notable among these findings is that a stable financial sector is one of five key components affecting economic growth; the other four are inequality, structural

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*Corresponding author. E-mail: *ms.ijaaz@gmail.com*

transformation, underinvestment by government, and political motives (Stiglitz, 2016). This highlights how an unstable financial sector negatively affects sustainable economic growth (Owusu & Odhiambo, 2014).

Economic theory provides two opposite views on the link between bank competition and stability, i.e., "competition fragility hypothesis" and "competition stability hypothesis". Competition fragility view explains that when competition intensity increases, banks are not able to charge premium monopoly rents due to loss of market power (interest rate effect). This decreases the charter value of banks, making them more vulnerable in the time of crisis. Further, it exacerbates the risk-taking incentive for bank by investing in risky portfolios in search of high margins which reduces the stability of the banking system. Competition stability view is also explained by the bank moral hazard problem which occurs when too-big-to-fail banks receive state guarantees at the time of financial turmoil, in collusive market, in the form of bank bail-outs. It increases the risk-taking incentives for banks (Keeley, 1990). On the contrary, competition stability view postulates that borrower side of the relationship must be taken into consideration. Banks are can charge high interest rate in collusive market which increases the borrowing cost for entrepreneurs that triggers moral hazard problem. Entrepreneurial moral hazard provides the risk-taking incentives to borrowers to invest in to risky projects to pay increased interest payments which increase the default of loans. It creates a risk shifting effect and make the banking system unstable (Boyd & De Nicolo, 2005).

Further, Coccorese (2008) states that market power (which is linked to bank size and information asymmetries) has a positive impact on financial stability, which in turn positively affects economic growth. In the banking sector, competition is associated with capital allocation, access to finance, and economic growth. Competition drives companies to innovate, reduce product/services prices, and increase quality, which in turn increases choice and enhances growth (Amidu & Wilson, 2014; Rakshit & Bardhan, 2019). However, in a less competitive environment, borrowers are reluctant to borrow due to hold-up problems which, in turn, lowers the demand for loan financing. Also, in a less competitive environment, prices are usually higher and service quality is lower, which ultimately leads to lower demand and affects growth (Claessens, 2009). Similarly, one can justify the positive effects of bank competition on economic growth and financial stability (Fernandez et al., 2016). However, international evidence in this context is missing in the literature. Hence, this paper investigates how bank competition and financial stability affect economic growth. Any crisis in the banking sector also adversely affects economic growth, after all, as it affects the stability of the financial sector (Fernandez et al., 2013).

Several papers also study the relationship between financial development and economic growth in recent years (Craigwell et al., 2001; Al-Yousif, 2002; Levine, 2005; Wolde-Rufael, 2009; Ngare et al., 2014; Pradhan et al., 2019; Creel et al., 2015). Most conclude that development of the financial system positively affects economic growth. In contrast, researchers have given much less attention to how resilience and bank competition affect the economic growth, despite the fact that these characteristics can affect innovation, efficiency, and the quality of services offered in the economy. Additionally, more research is needed to elucidate that how the financial system affects economic growth, given that financial and economic theories suggest that the financial tasks executed by banking and non-banking firms play a

vital role in promoting economic growth (Levine, 2005; Cole et al., 2008; Moshirian & Wu, 2012; Pradhan et al., 2017).

Previous studies on the relationship between economic growth and bank competition show conflicting results. Conventional economic theories, for example, explain that market power provides an equilibrium between high interest rates and lower demand for financing (De Guevara et al., 2005). Any inefficient monopoly causes fewer investment projects to be financed, which in turns lowers economic growth, when economic agents have perfect information. Accordingly, banks with market power will lower the incentives for customers who are interested in investing in sectors that need loans; this, in turn, reduces economic growth (De Guevara & Maudos, 2011). On the other hand, increase in market power leads to higher financing costs. Therefore, due to imperfect or asymmetric information, market power may incentivize banks to nurture relationships with their customers (relationship lending), which increases credit availability, reduces financial limits, and contributes to economic growth (Dell'Ariccia et al., 1999; Fernandez et al., 2016).

The theory of industrial organization, for instance, shows that market structure indicators alone (such as the Herfindahl index or other concentration indexes, and the number of institutions) cannot measure competition (Coccorese, 2008; Fernandez et al., 2016). Studying the effective competition requires non-structural models but, to date, most growth related research does not study banking competition using any specific non-structural model. Therefore, the results of those studies regarding the impact of market structure on the performance of the banking system, firm financing, and growth could reflect factors other than banking competition.

The economic and banking literature has yet to examine empirically how bank competition and stability shape economic growth, especially in a crisis period. Along with the direct effect that bank competition and stability have on economic growth, this study investigates the indirect effect that competition has on economic growth. We believe that such an analysis of banking competition, financial stability, and economic growth has significant policy implications for bank regulators and governments, which motivates us to investigate this nexus. More specifically, this study shows how competition affects economic growth by influencing the stability of the banking sector.

This study also contributes to the global economic and banking literature in the following ways. First, economic literature pays little attention to the role of structure in the banking market, and also mixed evidence is found in the research literature. So, this study adds to this end by directly analyzing the effect of bank competition on economic growth. Second, rather using a market structure measure based on industrial organization, such as the Herfindahl index or concentration ratios, this study uses a non-structural measure of competition in banking, i.e., the Boone indicator, which is a stronger proxy of bank competition (Van-Leuvensteijn et al., 2011). Next, this study uses various specifications of econometric models to increase confidence in the results. It estimates the results with a fixed-effect estimator to control for cross-sectional heterogeneity and a system generalized method of moment estimator to control the problem of endogeneity. This study also estimates the econometric model in static as well as dynamic specifications. In addition, this study uses country level bank stability measures rather using bank level measures as in Fernandez et al. (2016) and believes that use of country level measures is more appropriate as this study analyzes the link between

country level competition in banking and economic growth. Last, using an interactive term, this study focuses on how financial crises are associated with economic growth and to what extent stable banking sector supports during crisis. As a further contribution, this study estimates the indirect effect of bank competition on economic growth due to stable banking sector which is not studied in the extant literature, to our best knowledge, so this study fills this gap. The empirical outcomes of this study are useful for policy-makers because banking system plays a key role in allocation of resources and ultimately enhances economic growth.

