Emerging Markets Finance and Trade

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/mree20

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To cite this article: Edib Smolo, Mansor H. Ibrahim & Ginanjar Dewandaru (2021) Impact of Bank Concentration and Financial Development on Growth Volatility: The Case of Selected OIC Countries, Emerging Markets Finance and Trade, 57:7, 2094-2106, DOI: 10.1080/1540496X.2021.1903869

To link to this article: https://doi.org/10.1080/1540496X.2021.1903869

Published online: 02 Apr 2021.

EMERGING MARKETS FINANCE AND TRADE
2021, VOL. 57, NO. 7, 2094–2106
https://doi.org/10.1080/1540496X.2021.1903869

Routledge
Taylor & Francis Group

Impact of Bank Concentration and Financial Development on Growth Volatility: The Case of Selected OIC Countries

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ABSTRACT

This study investigates the impact of bank concentration and financial development on economic volatility for the Organization of Islamic Cooperation (OIC) member countries. Employing dynamic panel models, we find no evidence that bank concentration is significantly related to economic volatility when it is entered independently in the models. Meanwhile, financial development lowers economic volatility. Extending the models to include market structure–financial development interaction, we note that the impact of bank concentration on volatility depends on the level of financial development within OIC countries. More specifically, the volatility-increasing effect of bank concentration tends to be moderated by financial development. Accordingly, in the wake of banking sector consolidation in these countries, policymakers and regulators in OIC countries should focus on further developing their financial markets such that the negative consequences of resulting market concentration can be mitigated.

KEYWORDS

Bank concentration; financial development; growth volatility; OIC countries; GMM

JEL

C33; E44; G21; G28

1. Introduction

The relations between finance and real activities have been a subject of continuous discussion and research. From the early focus on financial development–growth nexus, the literature has expanded to look at other potential effects of finance, among which include growth volatility, and its non-linear effects on economic development. More recently, some emphasize the importance of making distinction among various aspects of the financial sector in the evaluation of the financial and real impacts of financial development. These aspects include among others financial access, financial efficiency and financial stability (Benbouzid, Mallick, and Sousa 2017; Zhang and Naceur 2019). However, a further look at the literature would reveal that the financial market structure, i.e., the degree of market competition and concentration, and its implications on real activities seem to receive relatively less attention.

Over the years, the financial sector, in particular the banking sector, has witnessed changes in market structure as a result of bank deregulation and re-regulation. The deregulation in the banking sector results in a more competitive market while re-regulation, especially in the aftermath of crises, leads to a more concentrated banking sector. While many have acknowledged the potential effects of competition on especially bank-level stability as hypothesized by the competition–stability and competition–fragility views, little is known about how bank competition or concentration would affect economic stability. Moreover, it would be interesting to see whether the effect of financial development on economic stability depends on the structure of the financial markets or, alternatively,

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whether financial development moderates the impact of market structure on aggregate stability. This is of particular importance especially for a group of developing countries that have adopted measures to further advance their financial sector against the backdrop of wide variations in their financial market structure such as the Organization of Islamic Cooperation (OIC) member countries.

In view of these, the present article examines empirically the implications of bank concentration and financial development on growth volatility for OIC countries. Our focus on these countries is motivated by the following reasons. First, the financial sector of the OIC countries has witnessed significant changes in the last two decades, especially with the rapid emergence of its Islamic financial sector. At present, there are 13 systemically important Islamic jurisdictions in the OIC.[1] Islamic finance is fast growing in other member countries as well. This has significantly shaped the competitive landscape of the banking sector in these counties and hence its potential economic impacts. Second, there are vast variations in both market structure and financial development in the OIC countries, which make them an interesting case study to assess how they interactively influence economic outcomes. And finally, as compared to other regions, there are relatively fewer studies that focus on the OIC and majority of them examine the finance–growth nexus. Backed by these reasons, we contribute to the literature on finance–growth nexus by extending the analysis to banking structure and financial developments and their impacts on growth volatility from the OIC perspective.

Our analysis yields several interesting results. First, when entered independently in the analysis, the market structure is insignificantly related to growth volatility and financial development tends to be growth stabilizing. Second, financial market development has the ability to dampen growth volatility, especially in a more concentrated market. And finally, we document some variations in the results across different measures of market concentration or competition. The clear policy implication from our analysis is, in the wake of financial consolidation in the aftermath of the financial crisis, policy attention should also be directed to further develop the financial market such that the growth volatility effect of the increasing market concentration can be mitigated.

