Does market power fuel the systemic stability of alternative financial systems?

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Does market power fuel the systemic stability of alternative financial systems?

Abstract

This paper examines the bidirectional relationship between competition and systemic risk in dual financial systems where Islamic and conventional financial institutions operate side by side. Using a sample of publicly listed financial institutions from the Asia-Pacific, Gulf Cooperation Council (GCC), and Middle East and North Africa (MENA) regions from 2000 to 2019, we estimate systemic risk through ΔCoVaR and competition using the Lerner index. Employing a panel vector autoregressive framework, we analyze how this relationship evolves across different economic phases, with particular focus on the Global Financial Crisis (GFC). We find that lower competition is consistently associated with reduced systemic risk, with this effect being stronger—by approximately 25%—in conventional financial institutions. Notably, the competition–risk relationship is asymmetric and time-varying. Put simply, competition enhances stability pre-crisis, it amplifies systemic risk during the GFC, especially in the conventional sector. Post-crisis, this fragility effect persists in conventional institutions but dissipates in Islamic ones. Our findings contribute to the literature on competition, systemic risk, and comparative banking by highlighting how alternative financial models and economic conditions jointly shape financial stability.

Keywords: Islamic banking; Systemic risk; Competition; ΔCoVaR; Global Financial Crisis; Dual financial/banking systems; Panel VAR

1. Introduction

Islamic finance has emerged as a key player in the increasingly diversified global financial landscape, particularly within dual financial systems where Islamic and conventional financial institutions operate side by side. Rooted in Shariah principles and guided by the broader objectives of Islamic law (*Maqasid al-Shariah*), Islamic finance emphasizes ethical conduct, social responsibility, and justice in financial dealings. It prohibits interest (*Riba*), gambling (*Gharar*), and investment in harmful or non-permissible sectors, advocating instead for risk-sharing, transparency, and equitable treatment of all stakeholders (Jatmiko et al., 2024). A catalytic factor in its growth has been its relative resilience during the 2008 Global Financial Crisis (GFC), when Islamic financial institutions managed to "weather the storm"—a result attributed both to their favorable financial indicators and lower interconnectedness with the conventional markets (Alexakis et al., 2021; Beck, Demirgüç-Kunt, et al., 2013; Čihák & Hesse, 2010; Sorwar et al., 2016). This resilience, coupled with growing global demand for ethical and sustainable investment options, has driven the sector's substantial expansion over the past three decades, particularly in the South and Southeast Asia, and Middle East and North Africa (MENA) regions (Abuzayed et al., 2018).

The *interconnectedness* of financial markets received pronounced attention from regulators and investors in the period that followed the GFC. It then became evident that the distress or failure of certain financial institutions could trigger significant spillover and cascading effects across the broader financial system (Acharya et al., 2012). This effect, where distress in one institution adversely impacts others, leads to such entities being classified as highly systemic. The recognition of systemic institutions and their potential to destabilize the entire financial system prompted a reassessment of risk management measures and practices, ultimately leading to the development of formal systemic risk measures.

On the other hand, the interconnectedness of financial markets has increased overtime, a trend driven in part by the deregulation of financial services and technological innovation. Deregulation has allowed financial institutions to operate freely across markets and borders, and to expand their range of services. More recently, advances in technology have further accelerated financial market integration. This increased interconnectedness has intensified competition among financial institutions competing for clients and capital. Indeed, competitive markets have long been regarded essential for economic growth, promoting efficiency, innovation, and resource allocation (Beck, 2008; Beck et al., 2010; Cetorelli & Gambera, 2001; Dick & Lehnert, 2010; Rice & Strahan, 2010). However, greater competition also raises challenges, such as banking sector instability (Beck, De Jonghe, et al., 2013), or increased risk transmission due to the close links within modern financial markets.

Against this background we motivate our paper that explores the interplay between competition and systemic risk within a financial/economic framework where alternative financial systems coexist and compete both among themselves and with each other. Furthermore, we investigate how the competition–systemic risk relationship varies across economic periods for these financial systems.

This is an important question as in many countries, Islamic and conventional financial institutions hold comparable market shares and play prominent roles. Islamic banks, in particular, command significant shares of total banking assets across various regions. For example, in the Middle East, Islamic banks hold market shares of 21% in Bahrain, 22% in Jordan, 56% in Kuwait, 29% in Qatar, 75% in Saudi Arabia, and 23% in the UAE. In Southeast Asia, Malaysia's Islamic banking sector accounts for 32%, while Pakistan and Bangladesh hold 20% and 21%, respectively (Islamic Financial Services Board, 2024). However, due to several differences between the two financial systems, it is important to examine them both collectively as a combined sector, but also separately within their respective sectors. This allows us not only to compare and contrast the systemic risk posed by each type of institution, but also to evaluate their respective contributions to the stability of the entire financial system.

To estimate systemic risk at the bank-level we employ the change in the conditional value at risk method (ΔCoVaR) (Adrian & Brunnermeier, 2016), while we capture competition through the Lerner index of market power. We model the dynamic interplay between systemic risk and competition through a panel vector autoregressive framework, controlling for institutional-level and country-level factors. We focus on the economic phases of the GFC, a representative example of an endogenous financial crisis originating within the financial system. Our sample comprises publicly listed Islamic and conventional financial institutions from the Asia-Pacific, the GCC, and the MENA regions over the period 2000–2019. We end our sample in 2019 to avoid distortions from the COVID-19 pandemic, an exogenous shock fundamentally different from structurally driven crises like the GFC.

Our analysis challenges the competition-stability relationship, showing that reduced competition is consistently linked to lower systemic risk and greater financial stability across the full financial sector. This negative relationship holds in both Islamic and conventional sectors, with the effect being significantly stronger—by about 25%—in the conventional sector. These results provide robust empirical support for an asymmetric impact of competition on systemic risk between conventional and Islamic financial institutions. Our investigation into the GFC reveals that the relationship between competition and systemic risk varies across economic periods. Before the crisis, increased competition was associated with greater financial stability in both Islamic and conventional sectors, with the effect being about twice as strong in the Islamic sector. However, during the GFC, this association reverses, supporting the competition-fragility relationship. Heightened competition increases systemic risk, especially in the conventional sector, where the effect is roughly twice as large. Post-crisis, the competition-fragility effect persists and even strengthens in the conventional sector, but dissipates in the Islamic sector, where competition no longer significantly affects systemic risk. These findings highlight the asymmetrical and time-varying nature of competition's impact on financial stability across sectors and economic phases.

Our paper mainly contributes to the literature on bank competition and risk. First, it relates to ongoing discussions about the dynamic interplay between competition and risk, specifically whether increased competition exacerbates risk (competition-fragility relationship) or mitigates it (competition-stability relationship) (Anginer et al., 2014; Ariss, 2010b; Beck, De Jonghe, et al., 2013; Berger et al., 2009; Boyd & De Nicolo, 2005; Keeley, 1990; Martinez-Miera & Repullo, 2010). We add to this work by extending stand-alone financial risk measures (e.g., insolvency risk, credit risk, liquidity risk, and market risk) using a systemic risk measure (ΔCoVaR), which captures the broader impact of individual institutions on the stability of the entire financial system and aligns with the current regulatory focus on systemic stability and financial resilience.

Second, our paper is also related to literature that compares alternative banking models (Islamic/conventional) across a wide range of outcomes, such as performance, financial risk, competition, efficiency convergence, payout policy and corporate governance (Abedifar et al., 2013; Alamad et al., 2021; Alexakis et al., 2021; Alqahtani et al., 2017; Baele et al., 2014; Baldwin & Alhalboni, 2023; Beck, Demirgüç-Kunt, et al., 2013; Duqi et al., 2020; Farag et al., 2018; Izzeldin et al., 2021; Mamatzakis et al., 2023; Mollah & Zaman, 2015; Quttainah et al., 2013; Rizkiah et al., 2021; Virk et al., 2022; Sorwar et al., 2016). Closely related to our work, Ariss (2010a) investigates the impact of competition on profitability differences between Islamic and conventional banks; Leon (2015) examines its consequences for credit constraints; Meslier et al. (2017) explore its impact on deposit rates; and Ernaningsih et al. (2024) examine the impact of competition and banking regulation on the systemic risk of Islamic and conventional banks (as standalone sectors). We complement these studies by examining the bidirectional relationship between competition and systemic risk in countries where Islamic and conventional banks operate side by side and are subject to mutual competitive pressures.

Third, we add to the strand of literature that examines how economic periods affect the competition–risk relationship (Beck et al., 2006; Jiménez et al., 2013) and the performance and resilience of Islamic and conventional banks (Abedifar et al., 2013; Alexakis et al., 2019, 2021; Beck, Demirgüç-Kunt, et al., 2013; Sorwar et al., 2016).

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and develops testable hypotheses. Section 3 presents the econometric methodology, and Section 4 describes the data. Section 5 presents and discusses our empirical results, while Section 6 reports the robustness checks. A final section concludes.

2. Literature Review and Hypotheses Development

2.1 Research Hypotheses and Theoretical Motivation

The relationship between bank competition and financial stability has been the subject of extensive academic debate, centered around two competing hypotheses: the competition–fragility and competition–stability. The competition–fragility hypothesis (Keeley, 1990) posits that increased competition pressures banks to assume greater asset risk and reduce capital buffers, thereby weakening financial stability at the bank level. The underlying mechanism is that competition erodes banks' charter value by diminishing their pricing power and undermining stable customer relationships.

Boyd and De Nicolo (2005) challenge the competition–fragility view by introducing a reverse causality mechanism. They argue that while banks in more concentrated markets enjoy greater pricing power, which can lead to higher lending rates, this in turn increases borrower default risk and reduces overall financial stability. They argue that higher competition leads to lower lending rates and, as a result, improves borrower solvency, thus supporting the competition–stability hypothesis.