This study is structured as follows. Section 1 briefly reviews the related literature. Section 2 presents the details of data, variables, and methodology. Section 3 presents results and discussions. The conclusion and policy implications are presented at the end.

1. Related literature and research focus

In the banking literature, measurement of competition is debatable. Boone (2008), for example, is the most recent approach; that study bank competition using a straightforward measure of firm competitive behavior called the Boone indicator. It measures the performance of the firms in terms of profits as a result of firm efficiency, and it captures the association of elasticity of profits to marginal costs (*MC)*. Elasticity is the coefficient of the log of *MC*, which is typically the first derivative of a translog cost function, and is obtained when we regress the log of profit on the log of *MC*. The Boone indicator reveals which banks are more efficient and therefore more profitable. Negative values of the Boone indicator suggest that a higher level of competition exists among banks in the market. High competition consequently allows only efficient banks to earn more profits whereas inefficient banks may not be able to gain such profits. In this way, the Boone indicator captures the reallocation of market share from inefficient to efficient firms. Accordingly, this study uses the Boone indicator to capture the competition of the banking sector and find support for the channel of bank stability through which competition affects economic growth even during crisis periods.

In literature, link between bank competition and economic growth is explained in the context of bank-firm relationship. On the one hand, "perfect information hypothesis" affirms that lower competition leads to high interest rates in concentrated market, when perfect information is available to all agents, which reduces the financial intermediation activity, the lending channel, and in turn reduces the economic growth (implying positive relationship). On the other hand, "asymmetric information hypothesis" postulates that banks in collusive markets can reduce information asymmetries by relationship lending as higher costs are associated with information acquisition. This eliminates financing constraints, spurs loan growth, and increase access to finance which in turn boosts economic growth (implying negative relationship).

According to Caggiano and Calice (2016), competition among banks affects economic growth in two ways: First, banking competition facilitates access to credit for small and new firms, which is important for economic growth. Second, companies dependent on external financing to run their operations are associated with slow patterns of economic growth; an increase in market power may hasten that economic growth (Hamada et al., 2018; Diallo & Koch, 2018; Mitchener & Wheelock, 2013). Claessens (2009) states that banking competi-

tion increases the quality of financial services and market innovation. It also reports that banking competition draws organizations and households toward banking products, which contributes to the growth of the overall economy.

Claessens and Laeven (2005) and Cetorelli and Gambera (2001) study the relationship between bank competition and economic growth. The latter studies bank competition and concentration measures for economic growth in a sample of 41 economies. They find that concentration has a negative overall effect on economic growth that affects all industries. Classens and Laeven (2005) initially estimate bank competition in 16 countries using an industrial organization-based measure of banking sector competition. When they relate industrial growth to competition, they find that greater competition in banking systems allows financially dependent industries to grow faster.

De Guevara and Maudos (2011) analyze how bank competition effects economic growth using both structural measures of competition and measures based on the new empirical industrial organization in a sample of 21 countries. Results show that financial development promotes economic growth. Soedarmono et al. (2011) study the relationship between bank competition and financial stability, as well as how economic growth influences the link between market power and financial stability in Asia. The empirical results show that higher economic growth encourages banks in less competitive markets to enhance their stability. By analyzing the economic impact, the authors find that the banking industry's monopolistic structure benefits the economy as a whole because it contributes to the industry's stability (Schnitzer, 1999; Albaity et al., 2019).

Financial stability helps stakeholders manage their risks promptly and enables them to use their financial resources efficiently, which ultimately increases economic growth (Hoggarth et al., 2002; Jokipii & Monnin, 2013; Creel et al., 2015). In addition, some researchers argue that financial stability and economic growth reinforce each other. Countries facing economic decline, notably, have hindered banking operations and business activities. For such countries, it is difficult to get foreign financing, which lowers GDP growth and credit. Therefore, in this context, it is quite obvious that economic growth promotes financial stability (DellAriccia et al., 2008; Wang et al., 2019; Cave et al., 2019). Considering this view, this study regresses economic growth on lag value of bank stability using a fixed-effect estimator to tackle reverse causality. However, in GMM estimation this study uses current period realizations of bank stability because it already uses lags of endogenous variables in instrument matrix to tackle endogeneity caused by reverse causality.

2. Data, variables, and methodology

This study examines the link between bank stability, competition, and economic growth in a sample of 38 European countries over 2001 to 2017.[1] The macroeconomic data is from

[1] The sample includes Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Macedonia FYR, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, and the United Kingdom. We exclude Andorra, Holy See, Liechtenstein, Monaco, Montenegro, and San Marino from sample due to data problems.

World Development Indicators published by the World Bank. Bank competition and stability measures are from Bankscope, Orbis Bank Focus and the Global Financial Development Database.

This study uses two measures of economic growth (*ECG*), two measures of bank stability (*BST*), and one measure of banking competition (*BNE*). In the economics literature, annual growth rate and per capita growth rate are widely used measures of economic growth. This study uses both measures for the robustness of the results. The economic growth measures are annual GDP growth rate (*AGR*) and annual GDP per capita growth rate (*CGR*). The bank stability measures are bank Z-score (*BZS*), which is the distance to default for a bank in standard deviations, and the ratio of non-performing loans to gross loans (*NPR*). The measure of bank competition is the Boone indicator, which measures bank competition in relation to marginal costs. Economic growth is measured at the country level. Hence, both stability measures are transformed to the country level by taking the weighted average; and weights are based on asset size of banks in each country. Appendix A provides definitions of the variables and data sources. The following equation estimates the effect of bank stability on economic growth.

$$ECG_{i,t} = \alpha_i + \beta \cdot BST_{i,t-1} + \gamma_1 \cdot TPN_{i,t} + \gamma_2 \cdot LFF + \gamma_3 \cdot GEX_{i,t} + \gamma_4 \cdot EAL_{i,t} + \varepsilon_i + \mu_{i.t}. \quad (1)$$