The remainder of the article is structured as follows. Section 2 provides a brief literature review. Section 3 explains the methodology used in the analysis. Section 4 presents the data and discusses the estimation results. Finally, section 5 concludes the study.

2. Literature Review

Theoretically, there are two contradictory views on bank competition–economic volatility nexus, the competition–stability view and the competition–fragility view. The former view posits that a highly concentrated banking structure with monopolistic power is detrimental to economic growth in general and economic volatility in particular (Cetorelli and Strahan 2006; Guzman 2000). By contrast, the latter argues that bank concentration and monopolistic power may be beneficial to economic growth and promote financial stability as excessive bank competition may lead to financial instability (Deidda and Fattouh 2005; Di Patti and Dell'Ariccia 2004). Bank competition (and hence lack of concentration) puts pressure on banks' profits leading to higher risk appetite of banks' managers. As pointed out by Davis (2007), bank concentration has been tolerated and even encouraged historically due to a belief that it is less prone to banking failure and crises and more beneficial for financial stability.

We may also envision that the effect of market structure on growth volatility would depend on which structure eases credit constraints, provides wider financial access and is more efficient in the allocation of financial resources. Some have argued that less banking competition or higher banking concentration would lead to more credit access (Cetorelli 2001). Consequently, with the relaxation of credit constraints, output fluctuations can be moderated or dampened. On the contrary, the allocation of financial resources tends to be less inefficient in a less competitive banking sector (Pagano 1993). As a result, economic growth can be dampened. In line with the argument by Huang, Fang, and Miller (2014), we may extend this mechanism to growth volatility as well.

Empirically, within the banking literature, there is a strand of research that evaluates the bank competition–stability relations. Both views have received their respective supports, see for instances Lee and Hsieh (2013), Beck, Demirgüç-Kunt, and Levine (2006), and Schaeck, Čihák, and Wolfe (2009). At the country and the aggregate level, however, the focus has been mainly on the roles played by financial development in influencing growth or growth volatility. A recent study by Yeh, Huang, and Lin (2013) investigates how financial architecture—as measured by the activity, size, and efficiency of the stock markets relative to those of banks—affects economic growth and volatility. They find that the effect is significantly positive on both. Further, while market–based economies experience faster economic growth, they tend to exhibit higher economic volatility in the long run. Along the same line, one of the main findings of the article by Ibrahim (2007) indicates that financial market development is accompanied by financial volatility.

In contrast, although financial development may increase economic growth, Law and Singh (2014) argue that an oversize financial market could be detrimental to the growth and result eventually in instability. Non-linear effect of financial development on business cycle is also reported by Ibrahim and Alagidede (2017) using a panel sample of 23 sub-Saharan African countries. Similarly, using cross-country panel data, Ma and Song (2018) document a non-linear and U-shaped relationship between financial development on macroeconomic volatility. These results are further supported by Deidda and Fattouh (2005), Cecchetti and Kharroubi (2012), Arcand, Berkes, and Panizza (2015), and Prochniak and Wasiak (2017). Meanwhile, Beck, Degryse, and Kneer (2014) show that intermediation services contribute to economic stability by reducing volatility in the long-run.

Hoxha (2013) and Huang, Fang, and Miller (2014) are two recent studies that have assessed directly the empirical relations between banking market structure and industrial growth volatility. Hoxha (2013) evaluates the impacts of both market concentration and market competition on growth volatility of manufacturing sectors in 22 developing countries. In the analysis, he takes banking concentration and banking competition to represent banking market structure and arrives at the evidence that banking concentration dampens growth volatility while banking competition increases it. Huang, Fang, and Miller (2014) employ a larger set of countries, which include both developed and developing countries. In contradiction to Hoxha (2013), they find evidence suggesting the amplification of industrial growth volatility in more concentrated banking market. This effect, however, is moderated by the external liquidity needs of the industrial sectors.

When it comes to OIC member countries, the literature is rather limited. Using GMM methods, Abojeib (2017) investigates competition–stability relationships in countries with dual banking systems for the period from 2004 until 2014. He finds that market power contributes to the stability only up to a certain point, indicating a non-linear relationship for both types of banks. In a recent article, Ali, Ibrahim, and Shah (2020) investigates the impact of non-intermediation activities of banks on economic growth and volatility of OIC countries. They find that non-intermediation income does not contribute significantly to either economic growth or volatility. However, the volatility is significantly decreased by aggregate intermediation activities in sample countries.