Some studies refine the debate by suggesting a non-linear relationship between competition and stability. Martinez-Miera and Repullo (2010) report a U-shaped relationship, where moderate competition initially increases risk, but further competition improves borrower solvency. Conversely, Clark, Mare et al. (2018) find a hump-shaped link between market power and stability in EU cooperative banks, indicating that both low and high levels of competition can undermine stability.

Within this theoretical framework, a growing body of empirical research has sought to test the competition–risk nexus, providing support for either the competition–fragility or competition–stability hypothesis. These studies employ a range of competition proxies and risk measures, often incorporating various moderating factors. Berger et al. (2009), Davis et al. (2020) and González (2023) find that increased competition reduces the financial stability of institutions, thus supporting the competition–fragility view. Fu et al. (2014) explore this relationship in the Asia-Pacific region using both accounting-based (z-score) and market-based (probability of bankruptcy) measures of risk. Similarly, Ariss (2010b) investigates the role of bank cost efficiency as a moderating factor in the competition–fragility relationship, focusing on developing economies.

On the other hand, many studies lend support to the competition–stability hypothesis. Claessens and Laeven (2004) use the Panzar and Rosse H-statistic across 50 countries to examine how bank competition relates to regulatory environments. They find that increased ease of foreign entry and reduced regulatory barriers enhance financial stability through improved product quality, innovation, and operational efficiency. Similarly, Noman et al. (2017) examine commercial banks in ASEAN countries, employing multiple competition proxies (H-statistic, Lerner index, Herfindahl-Hirschman Index) and risk measures (z-score, non-performing loan ratio, capitalization ratio), and find evidence supporting the competition–stability hypothesis. Goetz (2018) explores the effects of banking deregulation on market entry and finds that greater competition reduces bank failure probabilities and non-performing loans, further supporting the competition–stability view. Clark, Radić et al. (2018) investigate transition economies in the Commonwealth of Independent States and likewise find evidence that supports the competition–stability hypothesis. In the MENA region, Elfeituri (2022) shows that higher competition and lower market concentration contribute to greater bank stability. Claessens and Laeven (2005) also demonstrate that increased banking competition fosters faster growth in financially dependent industries across 16 countries, reinforcing the case for the competition–stability relationship.

A distinct strand of the literature moves beyond individual bank risk and examines systemic risk. Some of these studies employ formal systemic risk indicators, such as Leroy and Lucotte (2017), who analyze the relationship between bank competition (proxied by the Lerner index) and systemic risk, measured using the SRISK framework (Brownlees & Engle, 2016), across European listed banks. They find evidence supporting the competition–stability hypothesis. However, when replacing the systemic risk metric with a bank-specific risk measure, their results no longer hold, suggesting that systemic risk may respond differently to competition than traditional individual bank risk measures. Similarly, Hirata and Ojima (2020) use the ΔCoVaR measure (Adrian & Brunnermeier, 2016) to assess systemic risk among Japanese banks and find evidence supporting the competition–fragility hypothesis.

Other studies propose alternative systemic risk indicators. Anginer et al. (2014) develop a measure based on Merton's Distance to Default, adjusted for correlation in banks' risk-taking behavior, and find that increased competition enhances stability. Earlier approaches relied on systemic crisis datasets, such as the one of Demirgüç-Kunt and Detragiache (2005), which

Schaeck et al. (2009) use within a survival analysis framework to study how competition influences systemic fragility.

A common feature across much of this literature is the near-exclusive focus on (conventional) commercial banks, with relatively little attention to alternative banking/financial models. This is an important omission in countries operating dual-financial systems, where Islamic and conventional financial institutions coexist, often competing in overlapping markets while adhering to fundamentally different business models and principles. This leads us to the first testable hypothesis.

HYPOTHESIS 1: Competition-systemic stability nexus

Competition adversely affects the systemic risk of the overall financial sector, as well as its separate Islamic and conventional sectors, consistent with the competition–systemic stability hypothesis.

While Hypothesis 1 examines the relationship between competition and systemic risk across the full financial system and within its Islamic and conventional sectors, Hypothesis 2 explores potential asymmetries in this relationship. The distinct characteristics of Islamic and conventional institutions, in terms of operational principles, risk-sharing arrangements and regulatory frameworks, suggest that competition may not affect both sectors equally. In other words, a competition shock may pose a greater systemic risk to one sector than the other, depending on how each absorbs and transmits competitive pressures. Identifying such asymmetric effects is essential for informing sector-specific policy responses, particularly in jurisdictions where Islamic institutions hold systemic importance. This leads us to the second testable hypothesis.

HYPOTHESIS 2: Asymmetric competition–systemic stability nexus

The effect of competition on systemic risk is asymmetric between Islamic and conventional sectors.

Building on Hypotheses 1 and 2, Hypothesis 3 considers whether the competition–stability relationship varies over time, particularly across major economic disruptions. One such disruption was the GFC, which significantly altered the structure, behavior, and risk dynamics of financial systems worldwide. Given their distinct business models, Islamic and conventional institutions have responded differently to crisis. Therefore, the competition–stability relationship may not only shift across economic phases (pre-crisis, during-crisis, post-crisis), but also do so in sector-specific ways. Understanding this temporal and institutional variation is critical for assessing the resilience and policy needs of dual financial systems. This leads to our third hypothesis:

HYPOTHESIS 3: *Competition–systemic stability nexus across economic phases*

The impact of competition on systemic risk varies across economic phases (pre-crisis, during-crisis, post-crisis), with differential effects for Islamic and conventional sectors.

2.2 Islamic Finance and ESG

Islamic finance, though founded on faith-based principles, exhibits significant alignment with the objectives of environmental, social, and governance (ESG) frameworks. The higher objectives of Islamic law (*Maqasid al-Shariah*) highlight the preservation of wealth (Māl), life (*Nafs*), and environment (Hifẓ Al-bi`ah), inherently promoting social justice, ethical governance, and environmental stewardship (Dusuki & Bouheraoua, 2011). Shariah-compliance mandates the exclusion of industries deemed harmful to society, such as alcohol, gambling, and tobacco, and prohibits interest-based dealings (riba), reflecting ethical screening criteria analogous to those in ESG investment standards (Jatmiko et al., 2024). Furthermore, Islamic finance emphasizes risk-sharing, transparency, and wealth redistribution (through mechanisms like *Zakat*), which relate to the broader ESG agenda of fostering sustainable and inclusive economic development (Alghafes et al., 2024). As such, even in the absence of formal ESG certification, Islamic financial institutions often achieve ESG-equivalent outcomes through their inherent ethical and operational structures.

Recent scholarship has extended this alignment to innovative asset classes. Ali et al. (2022) explore gold-backed Islamic cryptocurrencies, such as OneGram and X8X, and demonstrate their effectiveness as safe-haven assets for Islamic equity markets during periods of heightened uncertainty. Similarly, Ali et al. (2024) propose a screening methodology for identifying "green" (energy-efficient) cryptocurrencies and find that assets like Cardano and Tezos provide significant diversification benefits in ESG-compliant portfolios. These studies illustrate how Islamic finance principles are being embedded into emerging financial instruments, broadening the scope of ethical investing. However, they largely focus on asset-level co-movements, hedging properties, and portfolio diversification benefits, reflecting a micro-level perspective on ESG integration. By contrast, the present study adopts a macro-institutional perspective, analyzing the systemic implications of competition within dual financial systems. Specifically, it investigates how the structural differences between Islamic and conventional institutions influence systemic risk transmission under competitive pressures. This approach extends beyond the portfolio-centric focus of prior research to address a critical gap in the literature: the competition–stability nexus and its implications for financial stability in economies where dual financial systems coexist. Such a systemic perspective offers novel insights into the resilience and sustainability of Islamic financial institutions within the broader context of global financial systems.

2.3 Dual banking systems: related literature

This section reviews the literature on dual banking systems, with particular emphasis on comparative evidence on risk, competition, and stability across Islamic and conventional financial institutions (for a broader survey, see, Hassan and Aliyu, 2018).

A substantial body of empirical research comparing the stand-alone financial risks of Islamic and conventional banks generally concludes that Islamic banks exhibit greater financial resilience and lower default risk, particularly during and after the 2008 GFC (Alexakis et al., 2019; Čihák & Hesse, 2010; Gheeraert, 2014; Poledna et al., 2015; Sorwar et al., 2016). In contrast, a more limited but growing strand of literature focuses on systemic risk within dual banking systems. For example, Hashem and Giudici (2016) employ network-based modelling to examine systemic interconnections between Islamic and conventional banks in the MENA region. Similarly, Chakroun and Gallali (2017) use the Marginal Expected Shortfall (MES) framework suggested by Acharya et al., (2017) to compare systemic risk across Islamic and conventional banks operating in six Middle Eastern countries, providing further evidence that risk transmission differs across the two banking segments. More recently, Khurram et al. (2025) also examined the systemic stability of conventional and Islamic financial institutions over the period 2000-2019 in South, South-East Asia and MENA regions using conditional value-at-risk (ΔCoVaR) measure (Adrian and Brunnermier, 2016). They reported an asymmetric systemic relationship i.e. the conventional system is a dominant source of risk transmission to the Islamic system, which in turn poses less of a threat back to the conventional one.

Parallel to the systemic risk literature, a large body of work examines competition in dual banking markets, with mixed evidence. Some studies find that Islamic banks exhibit lower market power than conventional banks (Ariss, 2010a; Meslier et al., 2017), while others, such as Weill (2011), find no significant difference in market power between the two bank types. Importantly, Meslier et al. (2017) show that competition affects pricing behavior differently across the sectors. Specifically, conventional banks with stronger market power tend to drive deposit rates down, whereas conventional banks with lower market power set higher deposit rates—especially in dual banking markets. In contrast, Islamic banks do not exhibit similar pricing responses. This suggests that, at the local level, conventional banks are influenced by competition from Islamic banks, but Islamic banks are mainly affected by their own sector peers. Globally, Islamic and conventional banks tend to operate in segregated markets, indicating that competition occurs predominantly within rather than between these two sectors.