In Eq. (1), *ECG* represents the two proxies of economic growth: annual GDP growth rate (*AGR*) and annual GDP per capita growth rate (*CGR*); α is the country fixed effect and β is the main coefficient of interest in this study. *BST* represents the two proxies of bank stability: bank Z-score (*BZS*) and the non-performing loan ratio (*NPR*). Four control variables are adopted from prior literature (Cole et al., 2008; Ngare et al., 2014; Creel et al., 2015). They include trade openness (*TPN*), which is the ratio of imports and exports to GDP, the log of gross fixed capital formation (*LFF*), the log of government expenditures (*GXP*), and financial integration, which is the log of external assets and liabilities (*EXT*). Also, ε measures unobserved heterogeneity, and μ is the random error term. Subscripts *i* and *t* index the country and time, respectively. Eq. (2) investigates the relationship between economic growth (*ECG*) and banking competition (*BNE*) by replacing the bank stability variable with competition in Eq. (1).

$$ECG_{i,t} = \alpha_i + \beta \cdot BNE_{i,t} + \gamma_1 \cdot TPN_{i,t} + \gamma_2 \cdot LFF + \gamma_3 \cdot GEX_{i,t} + \gamma_4 \cdot EAL_{i,t} + \varepsilon_i + \mu_{i,t}. \quad (2)$$

3. Results

This section reports the results of the study. First, it presents the descriptive statistics of the main study variables in Table 1. Then sub-sections 3.1 to 3.5 report the regression results. In the descriptive statistics results, the highest *NPR* is in Malta (21.65%), Serbia (18.21%), and Ukraine (16.97%); the lowest *NPR* is in Finland (0.48%), Luxembourg (0.34%), and Sweden (0.98%). For bank Z-score, Luxembourg (28.38%), Austria (20.82%), and Spain (19.42%) have the most stable banking systems, whereas Belarus (3.92%), Slovenia (2.52%), and Iceland (1.43%) have the lowest bank stability scores. For competition, Luxembourg (–8.58), Macedonia FYR (–5.01), and Belarus (–1.57) have the most competitive banking systems,

whereas Netherlands (0.12), Norway (0.07), and Finland (0.03) have the lowest Boone indicators. For economic growth, Azerbaijan, Armenia, and Georgia have the highest annual GDP growth rates and per capita GDP growth rates (10.95%, 6.93%, and 5.61%; 9.65%, 7.33%, and 6.81%, respectively) whereas Greece, Italy, and Portugal have the lowest annual GDP growth rates and per capita GDP growth rates (1.09%, 0.92%, and 0.44%; 0.20%, 0.12%, and 0.35%, respectively). We also perform a normality test (Jarque-Bera test, J-B for short) on this data set. A high J-B test value rejects the null hypothesis of normal distribution for study variables at the 5% significance level. However, this does not affect the results, as this study uses a system-GMM estimator to estimate the results.

Table 1. Descriptive statistics: Country-level information for main variables

Country	BNE		BZS		NPR%		AGR%		CGR%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Armenia	–0.13	0.02	10.98	3.22	6.36	5.06	6.93	7.15	7.33	7.81
Austria	–0.02	0.01	20.82	5.42	3.13	0.60	1.62	1.83	1.05	2.46
Azerbaijan	–0.08	0.03	8.60	2.32	5.71	1.43	10.95	10.27	9.65	10.03
Belarus	–1.57	0.46	3.92	1.78	5.75	4.49	6.01	4.79	6.61	4.98
Belgium	–0.04	0.02	11.01	3.67	2.96	0.96	2.23	2.06	0.99	2.18
Bosnia and Herzegovina	–0.03	0.01	15.82	3.34	10.14	5.06	3.80	3.94	4.35	3.13
Bulgaria	–0.05	0.10	8.56	2.29	8.83	7.20	4.55	3.81	5.00	4.19
Croatia	–0.10	0.03	5.21	1.69	10.31	4.11	2.59	3.75	2.38	4.51
Czech Republic	–0.12	0.06	12.75	2.94	7.48	7.12	3.79	3.59	3.61	3.42
Denmark	–0.10	0.03	17.58	3.31	2.79	2.17	1.37	2.55	1.46	2.49
Estonia	–0.16	0.07	6.99	2.23	1.87	2.44	4.09	6.93	4.80	7.39
Finland	0.03	0.18	12.68	5.46	0.48	1.11	1.71	4.15	1.51	4.04
France	–0.02	0.01	17.87	3.85	4.95	0.90	1.37	1.99	0.99	2.22
Georgia	–0.01	0.07	6.59	1.88	4.74	3.42	5.61	4.65	6.81	4.76
Germany	–0.04	0.01	16.94	4.37	4.21	1.39	1.98	3.29	2.27	3.12
Greece	–0.01	0.12	5.21	3.12	14.30	11.26	1.09	4.85	0.20	5.30
Hungary	–0.16	0.07	5.84	0.89	7.52	6.68	2.87	3.96	2.96	3.24
Iceland	–0.37	0.46	1.43	1.60	5.20	6.13	3.18	4.01	2.16	4.12
Ireland	–0.07	0.53	5.53	4.27	8.49	10.06	5.23	7.60	3.91	6.87
Italy	–0.03	0.04	14.20	4.85	9.93	5.05	0.92	3.14	0.12	2.77
Latvia	–0.23	0.06	6.23	1.42	6.22	6.17	4.08	6.76	5.41	7.13
Luxembourg	–8.58	58.33	28.38	6.60	0.34	0.35	3.20	3.90	1.56	3.56
Macedonia, FYR	–5.01	0.02	6.00	1.60	14.21	6.08	3.33	3.12	3.46	3.25
Moldova	–0.07	0.04	8.16	1.77	11.05	4.93	5.34	5.02	5.69	4.56
Malta	–0.06	0.04	7.47	2.98	21.65	13.71	2.31	3.47	1.23	4.05