The limited and contradicting evidence on growth volatility implication of banking market structure leaves open the question on how competition would affect stability at the aggregate level. This is an issue that this article attempts to address, which remains a gap not only in the finance–growth literature but also for the OIC countries.

3. Methodology

We begin with the following baseline panel model to assess the implications bank market concentration and financial development have on growth volatility,

$$\sigma_{i,t} = \alpha\sigma_{i,t-1} + \beta_1 MS_{i,t} + \beta_2 FIN_{i,t} + \delta B_{i,t} + \theta C_{i,t} + _i + \varepsilon_{i.t} \quad (1)$$

where σ is growth volatility, *MS* is a measure of banking market structure or concentration, *FIN* is a measure of financial development, *B* and *C* are, respectively, bank-specific and country-specific controlled variables, v_i is the country-specific effects, and $\varepsilon_{i.t}$ is the standard error term. Note that the lagged dependent variable is included to capture potential volatility persistence.

We use the 3-year rolling standard deviation of the annual growth rate of real GDP per capita. As for bank concentration, various measures are available. These include the traditional measures that capture the structure of the market in terms of number and relative size of the firms, which are k-firm concentration ratios and Herfindahl–Hirschman index (HHI). Arguing that these traditional measures may not necessarily reflect the degree of competition in the market, some have developed competition measures that directly capture the competitive conduct of the firms. These include the Lerner index, Boone Indicator and Panzar and Rosse (1987) H statistic.[2] Our main aim is to look at the degree of bank concentration, and hence the competitive environment of the banking sector, and its implications on growth volatility. Accordingly, since each measure has its own strengths and weaknesses (Leon 2015), we employ various measures of bank concentration/competition in the analysis. We start with 3-bank concentration ratio in our baseline model. Then, as robustness check, we consider alternative measures of market concentration and competition.[3]

As for financial development, we employ two commonly used measures. These are the ratio of private credit to GDP and the ratio of liquid liabilities to GDP. In line with the literature on growth volatility, we include the following country level variables: gross capital formation as a ratio to GDP, trade openness, government size, inflation, and the 2008–2009 global financial crisis dummy. We also control for bank-specific characteristics, which include bank diversification, cost efficiency and profitability. These are represented respectively by the ratio of non-interest income to total income, cost-to-income ratio, and net interest margin. Table 1 provides a brief definition of all variables used in the model, the expected relations between the explanatory variables and growth volatility, and data sources. Note that except growth volatility and market structure measures, all variables are expressed in natural logarithm.

In (1), we assess independently the influences bank concentration and financial development have on growth volatility. As discussed in the previous section, their coefficients cannot be signed a priori. Then, to see if the interactive effect of bank concentration and financial development on growth volatility, we introduce the interaction term in the model:

$$\sigma_{i,t} = \alpha\sigma_{i,t-1} + \beta_1 MS_{i,t} + \beta_2 FIN_{i,t} + \beta_3\left(MS_{i,t} \times FIN_{i,t}\right) + \delta B_{i,t} + \theta C_{i,t} + _i + \varepsilon_{i.t} \quad (2)$$

The coefficient of the interaction term (i.e., β_3) captures the role of financial development in growth volatility–bank concentration relation. Alternatively, it can also be taken to represent how bank concentration moderates the effect of financial development on growth volatility. For instances, if both β_1 and β_2 are positive and β_3 is negative and all are statistically significant, we may conclude that financial development mitigates volatility-increasing effect of bank concentration or, alternatively, bank concentration attenuates the effect of financial development on growth volatility.

We estimate Equations (1) and (2) using the system generalized method of moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998). The method, which is widely applied in estimating dynamic panel models such as ours, addresses the endogeneity issue inherent in the dynamic panel models as a result of non-zero correlation between the lagged dependent variable and the individual-specific effect. One main concern that we have, which is due to N = 49, is we may run into the problem of instrument proliferation. Accordingly, following the suggestion by Roodman (2009), we limit the lags or collapse the instruments such that the number of instruments is less than the number of countries (N) in the sample. We test the validity of the instruments using the Hansen test. For consistency of the estimates, we also conduct Arellano-Bond test for autocorrelation of order (1) and order (2), respectively, AR(1) and AR(2). Given there is no auto-correlation in the standard error terms in (1) and (2), we should find significant AR(1) but insignificant AR(2).

Table 1. Variable definition and data sources.