The competition–stability/fragility relationship in dual financial markets has so far been examined only in the context of stand-alone risk. Louati and Boujelbene (2015) investigate the link between competition and financial stability among Islamic and conventional banks in the MENA and Southeast Asia regions. They find evidence supporting a positive relationship between competition and financial stability, with bank size playing a significant, but differing, moderating role across the two banking models. Kabir and Worthington (2017) use both an accounting-based z-score and a market-based Merton's distance-to-default model as risk proxies and find empirical support for the competition–fragility hypothesis. Similarly, Ibrahim et al. (2019) employ non-performing loans to measure risk within Malaysia's dual banking system. Their results support the competition–stability hypothesis for the conventional sector while also revealing cross-sector effects where the market structure of Islamic banks increases risk in the conventional sector and the reverse holds as well. In the GCC context, Albaity et al. (2021) examine the relationship between banking risk and competition and uncover a U-shaped relationship, with Islamic banks found to be less stable than their conventional counterparts.

In addition, the literature also relies on parallel samples and quasi-natural-experimental settings to isolate structural differences between Islamic and conventional finance under otherwise comparable institutional environments. Using loan-level data for the same borrowers receiving both Islamic and conventional financing, Baele et al. (2014) provide evidence that Islamic loans default significantly less than conventional loans, attributing this difference to contractual design rather than borrower risk. Quttainah et al. (2013) show that Shariah screening operates as a natural governance constraint that significantly reduces earnings management relative to conventional banks, while Pappas et al. (2017) document, using survival analysis, that Islamic banks exhibit higher survival probabilities than conventional banks, particularly during periods of systemic distress. Most recently, Khurram et al. (2025) exploit Pakistan's religious prohibition of gambling and lotteries as a natural experiment and show that stocks investable by Islamic funds exhibit significantly different idiosyncratic volatility premia and lower gambling-like investment behavior relative to non-Islamic stocks. Collectively, these studies reinforce the view that Islamic and conventional financial systems exhibit structurally different risk-taking and stability characteristics even when operating under the same macroeconomic and regulatory environment.

3. Methodology

3.1 The ΔCoVaR measure of systemic risk

Market data-driven systemic risk measures capturing the conditional tail dependency across institutions include Systemic Expected Shortfall (SES) and Marginal Expected Shortfall (MES) (Acharya et al., 2017), a conditional capital shortfall measure of systemic risk (SRISK) (Brownlees & Engle, 2016), and ΔCoVaR (Adrian & Brunnermeier, 2016) among others. In this study, we adopt ΔCoVaR as our preferred systemic risk metric due to its distinct strengths in capturing the dynamic between individual institutions and the broader financial system. ΔCoVaR stands out by measuring the co-movement in risk between a single institution and the entire financial sector, thus offering insight into how stress in one entity may propagate through the system. Unlike SES and MES, which focus primarily on institutional risk in isolation, ΔCoVaR provides a clearer view of systemic interlinkages. Furthermore, ΔCoVaR directly quantifies an institution's contribution to systemic risk by assessing the shift in system-wide risk when that institution experiences distress, offering a more direct measure than SES, MES, or SRISK. Its foundation in value-at-risk principles also makes its interpretation more accessible and actionable for stakeholders.

ΔCoVaR is chosen for its bank-specific, forward-looking (countercyclical) nature and its ability to capture both cross-sectional and temporal tail dependencies between individual institutions and the financial system. As a reduced-form, market-based measure, ΔCoVaR effectively captures tail-dependent co-movements in asset returns, making it a valuable tool for assessing systemic risk (Adrian & Brunnermeier, 2016; Y. Cao, 2021; López-Espinosa et al., 2012). Here, we discuss the systemic risk measure, ΔCoVaR, which is derived from the well-known VaR measure. It measures financial institutions' systemic risk contribution by conditioning market events on financial institutions' events. In particular, the one-period-ahead, q% (quantile) VaR for institution j, is denoted as $\mathrm{VaR}^{j}_{q,t+1|t}$ and for which is true that:

$$\Pr\left(r_{j,t+1} \leq \mathrm{VaR}^{j}_{q,t+1|t}\right) = q\% \tag{1}$$

where $r_{j,t+1}$ is the (return) loss of institution j for which the $\mathrm{VaR}^{j}_{q,t+1|t}$ is defined. In line with Adrian and Brunnermeier (2016), the VaR of institution j conditional on a particular event $\mathbb{C}(r_{i,t+1})$ for institution i, is denoted as $\mathrm{CoVaR}^{j|i}_{q,t+1|t}$, defined by the q% quantile of the conditional probability distribution and for which is true that:

$$\Pr\left(r_{j,t+1} \leq \mathrm{CoVaR}^{j|i}_{q,t+1|t} | \mathbb{C}(r_{i,t+1})\right) = q\% \tag{2}$$

A common choice of the conditioning event is that a VaR violation is observed in institution i, namely $r_{i,t+1} \leq \mathrm{VaR}^{i}_{q,t+1|t}$. Such a conditioning event highlights the role of CoVaR in modelling tail-event linkages in financial institutions. Common choices for q% are 95% and 99%. In our analysis, we employ a more restrictive 99% level and omit q from subsequent notation to reduce notational clutter.[1] The ΔCoVaR quantifies the risk contribution in an institution j, of events happening in institution i, by measuring the difference in CoVaR between a stressed institution i (i.e., when the conditioning event is true) and a normal (median) institution i. More formally:

$$\Delta \mathrm{CoVaR}_{t+1|t}^{j|i} = \mathrm{CoVaR}_{t+1|t}^{j|\mathrm{VaR}(i)} - \mathrm{CoVaR}_{t+1|t}^{j|\mathrm{Med}(i)} \tag{3}$$

where $\mathrm{CoVaR}_{t+1|t}^{j|\mathrm{VaR}(i)}$ denotes institution's j VaR when a VaR violation is observed for institution i, and $\mathrm{CoVaR}_{t+1|t}^{j|\mathrm{Med}(i)}$ denotes institution's j VaR in normal times when institution's i returns (losses) equal its median (q = 0.50). For illustrative purposes, we have discussed the case of two financial institutions (i, j); a more interesting case is institution i's contribution to the financial system stability. Expanding the notation, we set j = FS (financial system) so that $\Delta \mathrm{CoVaR}_{t+1|t}^{FS|i}$ measures the difference in VaR conditional on institution i being under stress, and the market VaR conditional on institution i experiencing a normal time.

For each institution, we compute financial returns using daily closing prices, denoted as $r_{t+1} = -(\Delta P_{t+1}/P_t)$. We express them as negative returns (losses) to obtain a positive ΔCoVaR that can be interpreted as an increase in the systemic risk, given the distress of the institution i. It is customary to present the downside risk (−VaR) outcomes in positive values (López-Espinosa et al., 2012). For the financial system return (losses), we use lagged market equity-weighted returns of individual financial institutions, represented by r_{t+1}^{FS}.

[1] We reintroduce q in specific instances to avoid potential confusion.

To estimate systemic risk, we adopt the approach of Adrian and Brunnermeier (2016) by utilizing quantile regressions and lagged state variables. The state variables are not the systemic risk factors themselves; rather, they serve as mean and volatility conditioning variables for risk measures. Quantile regression is the simplest and most efficient method to measure ΔCoVaR, compared to other techniques such as GARCH (Girardi & Ergün, 2013) or maximum likelihood estimation (Z. Cao, 2013).[2] The two quantile regressions, denoted as Eq(4) and Eq(5), are estimated using monthly data alternatively for (i) the full financial sector (using both the Islamic and conventional financial institutions), (ii) the Islamic financial sector, (iii) the conventional financial sector.

$$r_{t+1}^{i} = \alpha^{i} + \beta^{i} SV_{t-1} + \varepsilon_{t}^{i} \tag{4}$$

$$r_{t+1}^{FS} = \alpha^{FS|i} + \beta^{FS|i} SV_{t-1} + \gamma^{FS|i} r_{t+1}^{i} + \varepsilon_{t}^{FS|i} \tag{5}$$

Eq(4) represents the quantile regressions of the financial institution *i* equity returns $\left(r_{t+1}^{i}\right)$ and lagged state variables (SV_{t-1}). Eq(5) represents the quantile regressions of the financial sector's equity returns as a function of lagged state variables and the financial institution *i* equity returns.

The estimated values from Eq(4) and Eq(5) are used to obtain VaR and CoVaR as follows:

$$VaR_{t+1}^{i} = \hat{\alpha}^{i} + \hat{\beta}^{i} SV_{t-1,} \tag{6}$$

$$CoVaR_{t+1}^{FS|i} = \hat{\alpha}^{FS|i} + \hat{\beta}^{FS|i} SV_{t-1} + \hat{\gamma}^{FS|i} VaR_{t+1}^{i} \tag{7}$$

Finally, the ΔCoVaR of each institution is computed by subtracting the CoVaR estimate at the extreme quantile $(q = 0.99)$ from the CoVaR estimate at the median quantile $(q = 0.50)$ as shown in Eq(8).

$$\Delta CoVaR_{0.99,t+1|t}^{FS|i} = CoVaR_{0.99,t+1|t}^{FS|i} - CoVaR_{0.50,t+1|t}^{FS|i} \tag{8}$$

[2] For details, please refer to Koenker and Hallock (2001).