End of Table 1

Country	BNE		BZS		NPR%		AGR%		CGR%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Netherlands	0.12	0.08	12.62	8.94	2.64	1.54	1.60	2.18	1.82	2.46
Norway	0.07	0.06	8.46	1.40	2.07	0.86	2.66	1.75	1.41	2.21
Poland	–0.10	0.04	7.81	2.31	10.22	6.82	3.73	2.25	4.79	1.79
Portugal	–0.59	0.56	10.90	3.50	5.51	4.30	0.44	2.69	0.35	2.05
Romania	–0.10	0.06	7.87	2.63	15.94	4.08	3.84	4.38	4.80	4.66
Serbia	–0.17	0.23	14.08	3.09	18.21	4.28	3.53	3.65	4.63	3.57
Slovak Republic	0.00	0.03	16.29	1.92	5.95	3.83	4.16	3.94	3.96	3.86
Slovenia	–0.57	0.00	2.52	1.22	7.82	5.02	2.83	4.00	2.82	3.80
Spain	–0.70	0.19	19.42	2.53	4.02	3.10	2.56	2.81	1.34	2.98
Sweden	–0.07	0.01	10.84	2.79	0.98	1.16	2.91	2.85	2.14	3.54
Switzerland	–0.07	0.01	11.74	3.73	1.44	1.64	2.39	1.93	1.02	2.07
Ukraine	–0.11	0.10	6.10	1.54	16.97	10.17	3.21	7.87	3.98	7.41
United Kingdom	–0.07	0.03	9.43	4.35	3.12	1.18	2.66	2.19	1.69	2.91

The table shows the mean and standard deviation of main variables. In this table, *NPR%* is the ratio of non-performing loans to gross loans and inversely measures bank stability. *BZS* or bank Z-score is the ratio of ROA/CAR to σROA and measures bank stability. *BNE* is the measure of bank competition proxied by the Boone indicator. *AGR%* and *CGR%* measures annual GDP growth and GDP per capita growth in percentage, respectively.

3.1. Bank stability, bank competition, and economic growth

Table 2 shows that (i) non-performing loans, bank Z-score, and competition economically and statistically influence economic growth; and (ii) these results are not due to unobserved heterogeneity. It reports the results of the fixed-effect estimator for the effect of non-performing loan (models 1 and 4), bank Z-score (models 2 and 5), and competition (models 3 and 6) on GDP growth rate (panel A) and per capita GDP growth (panel B). Control variables (i.e., trade openness, log of gross fixed capital formation, government expenditures, and external assets and liabilities) are included to avoid omitted variable bias. In models 1 and 2, this study regresses bank stability (*NPR*, *BZS*) on annual GDP growth. The coefficient associated with *NPR* is statistically significant at the 1% level and shows that low *NPR* is associated with high economic growth. Similar results occur when per capita GDP growth is used in column 4. The coefficient associated with Z-score is positive and statistically significant, implying that stability is positively associated with economic growth. The signs of coefficients for *NPR* (models 1 and 4) and *BZS* (models 2 and 4) are opposite because they are opposite measures to proxy banking stability. *NPR* is the inverse measure of bank stability, so the sign is negative, implying that bank instability hinders economic growth. *BZS* directly measures bank stability, so the sign is positive, implying that bank stability promotes economic growth.

Table 2. Bank stability, bank competition and economic growth

Variables	Panel A: Annual GDP Growth (*AGR*)			Panel B: GDP per Capita Growth (*CGR*)		
Model	(1)	(2)	(3)	(4)	(5)	(6)
NPR	–0.114***			–0.093***		
	(0.0181)			(0.0210)		
BZS		0.057**			0.051**	
		(0.0237)			(0.0195)	
BNE			2.934***			2.841***
			(0.773)			(0.7614)
TPN	0.029***	0.029***	0.027***	0.031***	0.030***	0.028***
	(0.0056)	(0.0054)	(0.0055)	(0.0056)	(0.0054)	(0.0055)
LFF	1.090***	1.745***	1.821***	0.882***	1.472***	1.554***
	(0.2928)	(0.2442)	(0.2462)	(0.2946)	(0.2446)	(0.2479)
GEX	–1.205***	–1.221***	–1.052***	–1.068***	–1.038***	–0.860***
	(0.3855)	(0.3376)	(0.3351)	(0.3879)	(0.3382)	(0.3375)
EXT	–1.372***	–1.280***	–1.773***	–1.629***	–1.477***	–1.980***
	(0.2688)	(0.2388)	(0.2414)	(0.2704)	(0.2392)	(0.2431)
Constant	–1.570	–8.997	–5.939	4.047	–10.914*	–9.803**
	(6.5228)	(5.5664)	(5.6479)	(6.5629)	(5.5756)	(4.6876)
Hausman Test	47.0960***	48.1261***	48.1488***	46.7879***	48.7718***	48.2479***
R-Squared Overall	0.4322	0.4004	0.4261	0.4206	0.3892	0.4157
F-Value	9.6343	8.6844	9.5498	9.1880	8.2882	9.1507
Sig.	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	38	38	38	38	38	38

The table shows the results of the fixed-effect estimator. *NPR* is the ratio of non-performing loans to gross loans and inversely measures bank stability. *BZS* or bank Z-score measures bank stability. *BNE* is the measure of bank competition proxied by the Boone indicator. *TPN* is trade openness, measured as the ratio of exports and imports to *GDP*; *LFF* is the natural log of gross fixed capital formation; *GEX* is the natural log of government expenditures, and *EXT* is the measure of financial integration. In models 1, 2, and 3, *NPR*, *BZS*, and *BNE* are regressed on *AGR*. In models 4, 5, and 6, *NPR*, *BZS*, and *BNE* are regressed on *CGR*, respectively. Standard errors are indicated in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Models 3 and 6 (in Table 2) regress the measure of bank competition (the Boone indicator) on annual GDP and GDP per capita growth. Lower competition is associated with higher economic growth, as the coefficient of the Boone indicator is statistically and economically significant at the 1% level. The significant values of the Hausman test, and F test imply correct use of the fixed-effect estimator and model fitness.