Variables	Notation	Definition	+|-	Data Sources
Dependent Variable				
Growth Volatility	σ	A 3-year rolling std. dev. of the annual growth rate of real per capita GDP.		Author's calculation
Key Independent Variables				
5-Bank concentration ratio	CR5	Ratio of the total assets of the 5-largest commercial banks to total commercial banking assets.	+|-	BankFocus
3-Bank concentration ratio	CR3	Ratio of the total assets of the 3-largest commercial banks to total commercial banking assets.	+|-	BankFocus
Herfindahl–Hirschman Index	HHI	The sum of the squared market share of each bank in the system.	+|-	WITS[a]
Lerner index	LI	A market power measure representing the difference between output prices and marginal costs.	+|-	BankFocus
Boone indicator	BI	Calculated as the elasticity of profits to marginal costs, BI measures a degree of competition.	+|-	BankFocus
Private credit	PR	A ratio of private credit by deposit money banks and other financial institutions to GDP.	+|-	IFS[b]
Liquid liabilities	LL	A ratio of liquid liabilities to GDP.	+|-	IFS
Control Variables				
Gross capital formation	GCF	Investment minus disposals as a ratio of GDP.	-	WDI[c]
Trade openness	TO	The sum of exports and imports of goods and services measured as a share of GDP.	+|-	WDI
Government size	GS	The government's final consumption expenditure to GDP ratio.	+|-	WDI
Inflation	I	Inflation is the annual growth rate of the GDP deflator.	+	IMF[d]
Financial crisis	C	The global financial crisis 2008–2009 dummy.	+	GFD[e]
Bank non-interest income	BNI	Non-interest income to total income ratio.	+|-	GFD
Bank cost to income ratio	BCI	Overhead costs to gross revenues ratio.	+	GFD
Bank net interest margin	BNIM	The difference between the interest charged by the bank and the interest paid out to lenders.	+	WDI

[a]World Integrated Trade Solution of the World Bank.
[b]International Financial Statistics of the International Monetary Fund.
[c]World Development Indicators of the World Bank.
[d]International Monetary Fund.
[e]Global Financial Development of The World Bank.

4. Data and Results

We compile data for the OIC countries from various sources (see Table 1). Due to data availability on key variables, our final sample comprises 49 out of 57 OIC member countries from 2000 to 2017. Tables 2 and 3 respectively report descriptive statistics and pairwise correlation coefficients of the

Table 2. Descriptive statistics.

Variable		Obs.	Mean	Std. Dev.	Min	Max
Growth volatility	σ	848	2.814	3.152	.103	18.56
5-Bank concentration ratio	CR5	726	84.846	14.962	36.891	100
3-Bank concentration ratio	CR3	831	73.28	19.29	29.128	100
Herfindahl–Hirschman Index	HHI	737	.135	.093	.036	.507
Lerner index	LI	600	.318	.138	−.057	.632
Boone indicator	BI	802	2.949	.117	2.155	3.208
Private credit (log)	PR	824	2.909	.934	.801	4.681
Liquid liabilities (log)	LL	824	3.568	.705	2.123	5.451
Gross capital formation (log)	GCF	820	3.136	.33	2.234	3.927
Trade openness (log)	TO	825	4.249	.44	3.252	5.295
Government size (log)	GS	821	2.577	.376	1.514	3.334
Inflation (log)	I	848	3.489	.312	2.028	4.308
Bank noninterest income (log)	BNI	848	3.655	.372	2.489	4.353
Bank cost to income ratio (log)	BCI	848	3.938	.282	3.193	4.505
Bank net interest margin (log)	BNIM	848	1.501	.526	.016	2.671

Calculated by the authors using Stata 14.2.

variables used in the model. As may be observed in Table 2, there are wide variations not only in the growth volatility but also in market structure and financial development across the OIC countries. In Table 3, several observations are notable. First, except between the 3-bank and 5-bank concentration ratios, the pairwise correlations between measures of market are low. The observed low correlations between the traditional measures of market concentration (CR3, CR5 and HHI) and non-traditional measures (LI and BI) suggest that they likely reflect different dimensions of market structure and hence the need to consider all of them in the analysis. Second, the correlations between growth volatility, on one hand, and market structure and financial development, on the other hand, are indicative of volatility-increasing effect of market concentration or power and volatility-dampening effect of financial development. Finally, except the CR3-CR5 and PR-LL pairs, the pairwise correlations between the independent variables are low. Accordingly, multicollinearity should not be a major concern.

4.1. Baseline Results

We first report the baseline results, which correspond to the estimation of Equations (1) and (2) using 3-bank concentration ratio (CR3) as a measure of banking market structure, in Tables 4 and 5.