3.2 The Lerner index measure of competition

The Lerner index is employed as an inverse proxy for the level of competition among financial institutions across our sample countries. It captures market power, defined as the ability of institutions to set prices (e.g., loan rates) above marginal cost. Unlike structural measures that rely on concentration ratios and assume a competition-concentration trade-off (Phan et al., 2019), the Lerner index offers a time-varying, firm-level indicator (Leroy & Lucotte, 2017), making it a more precise reflection of competitive behavior. Importantly, the Lerner index is one of the few measurable indicators of market power that varies at the bank level and serves as a proxy for both current and expected future profits stemming from pricing power. This makes it well-aligned with the theoretical concept of a bank's franchise value. In contrast, measures like market share may reflect not only pricing power but also rents associated with too-big-to-fail status, making them susceptible to measurement error (Gan, 2004). Moreover, the Lerner index has the added advantage of capturing pricing power on both the asset and funding sides of a bank's balance sheet and does not require the specification of a geographic market, unlike market share or concentration-based measures. The index ranges from 0 under perfect competition to 1 under monopoly. Accordingly, higher Lerner Index values reflect lower competition. Our estimation follows the established literature (Anginer et al., 2014; de Guevara et al., 2005; Leroy & Lucotte, 2017). Given estimates of price and marginal cost, the Lerner Index can be computed annually for each bank as follows:

$$Lerner_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}} \quad (9)$$

where $P_{i,t}$ is proxied by the ratio of total revenue (the sum of interest income, non-interest income and other operating income) to total assets. Since banks use a mix of interest and fee-generating financial products, we use both interest and non-interest revenues consistent with the literature (Anginer et al., 2014; Beck, De Jonghe, et al., 2013). The marginal cost, $MC_{i,t}$, is estimated using a translog cost function (explained in the Appendix). The Lerner index is estimated alternatively for (i) the full financial sector (using both the Islamic and conventional financial institutions), (ii) the Islamic financial sector, (iii) the conventional financial sector.

3.3 Panel VARX Model: Competition–Systemic Risk Nexus

To examine the dynamic interplay between systemic risk and competition, we adopt a panel vector autoregressive model with exogenous variables (pVARX), following the frameworks of Lütkepohl (2005). Specifically, we estimate

$$\mathbf{Y}_{i,t} = \sum_{p=1}^{m} \mathbf{A}_p \mathbf{Y}_{i,t-p} + \sum_{q=1}^{s} \mathbf{B}_p \mathbf{X}_{i,t-q} + \mu_i + \varepsilon_{i,t} \tag{10}$$

Where $\mathbf{Y}_{i,t} = \left[\Delta CoVaR_{i,t}, Lerner_{i,t}\right]'$ is a 2×1 vector of endogenous variables for bank i at time t. The matrix $\mathbf{A}_p$ includes the coefficients for the lagged endogenous variables. $\mathbf{X}_{i,t}$ denotes a vector of exogenous control variables, including contemporaneous bank-level factors and lagged country-level institutional variables, and $\mathbf{B}_p$ includes the coefficients for the exogenous variables. μ_i captures unobserved bank-specific fixed effects, $\varepsilon_{i,t}$ is a vector of idiosyncratic errors.

We estimate the pVARX system using the System Generalized Method of Moments (System-GMM) estimator developed by (Arellano & Bover, 1995; Blundell & Bond, 1998). This method is well-suited for dynamic panel data with lagged dependent variables, potential endogeneity, and fixed effects. In particular, we follow the implementation described in Abrigo and Love (2016), which allows for efficient estimation of panel vector autoregressions using GMM in short T, large N settings. We also cluster standard errors at the bank level to address potential serial correlation and heteroskedasticity across panels.

4. Data and Sample

The dataset includes a total of 376 publicly traded financial institutions. These consist of 126 Islamic and 250 conventional institutions and span 12 countries and nine financial sectors. The countries are Bahrain, Bangladesh, Egypt, Indonesia, Jordan, Saudi Arabia, Kuwait, Malaysia, Pakistan, Qatar, Singapore, and the United Arab Emirates. The sectors covered comprise banks, consumer finance, diversified financial services, brokerage and investment companies, insurance services, Islamic banks, Islamic insurance, Islamic Modarabas, and real estate investment firms. These nations host significant numbers of both Islamic and conventional financial institutions, providing a strong foundation for analyzing dual-financial systems.[3] The period under study extends from 2000 to 2019, capturing major economic events including two recessions, financial crises in 2000 and 2008, and the European debt crisis alongside the U.S. credit rating downgrade in 2011.[4]

To address potential misclassification of Islamic financial institutions in the database (Abedifar et al., 2013; Čihák & Hesse, 2010; Gheeraert, 2014), we rely on industry classifications from the Global Industry Classification Standard (GICS) and Bloomberg Industry Classification Standard (BICS) for identifying IFIs. Specifically, we use the two GICS sub-categories—"Is Islamic (IDeal ratings)" and "Is Islamic (Shariah)"—which are widely accepted global standards for classifying Islamic institutions.[5] Additionally, all Islamic financial institutions

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[3] Most of our sample countries host banks that have Islamic banking windows or branches, controlled and managed by the same administration. However, they are required by their regulators to maintain clear segregation ("ring fencing") of Islamic activities, funds, governance, and disclosures so that the Shariah integrity is not compromised and the prudential oversight remains robust (State Bank of Pakistan, 2024).

[4] Our study focuses only on financial events (such as the 2008 GFC). Therefore, we limited our sample period to 2019, coinciding with the onset of the COVID-19 crisis. Our sample time-period is similar to the one used in Ernaningsih et al (2024). This approach ensures that our results are not influenced by non-financial exogenous events such as COVID-19, as we purposely exclude such events from the study. We thank the anonymous referee(s) for their comment on the choice of sample period.

[5] The former category refers to securities issued by companies that comply with Shariah laws according to IDeal Ratings' general screening criteria, while the latter pertains to equities certified as Shariah-compliant at a specific point in time. This certification typically requires the firm to have a Shariah board—comprising Islamic scholars—responsible for overseeing and ensuring ongoing compliance with Islamic law.

are manually verified through their company profiles and management structures.[6] Institutions that do not meet compliance criteria are excluded from the sample. We also exclude financial institutions with missing data or fewer than three years of observations for the variables related to systemic risk and competition. To eliminate the impact of outliers we winsorize all variables at the 5th and 95th percentiles.

A detailed country and industry breakdown is shown in Panel A of Table 1. Malaysia and Kuwait have the highest number of Islamic financial institutions in the sample. These institutions operate across various financial sectors beyond Islamic banks, Islamic insurance, and Islamic Modarabas. Overall, commercial banks and insurance services represent the largest share of financial institutions in the dataset. Panel B of Table 1 reports summary statistics by country for the variables used in the ΔCoVaR estimation. To capture time variations in the conditional moments of asset returns, we include six country-specific state variables: (i) the monthly change in the three-month Treasury yield; (ii) the monthly short-term TED spread (the difference between the 3-month LIBOR rate and the 3-month secondary market T-bill rate); (iii) the monthly equity index return; (iv) the monthly stock market volatility, measured by the 22-day rolling standard deviation of daily equity index returns; and (v) the monthly Consumer Price Index (CPI) as a proxy for inflation. Panel C of Table 1 reports summary statistics by country for the variables used in the Lerner index estimation.

[Table 1 around here]

In our competition-systemic risk nexus regressions we include time-varying bank-level controls and country-level institutional variables. These variables are: *bank size*, measured as the logarithm of total assets (Beck, De Jonghe, et al., 2013; Goetz, 2018); *profitability*, captured

[6] According to regulatory authorities and the Islamic Financial Services Board, an institution is deemed Islamic if it has an independent Shariah supervisory board (SSB) and a qualified Shariah supervisor. We verify this by reviewing Islamic banks' websites for SSB presence and examining their financials for any interest-based dealings.

by return on assets (ROA), calculated as net income over total assets (Anginer et al., 2014; Meslier et al., 2017); *operational efficiency*, proxied by the cost-to-income ratio, reflecting operating expenses relative to total income (de Guevara et al., 2005; Meslier et al., 2017); *liquidity*, defined as the ratio of liquid assets to total assets, included due to its role in the risk-competition nexus, since distressed banks often face liquidity shortages (Imbierowicz & Rauch, 2014; Leroy & Lucotte, 2017; Phan et al., 2019); and *credit risk*, measured by the ratio of non-performing loans to interest income, a critical determinant of financial stability (Beck, Demirgüç-Kunt, et al., 2013).

In addition, we incorporate country-level macroeconomic and regulatory variables to capture external influences on the relationship between systemic stability and competition. These include *inflation*, proxied by the Consumer Price Index (CPI) growth rate to reflect macroeconomic imbalances (Leroy & Lucotte, 2017; Meslier et al., 2017); *real GDP growth*, representing economic expansion (Weill, 2011); and *economic freedom*, which has been linked to risk and stability dynamics. Following Berger et al. (2009) and Fu et al. (2014), economic freedom is captured through three exogenous indices: financial freedom, property rights, and business freedom. Financial freedom measures the availability of diversified financial services to businesses; property rights gauge the legal protections for private property essential for investment and employment; and business freedom assesses the ease of starting and operating a business without excessive government interference. These indices range from 0 (no freedom) to 100 (maximum freedom). Given that the impact of regulatory and macroeconomic variables materializes with a delay (a "time-to-build" effect as per Love and Zicchino (2006) we include lagged values of these country-level variables in our analysis.

We source our data from a variety of databases. The market equity and accounting data are obtained from Bloomberg and DataStream. The macroeconomic variables are sourced from Bloomberg, the International Financial Statistics database of the IMF, and the World Bank.

Data on economic freedom indicators are taken from the 2020 Index of Economic Freedom published by the Heritage Foundation.