3.2. Bank stability, economic growth, and financial crisis

In Table 3, we include a crisis variable in the model and analyze the growth difference in the crisis period using a dummy variable for the global financial crisis (*GFC*) and local banking crisis (*LBC*). The interactive term of bank stability captures its effect during the crisis period. The effect of bank stability is still statistically and economically significant in all models. In

Table 3. Bank stability, economic growth, and crisis

Variables	Annual GDP Growth (*AGR*)							
	GFC		LBC		GFC		LBC	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NPR	–0.135***	–0.132***	–0.112***	–0.104***				
	(0.0183)	(0.0187)	(0.0185)	(0.0191)				
BZS					0.043***	0.037***	0.034***	0.031***
					(0.0140)	(0.0143)	(0.0112)	(0.0110)
TPN	0.040***	0.040***	0.039***	0.039***	0.040***	0.039***	0.038***	0.038***
	(0.0057)	(0.0057)	(0.0057)	(0.0057)	(0.0055)	(0.0055)	(0.0055)	(0.0055)
LFF	1.433***	1.462***	1.120***	1.120***	2.103***	2.116***	1.782***	1.729***
	(0.2934)	(0.2947)	(0.2900)	(0.2898)	(0.2392)	0.2392)	(0.2340)	(0.2341)
GEX	–1.998***	–1.999***	–1.690***	–1.663***	–1.947***	–1.969***	–1.794***	–1.767***
	(0.3952)	(0.3952)	(0.3906)	(0.3908)	(0.3418)	(0.3418)	(0.3372)	(0.3366)
EXT	–1.656***	–1.674***	–1.531***	–1.540***	–1.787***	–1.780***	–1.604***	–1.569***
	(0.2293)	(0.2300)	(0.2309)	(0.2309)	(0.2052)	(0.2051)	(0.2060)	(0.2058)
Crisis	–1.378***	–1.190***	–2.386***	–1.758***	–1.048***	–1.619***	–2.591***	–4.161***
	(0.2170)	(0.2831)	(0.3759)	(0.5336)	(0.2012)	(0.3665)	(0.3680)	(0.6188)
Crisis* NPR		–0.031		–0.076*				
		(0.0304)		(0.0458)				
Crisis* BZS						0.043*		0.142***
						(0.0229)		(0.0449)
Constant	–3.021	–3.506	1.207	1.137	–8.694***	–8.811***	–3.910*	–3.083
	(4.7593)	(4.7823)	(4.6906)	(4.6885)	(3.7578)	(3.7562)	(2.1549)	(2.1767)
Hausman Test	58.459***	58.590***	47.189***	48.361***	53.179***	54.038***	42.749***	40.707***
R-Squared Overall	0.333	0.334	0.333	0.334	0.303	0.304	0.310	0.314
F-Value	7.079	7.032	7.079	7.052	6.236	6.225	6.450	6.500
Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	38	38	38	38	38	38	38	38

This table shows the results for the fixed-effect estimator. *NPR*, *BZS*, and *Crisis* (both *GFC* and *LBC*) are regressors in both estimations. Odd-numbered models are estimated without an interactive term for crisis and bank stability; even-numbered models include the interaction term as an explanatory variable. Standard errors are shown in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

model 1, *GFC* is associated with lower economic growth, significant at the 1% level. However, its interaction term is negative but statistically insignificant (model 2). In model 3, *LBC* is associated with statistically significant low economic growth (at the 1% level), and economic growth is negatively associated with credit risk (model 4). Models 5 and 7 show the results with the Z-score measure. Lower economic growth occurs during *GFC* and *LBC*, significant at the 1% level. The effect of the Z-score measure on economic growth is statistically and economically significant for *GFC* and *LBC* at the 10% and 1% levels, respectively (models 6 and 8); this result is consistent with prior literature (Cole et al., 2008). The opposite signs for *NPR* in models 1 to 4 and for *BZS* in models 5 to 8 are consistent because both variables are inversely related. The sign of interaction term reveals that credit risk (bank stability) augments (counteracts) the negative effect of the crisis on economic growth during *GFC* and *LBC*. The likelihood ratio and Hausman test support the use of the fixed-effect estimator in all models. All models in Table 3 are significant at the 1% level. For a robustness check, this study estimates the results using per capita GDP growth rate as a dependent variable. All of the results remain economically significant except *NPR*, which becomes statistically insignificant for model 4.

3.3. Bank stability, competition, and economic growth using system-GMM

This study further uses the generalized method of moment (GMM) dynamic panel estimator to analyze the dynamic relationships among bank stability, competition, and economic outcome. Using an estimator developed by Arellano and Bond (1991) and Arellano and Bover (1995), we can estimate a model in two ways: system or difference. The difference estimator removes the country-specific effect while differencing. The error term of the differenced equation is correlated with the lagged dependent variable by construction. Arellano and Bond (1991) develop two-step estimators by using the exogeneity of regressors and a serially uncorrelated error term as the moment condition. The two-step GMM estimator is more efficient due to the assumption that the error term is homoskedastic and independent over time and cross-sections in the first step, and the error term is assumed to be independent. We relax these assumptions in the second step, in which the first-step error term is used to make the consistent estimates for the variance-covariance matrix. This study uses two-step system estimators from Blundell and Bond (1998) to get efficient and consistent approximations of parameters because the lagged values of regressors are weak instruments for the GMM equation in difference form and because difference equations may suffer from small sample bias.

The consistency of the Arellano and Bover (1995), and Blundell and Bond (1998) GMM estimators relates to a set of assumptions regarding error term. These assumptions posit that the error term is not serially correlated with instruments and therefore is valid for use in the instruments matrix. To test these assumptions, this study relies on a set of specification tests. The first test tests the null hypothesis that the error term does not exhibit serial correlation at the second order. First-order serial correlation may be present in differenced residuals due to the specification of the equations of GMM estimator, even if the original residuals are not. Therefore, this study seeks to avoid rejecting the null hypothesis for second-order serial correlation. The second test examines the presence of over-identification of the restrictions. The results indicate the holistic validity of the instruments together with moment conditions of

the GMM estimator. Roodman (2009) *xtabond2* can do the Windmeijer (2005) finite-sample correction to the reported standard errors. This study uses this procedure using the *robust* command in Stata to adjust standard errors that are severely downward biased in two-step estimation.