In Table 4, bank concentration and financial development are incorporated individually in the regressions. The first three regressions employ private credit-to-GDP ratio while the last three use liquid liability-to-GDP ratio as a measure of financial development. As may be noted at the bottom of the Table, the Hansen test statistics and Arellano-Bond autocorrelation test statistics support the validity of the models and the absence of autocorrelation in Equation (1). The regressions also do not suffer from instrument proliferation as we have kept the number of instruments to be below the number of countries in the sample.

From Table 4, we may note a high persistence in the growth volatility as reflected by the coefficients of the lagged dependent variable being above 0.65. Note that, while the included bank-controlled variables have virtually no significant influences on growth volatility, the effects of macro-controlled variables generally conform to expectation and are in line with those reported by Yeh, Huang, and Lin (2013) and Ali, Ibrahim, and Shah (2020). Namely, we find gross capital formation and government size to be negatively related to growth volatility in the OIC countries. The increase in gross capital formation may be associated with improvements in the production processes that result in less output variations. Meanwhile, government spending as a ratio of GDP may reflect the counter-cyclicality of fiscal policy in these countries. Meanwhile, we note that trade openness and inflation are significantly and positive related to growth volatility, which likely capture the vulnerability of these countries to respectively external shocks and to macroeconomic uncertainty.

Turning to our main theme, we find the coefficients of bank concentration to be indistinguishable from 0. By contrast, we document significant and negative coefficients of financial development as measured by private credit-to-GDP ratio and liquid liability-to-GDP ratio. This finding is in line with Beck, Degryse, and Kneer (2014) and Ali, Ibrahim, and Shah (2020). From regression (3), we may infer that a 1% increase in the private-to-GDP ratio leads to the reduction in growth volatility by 0.244 point. This corresponds to roughly 7.8% of the standard deviation of the growth volatility. The results from using the liquid liability as a measure of financial development indicate larger impacts. Based on these results, we may state that the volatility-dampening impacts of financial development are not only significant but also economically important.

We further evaluate whether bank concentration and financial development interactively influence growth volatility as specified in Equation (2), the results of which are presented in Table 5. As may be noted from Table 5, the coefficients of the 3-bank concentration turn significant while those of financial development become positive but insignificantly different from 0. They, however, should not be directly compared to those in Table 4. The reason is, in models with interaction terms, we may not interpret the individual coefficients of the variables constituting the interaction terms independently from the coefficients of the interaction terms. As we have explained in the preceding section, in

Table 3. Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) σ	1.000														
(2) CR5	0.123	1.000													
(3) CR3	0.111	0.908	1.000												
(4) HHI	0.148	0.282	0.269	1.000											
(5) LI	0.198	0.173	0.065	0.039	1.000										
(6) BI	−0.071	0.183	0.164	−0.207	0.102	1.000									
(7) PR	−0.154	−0.240	−0.237	−0.329	0.045	0.211	1.000								
(8) LL	−0.143	−0.166	−0.120	−0.248	−0.021	0.221	0.832	1.000							
(9) GCF	−0.153	−0.160	−0.119	0.069	0.207	0.056	0.212	0.175	1.000						
(10) TO	0.103	0.152	0.173	−0.037	0.383	0.213	0.497	0.443	0.253	1.000					
(11) GS	0.053	0.345	0.255	0.022	0.324	0.293	0.250	0.264	0.086	0.410	1.000				
(12) I	0.153	−0.066	−0.035	−0.021	−0.142	−0.148	−0.172	−0.179	−0.039	−0.090	−0.255	1.000			
(13) BNI	0.063	0.131	0.119	0.063	−0.076	−0.071	−0.306	−0.407	−0.154	−0.107	−0.130	0.014	1.000		
(14) BCI	−0.048	0.017	0.055	0.175	−0.518	−0.213	−0.464	−0.380	−0.288	−0.360	−0.085	0.077	0.198	1.000	
(15)BNIM	0.178	−0.037	−0.016	0.200	−0.012	−0.297	−0.657	−0.685	−0.120	−0.392	−0.214	0.163	−0.003	0.441	1.000

σ is the growth volatility. *CR5* is the 5-bank concentration ratio. *CR3* is the 3-bank concentration ratio. *HHI* is the Herfindahl–Hirschman Index. *LI* is the Lerner index. *BI* is the Boone indicator. *PR* is the ratio of private credit to GDP. *LL* is the liquid liabilities to GDP. *GCF* is the gross capital formation. *TO* is the trade openness. *GS* is the government size. *I* is the inflation (GDP deflator). *BNI* is the bank noninterest income to total income ratio. *BCI* is the bank cost-to-income ratio. *BNIM* is the bank net interest margin.