To investigate how the competition–systemic stability relationship varies across economic phases, we extend our pVARX model (Equation 10) by introducing *Crisis* (2008–2010) and *Post-crisis* (2011–2019) dummy variables, interacting them with the endogenous variables ΔCoVaR and the Lerner index.[7] This approach enables us to capture the impact of the GFC on the competition–systemic risk nexus.

Table 2 presents the descriptive statistics of the endogenous (ΔCoVaR and Lerner index) and exogenous bank-level variables for the full sample (Panel A), Islamic sector (Panel B) and conventional sector (Panel C). Panel D presents the descriptive statistics for the country level variables. Islamic and conventional institutions are of comparable size suggesting that differences in systemic risk are unlikely to be driven by size.[8] However, Islamic institutions exhibit higher operating efficiency, but lower profitability and liquidity compared to their conventional counterparts. To ensure the suitability of our panel time series data for analysis, we apply Augmented Dickey-Fuller (ADF) tests to both endogenous and exogenous variables. These results, reported in Appendix Table A1, confirm that all series are stationary whether assuming common or individual unit root processes.

[Table 2 around here]

[7] In the literature, the GFC is typically defined as occurring in 2008–09 (Poledna et al., 2015). However, we extend this to 2010, as its effects persisted in the Asia-Pacific region, affecting the real economy in subsequent years. Olson and Zoubi (2017) showed that Islamic banks in this region faced delayed impacts, with recovery lagging until 2011–2014, well beyond the initial shock in the US and EU.
[8] The comparable size is confirmed using a Welch's test.

5. Empirical results

5.1 Univariate results

Panel A of Table 3 presents the summary statistics of the daily estimates of systemic risk (ΔCoVaR) for the full financial sector (using both the Islamic and conventional financial institutions), the Islamic financial sector, and the conventional financial sector. The systemic risk estimates suggest that Islamic financial institutions exhibit higher systemic risk within their own sector, on average, than conventional financial institutions within theirs (0.514 vs. 0.494). Put simply, the Islamic sector demonstrates higher levels of systemic risk compared to the conventional sector. However, the systemic risk estimate for the full financial sector is significantly lower (0.485) than that of either individual sector, suggesting that the coexistence of Islamic and conventional institutions reduces overall systemic risk. This suggests that the presence of Islamic institutions alone, without conventional counterparts, may increase systemic risk and vulnerability. Therefore, regulators should exercise caution when designing financial systems based solely on alternative models that exclude conventional frameworks.

Panel B of Table 3 presents the summary statistics of the Lerner index estimates for the full financial sector (using both the Islamic and conventional financial institutions), the Islamic financial sector, and the conventional financial sector. The mean Lerner index for the full financial sector (0.103) is comparable to previous findings, such as 0.116 for a sample of banks in the ASEAN-5 countries (Noman et al., 2017), 0.124 for a global sample of banks (Beck, Demirgüç-Kunt, et al., 2013), and 0.180 for a sample of conventional and Islamic banks (Kabir & Worthington, 2017). In our analysis, the similar Lerner indices of the Islamic sector and the conventional sector (0.11 vs. 0.12) suggest that competition levels are comparable within each financial sector on average across the countries. These findings are consistent with Weill (2011) and Meslier et al. (2017). However, cross-country analysis (see Figure 1) reveals variation where in some countries (Egypt, Kuwait, the UAE), the Islamic sector is significantly more competitive than the conventional sector, while in others (Jordan, Qatar), the opposite holds true.

[Table 3 around here]

During the GFC, conventional financial institutions exhibited significantly higher systemic risk than the Islamic ones, as illustrated in the time-series graph of ΔCoVaR measures (Panel A of Figure 2). In the post-crisis period, the systemic risk of the two financial systems converges. Panel B of Figure 2 reveals a similar trend for the competition, where during the 2008 GFC, there is increased volatility around the market power of either sector. In the post-crisis period, and unlike the systemic risk, competition shows a clear separation with the Islamic sector being less competitive.

[Figure 2 around here]

5.2 Multivariate results

Table 4 presents the estimated coefficients and standard errors from equation 10 for the full financial sector in columns (1) and (2), the Islamic financial sector in columns (3) and (4), and the conventional financial sector in columns (5) and (6) that feature institutional-level, and both institutional- and country-level control variables, respectively. The Hansen J-statistics indicate that the instruments used are valid and the models are correctly specified. In addition, the models were confirmed to be stable, with companion matrix moduli strictly less than one, indicating that the processes are stationary and invertible (see Figure 3). This ensures the models have valid infinite-order vector moving average representations, with time-invariant statistical properties.

[Table 4 around here]

[Figure 3 around here]

Columns (1) and (2) of Table 4 contradict our competition-stability hypothesis (H1). The coefficient on the lagged Lerner index is negative and significant across all specifications, indicating that reduced competition is associated with lower systemic risk and enhanced financial stability.

A comparative analysis of columns (3) and (4) with columns (5) and (6) yields similar results, further challenging the competition-stability hypothesis. In both Islamic and conventional sectors, financial stability appears to improve as competition decreases, as evidenced by the consistently negative and significant lagged Lerner index across all specifications. Comparing the marginal effects of the two financial sectors reveals that this relationship is more pronounced in the conventional sector. Specifically, in column (6) the coefficient on the lagged Lerner index is -0.032 (95% CI: -0.030, -0.032), compared to -0.025 (95% CI: -0.029, -0.025) in column (4) for the Islamic sector. The difference is statistically significant, suggesting that competition has a stronger impact on systemic risk in the conventional sector. This implies that the financial stability of conventional institutions benefits more, by approximately 25% (=ln(-0.032/-0.025)), from lower levels of competition. These findings provide empirical support for our second hypothesis (H2), which posits an asymmetric effect of competition on systemic risk between the two financial sectors.

Institutional-level controls significantly affect systemic risk and competition. Within the conventional sector, systemic risk is mainly driven by profitability, whereas in the Islamic sector, liquidity plays a more critical role. Size, operating efficiency and liquidity are key drivers of competition dynamics within the Islamic sector. By contrast, in conventional sector, competition is driven primarily by operating efficiency. Among country-level factors, financial freedom, business freedom, inflation, and real GDP growth are key determinants of competition in both sectors. However, competition in the Islamic sector is more sensitive to changes in real GDP growth and inflation than in the conventional sector.

5.3 The impact of the GFC

We proceed to investigate how the competition–systemic stability relationship varies across economic periods by interacting the *Crisis* and *Post-Crisis* dummy variables with the endogenous variables ΔCoVaR and the Lerner index within our pVARX model.[9] Table 5 presents the related estimated coefficients and standard errors for the full financial sector in columns (1) and (2), the Islamic financial sector in columns (3) and (4), and the conventional financial sector in columns (5) and (6) that control for institutional-level, and both institutional- and country-level factors, respectively. In the bottom part of the table we report the p-values of the total effect of a variable during and after crisis (p-values of the lagged pre-crisis + crisis or post-crisis coefficients) for pVARX models.

[Table 5 around here]

Columns (1) and (2) of Table 5 suggest that the rejection of the competition–stability hypothesis has not been consistent across the period of our analysis. While the coefficient on the lagged Lerner index is negative and significant, its interactions with the Crisis and Post-Crisis dummies are positive. The aggregate effect is thus positive, indicating that reduced competition is associated with higher systemic risk during and after the crisis. More specifically, the full financial sector results offer empirical support for the competition–fragility relationship in the pre-GFC period, whereas in the post-GFC period, the evidence shifts to support the competition–stability relationship.

We proceed to investigate the two financial sectors individually, around the timing of the crisis. For either sector, the coefficient on the lagged Lerner index is positive and significant, indicating that reduced competition is associated with higher systemic risk. Therefore, the pre-

[9] For robustness, we re-estimate the models using equal-time dummies to define the crisis (2008–2010) and post-crisis (2011–2013) periods, with 2005–2007 as the pre-crisis baseline. The results remain consistent with the main findings presented in the paper.

GFC results suggest that the results provide evidence in support of the competition-stability relationship for either the Islamic or the conventional financial sector. Comparing the marginal effects of the two financial sectors reveals that this relationship is more pronounced in the Islamic sector. In other words, a 1% increase in competition improves financial stability by approximately twice as much in the Islamic sector compared to the conventional one (= 0.218 / 0.110).

During the GFC, the relationship no longer holds, giving way to the competition-fragility hypothesis. In particular, the coefficient on the interaction term between the Crisis dummy and the lagged Lerner index is negative and significant for either sector. Putting the direct and the interaction effects together, columns (4) and (6) suggest that the previously beneficial effect of competition on financial stability is reversed. That is, increased competition during the crisis amplified systemic risk, consistent with competition–fragility. Comparing the marginal effects of the two financial sectors reveals that this relationship is more pronounced in the conventional sector. In other words, a 1% increase in competition reduces financial stability in both sectors, with the effect being twice as strong for the conventional sector.

In the post-GFC period, the competition-fragility relationship continues to hold (and even strengthens) but only for the conventional sector. Taking both the direct and interaction effects into account, column (6) suggests that the marginal effect has increased by approximately 45% (= -0.081/-0.056) compared to its GFC level. In contrast, the Islamic sector exhibits signs of a retrenchment from the competition–fragility relationship. Based on columns (3) and (4), the combined effect of the direct and interaction terms suggests that changes in competition are no longer significantly related to systemic risk in the post-crisis period.

6. Robustness

As a robustness check, we adopt an alternative method for estimating systemic risk based on credit default swap (CDS) spreads, referred to as *CoRisk*. This approach was introduced in the 2009 *Global Financial Stability Review* by the IMF (Chan-Lau et al., 2009) and predates more recent systemic risk metrics such as ΔCoVaR. CoRisk quantifies interconnected risk by examining the co-movement in credit spreads across financial institutions, thereby capturing both direct and indirect exposures through shared vulnerabilities, such as similar risk management practices, business models, or macro-financial sensitivities. CDS spreads are frequently used in systemic risk analysis alongside other indicators like Moody's KMV expected default frequencies, distance-to-default measures, corporate bond spreads, and the value-at-risk (VaR) of trading portfolios (Chan-Lau et al., 2009). When CDS spreads reach the 95th percentile of their empirical distribution, this is generally interpreted as a signal of entry into a financial distress regime.