Table 4 reports the results of the Arrellano and Bond two-step system GMM estimator. This estimation uses current period values for the independent variables instead of lag values, as lagged regressors are already present in the instrument matrix. Models 1 and 2 show the results of the baseline regression for annual GDP growth. These models are estimated via non-performing loans ratio and bank Z-score, respectively, as well as with four control variables: trade openness, log of government expenditure, log of gross fixed capital formation, and external assets and liabilities excluding financial crisis. A lag-dependent variable is included in the model to capture the persistence of economic growth, which is significant at the 1% level. The economic effect of the lag term shows the persistence of growth. In model 3, economic growth is negatively associated with non-performing loans at the 1% level, implying that bank instability (insolvency risk) harms economic growth. The results are consistent with earlier studies (Tabak et al., 2012; Caggiano & Calice, 2016; Gaffeo & Mazzocchi, 2014; Claessens & Laeven, 2005). Further, economic growth falls by 2.8% on average during the crisis. Bank instability further augments this negative effect on annual GDP growth during the crisis period, as shown by the coefficient of the interaction term in model 4.

Table 4. Bank stability and economic growth using system-GMM

Variables	Without Interaction		NPR Interaction		BZS Interaction		Competition
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
AGR(–1)	0.565***	0.562***	0.584***	0.636***	0.308***	0.314**	0.166***
	(0.102)	(0.102)	(0.0909)	(0.166)	(0.0753)	(0.158)	(0.0540)
NPR	–2.195***		–2.155***	–2.146***			
	(0.546)		(0.486)	(0.621)			
BZS		2.147***			2.555***	3.090***	
		(0.546)			(0.666)	(0.789)	
BNE							6.76***
							(1.923)
TPN	0.416***	0.416***	0.412***	0.460***	0.394***	0.449***	0.00693
	(0.0875)	(0.0880)	(0.0763)	(0.146)	(0.0592)	(0.127)	(0.00575)
GEX	8.505	8.889	8.376	8.022	–10.88***	–15.24***	–0.878***
	(6.381)	(6.466)	(5.488)	(9.046)	(3.030)	(4.789)	(0.130)
LFF	–18.32***	–18.33***	–17.21***	–18.19**	2.628	1.863	1.334***
	(5.056)	(5.077)	(4.675)	(7.606)	(2.780)	(4.497)	(0.301)
EXT	3.825**	3.613*	3.134*	3.366	–2.195	–0.861	–1.131***
	(1.909)	(1.938)	(1.725)	(2.090)	(1.633)	(2.002)	(0.264)
GFC			–2.808	–2.384*	–3.449	–2.157**	–7.855***
			(2.429)	(1.317)	(3.191)	(0.874)	(1.143)

End of Table 4

Variables	Without Interaction		NPR Interaction		BZS Interaction		Competition
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GFC*NPR				–0.669***			
				(0.204)			
GFC*BZS						0.172*	
						(0.105)	
AR (2) (p-Value)	0.59 0.555	0.71 0.479	0.56 0.575	0.56 0.573	0.57 0.566	0.76 0.444	0.52 0.536
Hansen (p-Value)	12.82 0.462	13.38 0.419	14.62 0.263	10.31 0.503	12.38 0.439	16.90 0.261	13.45 0.445
Wald χ^2 (p-Value)	83.66 0.000	83.06 0.000	112.07 0.000	80.54 0.000	123.11 0.000	112.66 0.000	546.28 0.000
# of Instruments	30	32	31	29	30	29	31
GMM Style	2,2	2,2	2,2	2,2	2,2	2,2	2,2
IV Style	1–5	1–5	1–5	1–5	1–5	1–5	1–5

This table shows the results of the two-step system GMM estimator. In the estimation, *AGR* is a dependent variable in all models, and *GFC* is a dummy variable for the global financial crisis. *GFC*NPR* and *GFC*BZS* are interaction terms of financial crisis with non-performing loans and bank Z-score, respectively. Standard errors are in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Models 5 and 6 report the results for the Z-score measure of bank stability. The coefficients of bank Z-score in models 5 and 6 are statistically and economically significant at the 1% level, showing that higher economic growth is associated with higher bank stability. The coefficient of the interaction term in model 6 is consistent with models 6 and 8 in Table 3, showing that bank stability supports economic growth during the crisis. Finally, model 7 estimates the effect of competition on bank stability. The coefficient of competition is economically large and statistically significant, implying that a less competitive banking sector positively contributes to economic growth. These results are consistent with the literature (Pradhan et al., 2017; Jayakumar et al., 2018) and with intuition. The AR (2) test examines the null hypothesis that the error term in the first differenced equation is not second-order correlated. This study does not reject this hypothesis at the 10% level.

The Hansen test is the test of the joint validity of instruments; it examines the null hypothesis that instruments are not correlated with the error term. This study uses maximum two lags of independent variables as instruments. It is unable to reject the null hypothesis with the Hansen test at the 10% level in all models. Both statistics show that the results of the system-GMM estimator are reliable. The results in Table 4 were checked for robustness but are not reported in this paper. In the robustness check, we use per capita GDP growth as the dependent variable instead of annual GDP growth. Further, instead of a global financial crisis, we use a local banking crisis dummy variable. The equation uses the two-step system GMM estimator. Careful examination shows that the results do not suffer in these variations.