Calculated by the authors using Stata 14.2.

Table 4. Estimation results—baseline model.

	3-Bank Concentration Ratio (CR3)					
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Growth volatility$_{t-1}$ (σ_{t-1})	0.674***	0.715***	0.715***	0.672***	0.714***	0.713***
	(0.046)	(0.014)	(0.014)	(0.042)	(0.012)	(0.013)
3-Bank concentration ratio	0.003	0.002	0.002	0.005*	0.003	0.003
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Private credit (log)	−0.283*	−0.247***	−0.244***			
	(0.152)	(0.086)	(0.087)			
Liquid liabilities (log)				−0.328**	−0.365***	−0.361***
				(0.142)	(0.084)	(0.086)
Gross capital formation (log)	−0.100	−0.342***	−0.336***	−0.116	−0.342***	−0.336***
	(0.203)	(0.114)	(0.116)	(0.182)	(0.108)	(0.110)
Trade openness (log)	0.589**	0.535***	0.532***	0.542**	0.506***	0.505***
	(0.295)	(0.100)	(0.104)	(0.259)	(0.106)	(0.109)
Government size (log)	−0.208	−0.207**	−0.209**	−0.162	−0.194*	−0.199*
	(0.184)	(0.103)	(0.103)	(0.178)	(0.108)	(0.108)
Inflation (log)	0.437**	0.155	0.159	0.438**	0.178	0.181
	(0.200)	(0.151)	(0.149)	(0.195)	(0.151)	(0.148)
Bank non-interest income (log)		−0.194	−0.191		−0.296***	−0.294***
		(0.130)	(0.133)		(0.100)	(0.103)
Bank cost to income ratio (log)		−0.201	−0.196		−0.241	−0.236
		(0.182)	(0.184)		(0.170)	(0.173)
Bank net interest margin (log)		0.052	0.053		−0.036	−0.033
		(0.125)	(0.124)		(0.111)	(0.110)
Crisis (dummy)			−0.004			−0.021
			(0.093)			(0.090)
Constant	−1.758	1.411	1.351	−1.442	2.584**	2.523**
	(1.179)	(1.125)	(1.163)	(1.145)	(1.024)	(1.074)
Observations	742	742	742	742	742	742
No. of instruments	10	27	28	10	27	28
No. of groups	47	47	47	47	47	47
AR1 *p*-value	.000	.001	.001	.000	.001	.001
AR2 *p*-value	.220	.220	.220	.220	.218	.219
Hansen *p*-value	.455	.230	.232	.460	.226	.227

The sample includes 742 observations from 47 OIC member countries. The dependent variable is a 3-year rolling std. dev. of the annual growth rate of real per capita GDP (σ). Standard errors are in parentheses where ***, **, and * denote significance at 0.01, 0.05, and 0.10 levels, respectively.
Calculated by the authors using Stata 14.2.

Equation (2), the marginal effects of bank concentration on growth volatility are contingent on financial development. Likewise, the marginal effect of financial development on growth volatility depends on the banking market structure.

Note that, in Table 5, the coefficients of market concentration–financial development interaction are negative and statistically significant at better than 5% significant level. Together with positive and significant coefficients of bank concentration, this means that financial development tends to dampen the volatility-increasing effect of bank concentration. Stated differently, the positive effect of bank concentration on growth volatility is less or even reversed in a more developed financial system. We may also state that financial development is negatively related to growth volatility in a more concentrated banking system. As for other variables, the results generally conform to those documented in Table 4.

4.2. Further Analyses

To further add credence to our findings, we perform additional analyses. In place of the 3-bank concentration ratio, we employ alternative traditional measures of bank concentration, namely the 5-bank concentration ratio and the Herfindahl–Hirschman Index (HHI). In addition, we also

Table 5. Estimation results—models with interactions.