Following the methodology of Chan-Lau et al. (2009), the CDS spread of the financial sector at time t, denoted as $CDS_{FS,t}$, is modelled using a quantile regression framework as:

$$CDS_{FS,t} = \alpha_q^{FS} + \sum_{m=1}^{M} \beta_{q,m}^{FS} R_{m,t} + \beta_{q,i}^{FS} CDS_{i,t} + \varepsilon_{FS,t} \tag{11}$$

where $CDS_{i,t}$ represents the CDS spread of institution i at time t; $R_{m,t}$ are the macro-financial risk factors m; $\beta_{q,i}^{FS}$ captures the influence of institution iii on the financial sector's CDS spread at the q-th quantile; $\beta_{q,m}^{FS}$ reflects the sensitivity of the sector's CDS to each risk factor at the q-th quantile; $\varepsilon_{FS,t}$ is the stochastic error term.

The following macro-financial risk factors are employed: (i) Equity market volatility (computed as the 22-day rolling standard deviation of daily equity market returns); (ii) Equity risk premium (computed as the return of the equity market over the risk-free rate, proxied by the 3-month T-bills rate); (iii) the Short-term liquidity risk (measured by the TED spread, the difference between LIBOR and the 3-month T-bills rate); (iv) the 3-month T-bills yield change (calculated as the change in the 3-month T-bills yield from the previous period). We use monthly CDS data for our sample of financial institutions from Bloomberg for the period 2005-2019, and the data for the risk factors are sourced from Bloomberg and DataStream.

We compute the conditional CoRisk contribution of institution i to the financial sector as:

$$CoRisk_t^{FS|i} = 100 \times \left(\frac{\alpha_q^{FS} + \sum_{m=1}^{M} \beta_{q,m}^{FS} R_{m,t} + \beta_{q,i}^{FS} CDS_{i,t}(q)}{CDS_{FS}(q)} - 1 \right) \quad (12)$$

where $CoRisk_t^{FS|i}$ denotes the systemic risk contribution from institution i to the financial sector; $CDS_{FS}(q)$ is the CDS spread of the financial sector corresponding to the q-th percentile of its empirical distribution. In our analysis we set $q = 95\%$. CoRisk is estimated using Equation (12) alternatively for (i) the full financial sector (using both the Islamic and conventional financial institutions), (ii) the Islamic financial sector, (iii) the conventional financial sector.

To assess the robustness of our findings, we replicate the main analysis using CoRisk as an alternative measure of systemic risk, replacing the ΔCoVaR used in the baseline models. Table 6 presents the estimations using CoRisk and Lerner index of all financial institutions (Col 1 & 2), IBs (Col 3 & 4) and CBs (Col 5 & 6). The results broadly confirm the key insights and conclusions of the main paper.

[Table 6 around here]

Further, Table 7 presents the CoRisk and Lerner estimations for all, IBS and CBs including crisis and post-crisis interactions and support the earlier findings. Specifically, the CoRisk-based analysis supports the competition–fragility relationship. The findings also reinforce all three central hypotheses: (i) greater competition undermines financial stability; (ii) the effect of competition on systemic risk is *asymmetric* across financial sectors; and (iii) the relationship between competition and systemic risk is stronger among conventional financial institutions.

Post-crisis, the competition-fragility effect persists and even strengthens in the conventional sector.

[Table 7 around here]

7. Conclusion

This paper explores the dynamic and bidirectional relationship between competition and systemic risk in dual financial systems where Islamic and conventional institutions coexist and compete. Using a comprehensive dataset of publicly listed financial institutions from Asia-Pacific, GCC, and MENA regions between 2000 and 2019, we employ the ΔCoVaR measure of systemic risk and the Lerner index of market power to capture institutional-level risk and competition. Through a panel vector autoregressive framework, we analyze how these dynamics shift across economic periods, with a particular focus on the 2008 Global Financial Crisis.

Our study reveals a nuanced relationship between competition and systemic risk in financial sectors where Islamic and conventional institutions coexist. Overall, reduced competition is linked to lower systemic risk and greater financial stability, with this effect being notably stronger in conventional institutions. However, during the 2008 Global Financial Crisis, the dynamic shifts: increased competition correlates with heightened systemic risk, especially within the conventional sector. Before the crisis, competition tended to enhance stability, particularly in Islamic institutions, but this effect reversed during and after the crisis in the conventional sector, where competition continued to elevate systemic risk. In contrast, post-crisis Islamic institutions show no significant relationship between competition and systemic risk. These findings underscore the importance of considering both financial models and economic conditions when assessing the interplay between competition and financial stability.

From a policy perspective, our findings offer implications not only for the countries in our sample but also for other jurisdictions increasingly embracing Islamic finance, such as Türkiye, Nigeria, Kazakhstan, and the Philippines. We find that higher market power is associated with lower systemic risk, suggesting that regulators should monitor and manage the competitive dynamics within dual financial systems carefully. Regulatory tools that help maintain competition at sustainable levels, such as encouraging consolidation through mergers or bolstering market discipline, can enhance systemic resilience. Moreover, given the asymmetric effects across the two sectors, a differentiated regulatory and institutional framework that accounts for the distinct risk transmission channels of Islamic and conventional institutions is essential, especially during the crisis periods.

One can argue that the competition–risk relationship between Islamic and conventional financial institutions reported in this study is *asymmetric* and *time-varying* due to the dominance of retail investors in the MENA and Asian markets (Govern, 2016; OECD, 2025). Retail investors are usually more sensitive than institutional investors to bank performance, interest rate changes, market signals, news, and psychological factors (Che Hassan et al., 2023), and are influenced by biases such as overconfidence, loss aversion, herding, and fear or greed (Kahneman & Tversky, 1979; Barber & Odean, 2000; Kim & Ohk, 2025; Chuang & Lee, 2006). Rising banking risks and macroeconomic uncertainty further increase retail investor pessimism (Akyol & Basar, 2024). However, retail dominance alone does not explain the asymmetry between conventional and Islamic banks, observed post-GFC, where competition-fragility appears only for conventional banks. This could be due to the distinct *ownership structure* (Grassa, 2016; Zouari & Taktak, 2014; Srairi, 2013; Duqi et al., 2020) and *bank business model* (Sorwar et al., 2016; Pappas et al., 2017; Alexakis et al., 2021; Asutay et al., 2021; Akhtar et al., 2023) of the Islamic and conventional financial institutions. Thus, we argue that the higher sensitivity of retail investors helps explain the time-varying nature of the competition–risk relationship, while the concentrated ownership and distinct business model of Islamic banks likely drive the asymmetric behavior between conventional and Islamic banks.

Future studies could delve deeper into identifying institutional-level and country-level factors that significantly enhance the market power of financial institutions, thereby reducing competition and potentially strengthening systemic stability. Understanding these drivers can inform targeted regulatory interventions to mitigate systemic fragility. Additionally, future research could explore the competition–systemic risk relationship in the context of exogenous shocks beyond financial crises, such as the COVID-19 pandemic, to better understand how dual financial systems respond to diverse types of economic disruptions.

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Table 1. Sample composition and summary statistics

	Panel A: Distribution of institutions												Panel B. Systemic risk variables							Panel C. Lerner index variables			
	Islamic	Conventional	Full Sample	Commercial Banks	Consumer Finance	Diversified Fin.Services	Institutional Brokerage	Insurance Services	Islamic Banks	Islamic Insurance	Islamic Modaraba	Real Estate Investment	Equity Return (Losses)	System Return (Losses)	Δ(T-bills yield)	TED spread	Market return	Market volatility	Inflation	Total Assets	Total Cost	Price of labour and fixed capital	Price of borrowed funds
Bahrain	7	8	15	3	1	0	2	2	6	0	0	1	0.010	0.029	1.27	-0.25	0.21	3.04	14.25	6,468	85	0.50	0.50
Bangladesh	1	29	30	8	2	0	1	18	1	0	0	0	-0.020	0.028	4.09	-4.50	0.78	6.68	1.22	3,101	65	0.30	1.30
Egypt	2	11	13	6	0	0	3	2	2	0	0	0	0.050	0.028	0.59	-9.17	1.10	8.77	0.96	4,127	79	0.30	1.10
Indonesia	13	23	36	8	3	1	1	10	0	1	0	12	0.000	0.027	1.62	-4.70	1.01	5.61	8.16	4,354	108	0.60	1.10
Jordan	5	28	33	11	1	2	4	10	3	2	0	0	0.010	0.028	1.74	-1.49	-0.38	2.31	19.17	4,413	52	0.60	0.50
Kuwait	20	18	38	5	1	1	15	4	5	0	0	7	0.000	0.029	1.18	1.51	0.52	5.19	6.86	7,320	82	1.10	0.50
Malaysia	40	31	71	11	3	1	9	5	1	2	0	39	0.030	0.027	0.17	-0.94	0.00	0.03	10.38	16,273	172	0.70	0.40
Pakistan	14	42	56	12	6	1	6	17	2	0	12	0	0.040	0.028	0.47	-6.56	1.20	6.92	1.60	2,346	55	1.40	2.10
Qatar	6	9	15	4	0	1	0	4	3	1	0	2	-0.020	0.022	9.70	-0.16	0.19	6.82	15.08	16,695	149	0.70	0.40
Saudi Arabia	8	10	18	7	0	1	2	0	4	3	0	1	0.000	0.029	1.94	-0.07	0.59	6.60	-2.76	22,368	171	0.40	0.20
Singapore	1	17	18	3	4	2	5	3	0	0	0	1	0.000	0.027	2.07	0.92	0.14	4.74	42.95	64,616	428	0.50	0.30
UAE	9	24	33	14	0	2	0	9	5	1	0	2	0.000	0.019	2.57	-0.73	0.73	5.71	-2.71	15,483	135	0.50	0.40
Total	126	250	376	92	21	12	48	84	32	10	12	65											
Mean													0.008	0.026	2.28	-2.18	0.55	5.20	9.59	13,964	132	0.60	0.70

Notes: Panel A categorizes the sample financial institutions by country, type and industry. Panel B presents country-wise summary statistics, expressed as percentages, for daily equity returns (losses) (r_t^i) and financial system returns (losses) (r_t^{FS}), and monthly state variables that are used in systemic risk estimation. Panel C provides country-level summary statistics for the variables used in estimating the Lerner index. Total assets, total cost, and total revenue are reported in millions of USD.