3.4. Impact of competition on bank stability

Table 5 shows the results using the two-step system GMM estimator and fixed-effect estimator for the competition and stability relationship, which enables us to control unobserved heterogeneity, endogeneity, and the dynamic relationship. The study estimates models 1 and 2 with the nonperforming loans ratio and bank Z-score as dependent variables. In model 3, the coefficient of lagged bank stability shows that bank risk is persistent at the 1% level. The coefficient of competition (the Boone indicator proxy) is negative, implying that lower

Table 5. Impact of competition on bank stability

Variables	FE Estimation		GMM Estimation	
	NPR	BZS	NPR	BZS
Model	(1)	(2)	(3)	(4)
BST(–1)			0.408***	0.414**
			(0.0753)	(0.158)
BNE	–8.752***	5.312***	–3.838***	4.828***
	(2.202)	(1.021)	(0.356)	(0.785)
TPN	–0.00708**	0.762***	0.650**	0.766**
	(0.00359)	(0.168)	(0.311)	(0.349)
GEX	0.459*	–0.832***	4.144	4.208
	(0.249)	(0.0777)	(2.987)	(2.943)
LFF	–0.439*	–0.103	–9.130***	–8.606***
	(0.238)	(0.0705)	(3.342)	(2.543)
EXT	0.0383	0.142*	3.490*	3.356*
	(0.165)	(0.0773)	(1.800)	(1.750)
Constant	2.46*	1.456**		
	(1.349)	(1.240)		
F-Stat [Wald χ^2] (*p*-Value)	435.67 0.000	372.54 0.000	[114.07] 0.000	[127.67] 0.000
R-Squared Overall Number of IDs	0.35 38	0.41 38		
Hansen Test (*p*-Value)			15.59 0.464	17.71 0.452
AR (2) Test (*p*-Value)			0.46 0.375	0.41 0.319
# of Instruments GMM Style IV Style			29 2.2 1–5	31 2.2 1–5

The table shows the results of the fixed-effect estimator. The ratio of non-performing loans to gross loans (*NPR*) (resp. bank Z-score (*BZS*)) is the dependent variable in model 1 (resp. model 2). *BNE* is the measure of bank competition proxied by the Boone indicator. Standard errors are shown in parentheses, with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

competition in the banking sector reduces credit risk (nonperforming loans) in the financial system and favors the competition-fragility hypothesis. Here, the study uses trade openness, the log of government expenditure, the log of gross fixed capital formation, and financial integration to control for country-level economic dynamics as in earlier estimations. Model 4 replaces the dependent variable and use bank Z-score. The coefficient of the lag term shows persistence in bank stability at the 1% level. The coefficient of competition is significant and supports the competition-fragility view of the literature. Its positive value shows that reductions in competition intensity enhance bank stability at the 1% level.

In both models, this study is unable to reject the null hypothesis of AR (2) at the 10% level (recall that AR (2) tested the null hypothesis that the error term in the first differenced equation is not second-order correlated). Further, this study is not able to reject the null hypothesis of the Hansen test at the 10% level in both models (recall that the Hansen test tested the joint validity of instruments that instruments are not correlated with the error term). The maximum two lags of independent variables are instruments in the estimation process. Models 1 and 2 show similar results using the fixed-effect estimator. Both analyzes show that the results of the system-GMM estimator and fixed-effect estimator are reliable. These findings are consistent with Fu et al. (2014), who support the competition-fragility view.

3.5. Bank stability, bank competition, and economic growth – disentangling the channel

This section concentrates on how bank stability affects the relationship between bank competition and economic growth. The premise is that bank market power creates stability among banks and that this stability leads to greater economic growth. More specifically, lower competition increases bank stability, which makes the financial sector more stable and in turn boosts economic growth. To quantify these indirect effects of bank competition on economic growth through bank stability, this study uses the methodology of Preacher and Hayes (2004), which requires estimating the following equations in three steps:

$$Economic\ Growth = f\ (Bank\ Competition,\ Controls); \tag{3}$$

$$Bank\ Stability = f\ (Bank\ Competition,\ Controls); \tag{4}$$

$$Economic\ Growth = f\ (Bank\ Competition,\ Bank\ Stability,\ Controls). \tag{5}$$

The literature frequently uses this approach[2]. First introduced by Baron and Kenny (1986), it appears in reputable business and finance journals such as *Management* (Rungtusanatham et al., 2014), *Entrepreneurship* (Semrau & Sigmund, 2012), and *Finance* (Fedaseyeu et al., 2018; Ferris et al., 2017).

This study performs the first step of the analysis (equation 3) in Table 2 (models 3 and 6) by establishing the significant effects of competition on economic growth (annual GDP growth and per capita GDP growth). Further, it discusses the results of the second step (equation 4) in the previous section (Table 5, models 1 and 2), where bank competition significantly affects bank stability (*BZS* and *NPR*). The third and final step (equation 5) is to

[2] See Darlington and Hayes (2016) for statistical explanation and Ferris et al. (2017) for an application.

include bank stability in the regression of bank competition on economic growth. We estimate this equation with a fixed-effect estimator. The main variable of interest is the reduction in the effects of bank competition on economic growth.

The results of this analysis are in Table 6. In models 1 and 2, the dependent variable is annual GDP growth rate. In these models, the coefficient of the Boone indicator is positive and statistically significant at the 1% level; bank stability supports economic growth, and decreases in the competition are associated with increases in economic growth. Including the measure of bank stability reduces the effect of bank competition on economic growth. In relation to the total effect, this decrease is equal to 27.80% in model 1 and 10.17% in model 2 significant at 1% level. Models 3 and 4 replace the growth proxy with per capita GDP growth rate and observe that decrease is equal to 18.57% in model 3 and 9.82% in model 4 significant at 5% and 10% levels respectively, that show the presence of channeling effect.

Table 6. Effect of bank stability and competition on economic growth

Variables	Annual GDP Growth (AGR)		Per Capita GDP Growth (CGR)	
Model	(1)	(2)	(3)	(4)
BNE	2.119**	2.636***	2.313**	2.562***
	(0.964)	(0.913)	(0.972)	(0.916)
NPR	–0.093***		–0.060***	
	(0.018)		(0.019)	
BZS		0.056**		0.053*
		(0.017)		(0.027)
TPN	0.042***	0.039***	0.044***	0.041***
	(0.006)	(0.006)	(0.006)	(0.006)
GEX	–1.498***	–1.501***	–1.202***	–1.157***
	(0.390)	(0.337)	(0.393)	(0.338)
LFF	1.167***	2.033***	1.008***	1.824***
	(0.295)	(0.239)	(0.297)	(0.239)
EXT	–1.927***	–2.207***	–2.022***	–2.260***
	(0.231)	(0.213)	(0.233)	(0.214)
Constant	2.645	–15.757***	4.418	–13.601***
	(4.850)	(3.732)	(4.890)	(3.744)
Hausman Test	22.332***	24.592***	22.792***	24.150***
F-Stat	7.039***	6.675***	6.861***	6.458***
Indirect Effect	0.816***	0.298***	0.528**	0.279*
p-Value	[0.002]	[0.006]	[0.016]	[0.071]
% of Total Effect	27.80%	10.17%	18.57%	9.82%
Number of IDs	38	38	38	38