	3-Bank Concentration Ratio			
Variables	(1)	(2)	(3)	(4)
Growth volatility$_{t-1}$ (σ_{t-1})	0.700***	0.708***	0.712***	0.709***
	(0.064)	(0.014)	(0.014)	(0.013)
3-Bank concentration ratio	0.029*	0.024***	0.030**	0.032***
	(0.016)	(0.008)	(0.012)	(0.012)
Private credit (log)	0.338	0.303		
	(0.351)	(0.219)		
CR3*PR	−0.008	−0.007***		
	(0.005)	(0.003)		
Liquid liabilities (log)			0.244	0.192
			(0.202)	(0.199)
CR3*LL			−0.008**	−0.008***
			(0.003)	(0.003)
Gross capital formation (log)	−0.132	−0.323***	−0.265***	−0.304***
	(0.208)	(0.114)	(0.094)	(0.103)
Trade openness (log)	0.583**	0.517***	0.500***	0.506***
	(0.281)	(0.094)	(0.106)	(0.103)
Government size (log)	−0.219	−0.195*	−0.190*	−0.192*
	(0.195)	(0.111)	(0.106)	(0.112)
Inflation (log)	0.418*	0.158	0.204	0.187
	(0.216)	(0.148)	(0.145)	(0.152)
Bank non-interest income (log)		−0.199		−0.321***
		(0.125)		(0.106)
Bank cost to income ratio (log)		−0.206		−0.246
		(0.183)		(0.167)
Bank net interest margin (log)		0.068		−0.044
		(0.120)		(0.109)
Constant	−3.560*	−0.282	−2.007	0.547
	(1.901)	(1.214)	(1.258)	(1.245)
$\beta_1 + \beta_3$	0.020*	0.017***	0.022**	0.024***
	(0.011)	(0.006)	(0.009)	(0.009)
Observations	742	742	742	742
No. of instruments	25	28	25	28
No. of groups	47	47	47	47
AR1 *p*-value	.000	.001	.001	.001
AR2 *p*-value	.240	.227	.228	.216
Hansen *p*-value	.226	.231	.243	.238

The sample includes 742 observations from 47 OIC member countries. The dependent variable is a 3-year rolling std. dev. of the annual growth rate of real per capita GDP (σ). Standard errors are in parentheses where ***, **, and * denote significance at 0.01, 0.05, and 0.10 levels, respectively.
Calculated by the authors using Stata 14.2.

experiment with the new empirical industrial organization measures of bank competition, the Boone indicator and Lerner index. The results are reported in Table 6. To conserve space, we report on the estimation results related to our main themes, the coefficients of market structure, financial development and their interactions.

When we use the 5-bank concentration ratio and the HHI, we find virtually no significant impacts of market concentration and financial development on growth volatility. The same can be said for the Boone indicator. However, the results from using the Lerner index as a measure of bank competition recover the positive and significant coefficients of market structure and negative and significant coefficients of the interaction terms.

These contradicting results lend themselves to two plausible interpretations. First, the evidence supporting the nature of the relations between the two dimensions of finance (financial development and market structure) and growth volatility is fragile and it depends on which measure of market structure is employed. And second, within the two approaches of market structure measurement, i.e., the traditional approach and the new empirical industrial organization approach, the 3-bank concentration ratio and the Lerner index tend to be better measures within their respective classes of the

Table 6. Estimation results—alternative measures of banking market structure.

	Model with No Interaction		Model with Interaction	
Variables	(1)	(2)	(3)	(4)
A. Market Structure (MS) = 5-Bank Concentration Ratio (CR5)				
σ_{t-1}	0.300*	0.370***	0.760***	0.756***
	(0.158)	(0.124)	(0.014)	(0.014)
MS	−0.001	0.005	−0.004	−0.001
	(0.009)	(0.007)	(0.012)	(0.012)
PR	−0.565		−0.284	
	(0.411)		(0.307)	
LL		−0.601*		−0.245
		(0.307)		(0.247)
MS × *PR*			0.002	
			(0.003)	
MS × *LL*				0.001
				(0.003)
B. Market Structure (MS) = Herfindahl–Hirschman Index (HHI)				
σ_{t-1}	0.412***	0.424***	0.520***	0.558***
	(0.079)	(0.079)	(0.124)	(0.030)
MS	0.336	0.484	0.997	1.277
	(0.658)	(0.610)	(1.828)	(2.281)
PR	−0.288**		−0.179	
	(0.121)		(0.142)	
LL		−0.318*		−0.146
		(0.166)		(0.153)
MS × *PR*			−0.309	
			(0.739)	
MS × *LL*				−0.254
				(0.628)
C. Market Structure (MS) = Boone Indicator (BI)				
σ_{t-1}	0.722***	0.731***	0.743***	0.724***
	(0.046)	(0.044)	(0.046)	(0.043)
MS	−0.891	−0.655	−4.432	5.336
	(1.355)	(1.339)	(4.820)	(5.095)
PR	−0.316		−1.762	
	(0.204)		(1.853)	
LL		−0.397**		1.908
		(0.179)		(1.882)
MS × *PR*			1.456	
			(1.682)	
MS × *LL*				−2.119
				(1.762)
D. Market Structure (MS) = Lerner Index (LI)				
σ_{t-1}	0.520***	0.805***	0.799***	0.795***
	(0.049)	(0.024)	(0.021)	(0.021)
MS	1.178**	0.761	1.774**	3.483***
	(0.556)	(0.477)	(0.735)	(1.092)
PR	−0.132		0.088	
	(0.097)		(0.073)	
LL		−0.145*		0.109
		(0.085)		(0.105)
MS × *PR*			−0.350**	
			(0.173)	
MS × *LL*				−0.780***
				(0.273)