Table 2. Descriptive statistics

	Mean	Std. Dev.	Min	Max	N
Panel A: Bank-level variables (Full sample)					
ΔCoVaR	0.44	0.24	-0.04	1.58	4,938
Lerner index	0.10	0.50	-6.83	7.98	7,920
Size (lnTA)	8.31	1.95	2.71	13.00	7,920
Profitability (ROA)	0.02	0.03	-0.60	0.19	7,587
Operating Efficiency	0.36	0.24	-1.62	2.26	7,919
Liquidity	0.09	0.08	0.00	0.57	7,875
Credit risk	3.31	4.60	0.21	122.00	4,917
Panel B. Bank-level variables (Islamic sector)					
ΔCoVaR	0.52	0.18	0.05	1.35	1,171
Lerner index	0.11	0.85	-3.29	14.90	1,960
Size (lnTA)	8.07	1.73	3.09	11.50	1,960
Profitability (ROA)	0.01	0.04	-0.15	0.19	1,880
Operating Efficiency	0.42	0.27	-0.42	1.53	1,960
Liquidity	0.09	0.08	0.01	0.48	1,957
Credit risk	3.97	3.68	0.25	28.90	1,166
Panel C. Bank-level variables (Conventional sector)					
ΔCoVaR	0.44	0.25	-0.09	1.62	3,767
Lerner index	0.11	0.53	-5.34	6.74	5,960
Size (lnTA)	8.39	2.01	2.71	13.00	5,960
Profitability (ROA)	0.02	0.03	-0.60	0.19	5,707
Operating Efficiency	0.35	0.22	-1.62	2.26	5,959
Liquidity	0.09	0.07	0.00	0.57	5,918
Credit risk	3.10	4.83	0.21	122.00	3,751
Panel D. Country-level variables					
Financial Freedom	51.49	13.70	20.00	90.00	7,885
Property Rights	51.11	17.10	20.00	98.40	7,868
Business Freedom	68.82	12.10	40.09	100.00	7,868
Inflation	0.05	0.81	-4.32	15.20	7,369
Real GDP growth	0.03	0.05	-0.20	0.32	7,920

Notes: Panels A, B, and C present descriptive statistics of bank-level variables for the full sample, the Islamic sector, and the conventional sector, respectively. For the Islamic and conventional sectors shown in Panels B and C, the bank-level endogenous variables are re-estimated using only the relevant institutions within each sector. Descriptive statistics for the bank-level exogenous variables are also calculated separately for each bank type in its respective panel. Panel D presents country-level exogenous variables.

Table 3. Systemic risk and competition estimates

	Mean	Std. Dev.	Min	Max	N
Panel A. Systemic risk					
Full	0.485	0.269	-0.330	2.170	48,550
Islamic	0.514***	0.186	-0.458	2.310	16,076
Conventional	0.494**	0.274	-0.509	2.210	32,474
Panel B. Competition					
Full	0.103	0.49	-6.80	7.98	7,921
Islamic	0.110	0.84	-3.29	14.98	1,960
Conventional	0.120	0.61	-5.33	24.1	5,961

Notes: The table reports the summary statistics of the estimated systemic risk measure (ΔCoVaR) (Panel A) and the Lerner index of competition (Panel B) for the full financial sector (using both the Islamic and conventional financial institutions), the Islamic financial sector, and the conventional financial sector. ***, **, * denote significance at the 1, 5 and 10% significance levels respectively for the pairwise Welch test comparison against the full financial sector.

Table 4. Panel VARX estimation results

	(1-All)		(2-All)		(3-IB)		(4-IB)		(5-CB)		(6-CB)	
	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner
ΔCoVaR (-1)	0.764***	-0.160	0.766***	-0.015	0.597***	0.199	0.571***	-0.234	0.869***	-0.094	0.886***	-0.102
	(0.029)	(0.252)	(0.028)	(0.153)	(0.033)	(0.132)	(0.034)	(0.124)	(0.020)	(0.086)	(0.033)	(0.077)
Lerner (-1)	-0.026***	0.329***	-0.020**	0.386***	-0.029***	0.108*	-0.025**	-0.042	-0.030**	0.416***	-0.032***	0.479***
	(0.010)	(0.150)	(0.008)	(0.069)	(0.010)	(0.055)	(0.013)	(0.050)	(0.011)	(0.067)	(0.014)	(0.058)
Size	0.017	0.481	0.006	0.216	-0.020	-0.747***	-0.025	-0.577***	-0.012	0.197***	0.005	0.044
	(0.036)	(0.413)	(0.029)	(0.166)	(0.027)	(0.116)	(0.024)	(0.102)	(0.021)	(0.041)	(0.018)	(0.054)
Profitability	0.158***	0.315	0.104***	-0.064	-0.021	-0.112	-0.024	-0.342*	0.078*	0.033	0.187***	-0.179
	(0.040)	(0.572)	(0.036)	(0.243)	(0.031)	(0.211)	(0.033)	(0.182)	(0.045)	(0.147)	(0.065)	(0.177)
Operating efficiency	-0.002	-0.148***	-0.000	-0.140***	-0.030	-0.927***	-0.032	-1.104***	0.002	-0.139***	-0.008**	-0.129***
	(0.003)	(0.032)	(0.002)	(0.015)	(0.029)	(0.135)	(0.027)	(0.153)	(0.027)	(0.012)	(0.004)	(0.013)
Liquidity	0.319**	-0.031	0.297**	0.029	0.058***	0.045***	0.093***	0.355***	-0.003	-0.162***	0.012	-0.026
	(0.131)	(1.462)	(0.129)	(0.868)	(0.016)	(0.007)	(0.015)	(0.081)	(0.010)	(0.039)	(0.013)	(0.044)
Credit risk	0.005*	0.018	0.009***	0.007	0.003*	0.024***	0.000	0.014**	0.000	-0.005	0.000	-0.021***
	(0.002)	(0.026)	(0.001)	(0.009)	(0.002)	(0.008)	(0.001)	(0.007)	(0.001)	(0.007)	(0.002)	(0.008)
Financial freedom (-1)			0.002	-0.120*			-0.030*	-0.019***			-0.013	-0.135***
			(0.012)	(0.070)			(0.023)	(0.005)			(0.008)	(0.031)
Property rights (-1)			-0.002	0.030			-0.014	0.006*			-0.010	-0.006
			(0.013)	(0.075)			(0.010)	(0.003)			(0.009)	(0.030)
Business freedom (-1)			0.014**	0.039			0.004	0.021***			-0.002	-0.059***
			(0.006)	(0.037)			(0.012)	(0.004)			(0.006)	(0.027)
Inflation (-1)			0.011***	0.019			0.025	0.038***			-0.005**	0.007*
			(0.001)	(0.012)			(0.051)	(0.014)			(0.002)	(0.003)
Real GDP growth (-1)			0.040	-0.175			0.158**	-0.644**			-0.002	-0.243*
			(0.047)	(0.306)			(0.074)	(0.275)			(0.056)	(0.126)
Observations	2,796		2,796		690		690		2,106		2,106	
Hansen J-test	0.118		0.203		0.403		0.494		0.108		0.165	

Notes: The table presents the pVARX estimations results (equation 10). The two dependent variables are the ΔCoVaR measure of systemic risk and the Lerner index of competition. the descriptions of these variables, we direct you to section 4. We apply GMM style estimations using lagged variables as instruments, account for panel fixed effects (Helmert transformations using forwards orthogonal deviations), time fixed effects (time demeaning), and specify the Newey-West heteroscedasticity and auto-correlation consistent (HAC) estimators of the variance co-variance matrix. The optimal lag length as per moments and model selection Schwarz-Bayesian information criterion is 1. Robust standard errors are reported in parentheses. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