This table shows the results of the indirect effect of bank competition on economic growth through bank stability. Standard errors are shown in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Conclusions and policy implications

This study analyzes how bank stability (viz-a-viz non-performing loans and bank Z-score) and bank competition affect economic growth. It uses country-level data in a large sample of 38 European economies to reach generalizable results not previously available in the literature. By employing a fixed-effect estimator to control for cross-sectional heterogeneity and a system-GMM estimator to control for endogeneity and the dynamic relationship of growth, this study finds robust evidence that banking stability is crucial for economic growth, especially during crisis periods. Economic growth falls during the global financial crisis, as well as during a local banking crisis period. Moreover, increased financial stability neutralizes the negative effects the crisis has on economic growth. Results of the study support the idea that decreasing competition in the banking sector increases economic growth. In particular, empirical outcomes of this study show that market power in banking may support economic growth and increases financial stability.

The findings of this study also have wider implications for policymakers and regulators in European countries whose work relates to banking competition and the financial stability of banks, helping them devise appropriate regulations. The stance in recent literature that competition boosts stability may not be true; as the results of this study indicate that reducing competition in banking promotes stability in the banking sector. Acting upon the aforementioned stance may therefore actually destabilize the banking system, especially during crisis periods, and policies based on that stance can hinder economic growth. A banking environment with greater market power allocates resources efficiently that may improve the stability of the banking system. Accordingly, national central banks should strengthen their policies about competition to strengthen the stability of their banking systems, which could boost economic growth. Governments should also encourage favorable financial environments in order to promote the linkage between banking stability, banking competition, and economic growth.

To optimize competition intensity, regulators must additionally embrace a relatively cautious strategy for assessing and approving mergers and acquisitions at the indigenous level. This study's results confirm Craig and Santos (1997), which finds that lessening risk via bank mergers is a fundamental motive behind early bank merger waves (Carletti et al., 2002). In short, the literature posits that consolidation and reduced competition tend to increase loan rates, which increase charter value of banks and enhance bank stability and, in turn, support economic growth. This is in line with the market power-stability paradigm.

Policymakers must encourage financial innovation on the premise that effective risk management improves the allocation of resources in the economy. It may further augments banking stability through product innovation. To keep the financial system stable, entry barriers are needed for new domestic and foreign entrants. Further, foreign bank acquisitions in European countries must be more scrutinized.

Our findings further suggest that having formal policies around competition boost economic growth. Moreover, specific policies that endure higher economic growth must be put in place. This would spawn a righteous cycle with a positive impact on the stability of the banking sector, which in turn would lead to real growth. Hence, it is in the best interest

of banks in European countries to toughen their competition policies. In this paper, using country-level data is a limitation that may lead to a simplified conclusion. Agenda for future research could focus on the effect of bank type and local to foreign bank share in the banking sector on bank-level data using quantile regression estimator. Further, the connection between bank competition and economic growth may be influenced by competition determinants, which this paper does not study.

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Author contributions

SI and AF conceived the idea. SI collected and cleaned the data and written original draft under the supervision of AH. AT reviewed the paper and improved methodology and analyses. SI, AH and AT worked on revisions.

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APPENDIX A. Variables definitions and data sources

Variable	Definition	Data Source
Economic Growth (*ECG*)	Annual percentage growth rate of GDP (*AGR*). Annual percentage growth rate of GDP per capita (*CGR*).	WDI
Bank Stability (*BST*)	*Bank Z-score (BZS)*: The probability of default for a country's banking system. Z-score compares the buffer of a country's banking system (capitalization and returns) with the volatility of such returns. It is estimated as *(ROA+(equity/assets))/SDROA*; *SDROA* is the standard deviation of *Return on Assets* (calculated from underlying bank-by-bank data). This study uses the natural logarithm of *(ROA+(equity/assets))/SDROA*. It is converted to the country level by taking a weighted average. Weights are based on the asset size of banks in each country. *NPR*: The ratio of non-performing loans (interest and principal past due by 90 days or more) to total gross loans. Non-performing loans and gross loans are country-level aggregate figures.	GFDD, World Bank, Bankscope and Orbis
Competition (*BNE*)	*Boone Index*: A measure of the degree of competition based on profit efficiency in the banking market (Boone, 2008). It measures the elasticity of profits to marginal costs. More negative values of *BNE* (larger in absolute) represent higher intensity of competition. An increase in the Boone indicator implies deteriorating competition among financial intermediaries. It is separately estimated for each country using bank level data and time dummies are used to calculate the yearly estimates of the competition.	GFDD, World Bank, Bank Scope, and Orbis
Trade Openness (*TPN*)	Sum of exports and imports (% GDP).	WDI
Fix Capital Formation (*LFF*)	Gross fixed capital includes land, improvements, plant, machinery, and equipment purchases, as well as the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Data are in current U.S. dollars.	WDI
Govt. Expenditure (*GEX*)	The log of the sum of government final consumption expenditures. Data are in current U.S. dollars.	WDI
Net External Assets / Liabilities (*EXT*)	The volume of investments and liabilities abroad. Data is from International Investment Position Database (i.e., external wealth of nations).	Lane and Milesi-Ferretti (2007)
Global Financial Crisis (*GFC*)	A dummy variable for the global financial crisis of 2008. The variable equals 1 if the year is 2007 or 2008, and zero otherwise.	Author specified
Local Banking Crisis (*LBC*)	Systemic if significant signs of financial distress appear in the banking system (significant bank runs, losses in the banking system, and/or bank liquidations) and significant banking policy intervention measures occur in response to significant losses in the banking system. The crisis becomes systemic in the first year that the banking system meets both criteria. The end of a crisis is the year before both real GDP growth and real credit growth are positive for at least two consecutive years.	Laeven and Valencia (2012), GFDD