The sample includes 742 observations from 47 OIC member countries. The dependent variable is a 3-year rolling std. dev. of the annual growth rate of real per capita GDP (σ). Standard errors are in parentheses where ***, **, and * denote significance at 0.01, 0.05, and 0.10 levels, respectively. σ_{t-1} is the lagged growth volatility. *PR* is the ratio of private credit to GDP. *LL* is the liquid liabilities to GDP. *MS* represents market structure measures 5-Bank Concentration Ratio (*CR5*), Herfindahl–Hirschman Index (*HHI*), Boone Indicator (*BI*), and Lerner Index (*LI*) for panel A, B, C, and D, respectively.

Calculated by the authors using Stata 14.2.

market structure. We incline toward the latter given various weaknesses and assumptions needed in the construction of the Boone indicator and the widely used Lerner index in the banking literature. Accordingly, our main conclusions remain.

Apart from these, we also allow for non-linearity between competition and growth volatility.[4] In line with the baseline results, we find no evidence that banking market structure is related to growth volatility when entered independently in the model. Meanwhile, financial development carries negative coefficients, reinforcing the ability of financial development to dampen growth volatility. Similar findings are also observed when we extend the model to include the interaction term between market structure and financial development.

5. Conclusion

This study investigates the impact of bank concentration and financial development—individually and jointly—on the growth volatility of the selected OIC member countries. Specifying their relations in dynamic panel setting and using the system GMM estimator, we arrive at several findings. First, when entered independently in the models, banking concentration has no significant relations with growth volatility. The results remain even when we allow for non-linear relations between market concentration and growth volatility. By contrast, financial development significantly lowers growth volatility. Second, in models with bank structure–financial development interactions, our results suggest the volatility-increasing effects of bank concentration or market power, which is moderated or even reversed in a more developed financial market. And finally, although the findings tend to differ depending on which measure of market competition is used, the main conclusions remain intact when the Lerner index is used in place of the baseline 3-bank concentration ratio.

The study offers some policy implications. Given the above results, policymakers and regulators from OIC countries should not place too much concern over the evolving market concentration in the wake of banking consolidation pushes among especially Islamic banks. This development, however, should not be left unattended. Instead, it must be accompanied by further development of the financial markets such that the unintended volatility consequences of market concentration can be avoided or at least mitigated. The current financial development of OIC countries, on average, is relatively low and hence there is room for improvement in these countries.

Notes

1. The Islamic Finance Services Board (IFSB) defines "systemically important Islamic banking" as having the share of Islamic banking assets of 15% or more. The 13 systemically important countries are Iran, Sudan, Brunei, Saudi Arabia, Kuwait, Malaysia, Qatar, UAE, Bangladesh, Djibouti, Jordan, Palestine and Bahrain (IFSB 2019, 10–11).
2. Please refer to Leon (2015) for excellent discussion on measures of competition in banking and their advantages and disadvantages.
3. Due to the problem of data availability, the H statistic developed by Panzar and Rosse (1987) is not used in the article.
4. The results are not reported to conserve space. However, they are available upon request from the authors.

Acknowledgments

Earlier version of this article was presented at the *14th Annual BMEB International Call for Papers and Webinar Sessions* (Online) at Jakarta, Indonesia, 27-28 August 2020. We would like to thank the participants for useful comments. We are particularly grateful to Prof. Dr Chun-Ping Chang from Shih Chien University, Taiwan, for his careful reading and constructive criticism. The usual caveat applies. Last but not least, we would like to thank the anonymous reviewers for their insightful comments and suggestions. The usual caveat applies, however: The authors alone are responsible for any remaining mistakes and imperfections.

The data that support the findings of this study are available from the corresponding author, Edib Smolo, upon reasonable request.

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