Table 5. Panel VARX estimation results – The impact of GFC

	(1-All)		(2-All)		(3-IB)		(4-IB)		(5-CB)		(6-CB)	
	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner	ΔCoVaR	Lerner
ΔCoVaR (-1)	0.842***	-0.423***	-1.483	4.580	0.621***	0.329	0.702***	-0.096	0.903***	-0.330***	0.892***	-0.456***
	(0.028)	(0.078)	(1.011)	(3.255)	(0.075)	(0.269)	(0.055)	(0.382)	(0.018)	(0.064)	(0.019)	(0.054)
ΔCoVaR (-1) × Crisis	-0.136***	0.192***	2.406**	-5.166	-0.063	0.099	-0.095**	-0.402	-0.094***	0.062*	-0.053***	0.093***
	(0.015)	(0.040)	(1.109)	(3.576)	(0.041)	(0.161)	(0.041)	(0.309)	(0.014)	(0.036)	(0.015)	(0.034)
ΔCoVaR (-1) × Post-Crisis	-0.267***	0.334***	2.212**	-5.123	-0.089	0.257	-0.132**	-0.053	-0.073***	-0.075	-0.019	0.111
	(0.040)	(0.092)	(1.065)	(3.315)	(0.062)	(0.205)	(0.051)	(0.358)	(0.027)	(0.086)	(0.024)	(0.071)
Lerner (-1)	-0.035**	0.566***	-0.259***	0.899***	0.155**	0.352	0.218**	-0.448*	0.078***	0.579***	0.110***	0.769***
	(0.016)	(0.090)	(0.097)	(0.253)	(0.067)	(0.227)	(0.087)	(0.242)	(0.028)	(0.084)	(0.040)	(0.087)
Lerner (-1) × Crisis	-0.024	-0.149	0.257**	-0.574*	-0.188***	-0.177	-0.244***	0.445*	-0.127***	0.028	-0.166***	-0.356***
	(0.019)	(0.12)	(0.111)	(0.309)	(0.067)	(0.253)	(0.085)	(0.252)	(0.031)	(0.119)	(0.042)	(0.115)
Lerner (-1) × Post-Crisis	0.116***	-0.117	0.311***	-0.380	-0.164**	-0.241	-0.225***	0.405	-0.151***	0.136	-0.191***	-0.242**
	(0.027)	(0.114)	(0.094)	(0.268)	(0.066)	(0.216)	(0.086)	(0.247)	(0.032)	(0.112)	(0.043)	(0.110)
Observations	2,796		2,796		690		690		2,106		2,106	
Bank controls	Yes		Yes		Yes		Yes		Yes		Yes	
Macro controls	No		Yes		No		Yes		No		Yes	
Hansen J-test	0.100		0.444		0.143		0.187		0.110		0.230	
ΔCoVaR (-1) + ΔCoVaR (-1) × Crisis	0.000		0.007		0.000		0.106		0.000		0.000	
ΔCoVaR (-1) + ΔCoVaR (-1) × Post-Crisis	0.000		0.519		0.000		0.033		0.000		0.000	
Lerner (-1) + Lerner (-1) × Crisis	0.000		0.000		0.018		0.143		0.004		0.000	
Lerner (-1) + Lerner (-1) × Post-Crisis	0.000		0.000		0.644		0.331		0.000		0.000	

Notes: The table presents the pVARX estimations results (equation 10). The two dependent variables are the ΔCoVaR measure of systemic risk and the Lerner index of competition. Model (1) includes bank-level control variables. Model (2) further adds country-level lagged controls. For the descriptions of these variables, we direct you to section 4. The table also reports the p-values of the Hensen *J* test-statistic of over-identifying restrictions and the p-values of the total effect of a variable during and after crisis (p-values of the lagged pre-crisis + crisis or post-crisis coefficients) for pVARX models. We apply GMM style estimations using lagged variables as instruments, account for panel fixed effects (Helmert transformations using forwards orthogonal deviations), time fixed effects (time demeaning), and specify the Newey-West heteroscedasticity and auto-correlation consistent (HAC) estimators of the variance co-variance matrix. The optimal lag length as per moments and model selection Schwarz-Bayesian information criterion is 1. Robust standard errors are reported in parentheses. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively. For brevity purposes, we do not report the coefficients and standard errors of the bank-level and country-level control variables.

Table 6. Robustness analysis: Panel VARX with CoRisk

	(1-All)		(2-All)		(3-IB)		(4-IB)		(5-CB)		(6-CB)	
	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner
CoRisk (-1)	0.286^{***}	-0.110^{**}	0.069^{*}	-0.067	0.275^{***}	0.028	0.275^{***}	0.028	0.389^{***}	-0.107^{***}	0.196^{***}	0.016
	(0.041)	(0.051)	(0.040)	(0.053)	(0.069)	(0.053)	(0.069)	(0.053)	(0.026)	(0.020)	(0.031)	(0.022)
Lerner (-1)	-0.058^{**}	0.142^{*}	-0.075^{**}	0.171^{**}	-0.016^{**}	0.088	-0.016^{**}	0.088	-0.165^{***}	0.545^{***}	-0.056^{**}	0.521^{***}
	(0.021)	(0.076)	(0.033)	(0.072)	(0.068)	(0.086)	(0.068)	(0.086)	(0.029)	(0.040)	(0.027)	(0.063)
Observations	2,883		2,749		722		672		2,161		2,050	
Bank controls	Yes		Yes		Yes		Yes		Yes		Yes	
Macro controls	No		Yes		No		Yes		No		Yes	
Hansen J-test	0.110		0.200		0.721		0.109		0.218		0.145	

Notes: The table presents the pVARX estimations results (equation 10). The two dependent variables are the CoRisk measure of systemic risk and the Lerner index of competition. the descriptions of these variables, we direct you to section 4. We apply GMM style estimations using lagged variables as instruments, account for panel fixed effects (Helmert transformations using forwards orthogonal deviations), time fixed effects (time demeaning), and specify the Newey-West heteroscedasticity and auto-correlation consistent (HAC) estimators of the variance co-variance matrix. The optimal lag length as per moments and model selection Schwarz-Bayesian information criterion is 1. Robust standard errors are reported in parentheses. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively. For brevity purposes, we do not report the coefficients and standard errors of the bank-level and country-level control variables.

Table 7. Robustness analysis: The impact of GFC with CoRisk

	(1-All)		(2-All)		(3-IB)		(4-IB)		(5-CB)		(6-CB)	
	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner	CoRisk	Lerner
CoRisk (-1)	0.511***	-0.163***	0.777***	-0.498*	0.218*	0.996	-1.039	1.886	1.949***	-1.253	1.044***	-0.593***
	(0.051)	(0.053)	(0.163)	(0.279)	(0.132)	(0.125)	(6.855)	(9.530)	(0.456)	(0.804)	(0.153)	(0.191)
CoRisk (-1) × Crisis	-0.209***	0.207***	-0.860***	0.551*	-0.047	-0.100	0.101	-0.173	-1.750***	1.287	-0.691***	-0.567***
	(0.059)	(0.058)	(0.195)	(0.316)	(0.151)	(0.156)	(0.696)	(0.956)	(0.513)	(0.958)	(0.160)	(0.179)
CoRisk (-1) × Post-Crisis	-0.256***	0.240***	-0.654***	0.553*	-0.198	-0.094	1.060	-0.204	-2.106***	1.497	-1.031***	-0.764***
	(0.063)	(0.061)	(0.181)	(0.307)	(0.170)	(0.134)	(0.680)	(0.949)	(0.555)	(0.967)	(0.217)	(0.262)
Lerner (-1)	-0.190***	0.574***	-0.184*	0.173	-0.503*	-1.124***	-0.989**	2.938*	0.550***	0.481	0.351*	0.596***
	(0.067)	(0.108)	(0.108)	(0.188)	(0.328)	(0.419)	(0.959)	(1.530)	(0.202)	(0.312)	(0.206)	(0.170)
Lerner (-1) × Crisis	-0.312***	-0.238*	-0.271**	0.022	-0.528*	1.231***	0.102	-3.029**	-0.603***	-0.156	-0.370*	-0.226
	(0.071)	(0.141)	(0.107)	(0.204)	(0.333)	(0.443)	(0.097)	(1.542)	(0.188)	(0.332)	(0.201)	(0.209)
Lerner (-1) × Post-Crisis	-0.177**	-0.089	-0.104	0.137	-0.460*	1.360***	0.109	-0.295*	-0.642***	0.495*	-0.434*	0.621***
	(0.079)	(0.126)	(0.125)	(0.213)	(0.335)	(0.432)	(0.096)	(0.152)	(0.229)	(0.277)	(0.227)	(0.214)
Observations	2,883		2,749		722		672		2,161		2,077	
Bank controls	Yes		Yes		Yes		Yes		Yes		Yes	
Macro controls	No		Yes		No		Yes		No		Yes	
Hansen J-test	0.120		0.350		0.110		0.589		0.120		0.366	
CoRisk (-1) + CoRisk (-1) × Crisis	0.000		0.019		0.019		0.099		0.048		0.021	
CoRisk (-1) + CoRisk (-1) × Post-Crisis	0.000		0.000		0.000		0.299		0.017		0.085	
Lerner (-1) + Lerner (-1) × Crisis	0.004		0.000		0.532		0.021		0.024		0.016	
Lerner (-1) + Lerner (-1) × Post-Crisis	0.758		0.000		0.185		0.000		0.002		0.058	

Notes: The table presents the pVARX estimations results (equation 10). The two dependent variables are the CoRisk measure of systemic risk and the Lerner index of competition. Model (1) includes bank-level control variables. Model (2) further adds country-level lagged controls. For the descriptions of these variables, we direct you to section 4. The table also reports the p-values of the Hensen *J* test-statistic of over-identifying restrictions and the p-values of the total effect of a variable during and after crisis (p-values of the lagged pre-crisis + crisis or post-crisis coefficients) for pVARX models. We apply GMM style estimations using lagged variables as instruments, account for panel fixed effects (Helmert transformations using forwards orthogonal deviations), time fixed effects (time demeaning), and specify the Newey-West heteroscedasticity and auto-correlation consistent (HAC) estimators of the variance co-variance matrix. The optimal lag length as per moments and model selection Schwarz-Bayesian information criterion is 1. Robust standard errors are reported in parentheses. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively. For brevity purposes, we do not report the coefficients and standard errors of the bank-level and country-level control variables.

Appendix. Estimating marginal cost using a translog cost function

To obtain the marginal cost estimates needed for the Lerner index, we follow the standard practice in the banking literature (Beck, De Jonghe, et al., 2013; Berger et al., 2009), and adopt a **translog cost function**, which provides a flexible second-order approximation to any arbitrary cost function. We specify the bank's total cost (TC) as a function of bank output (Q) and a vector of input prices (w). Specifically, we estimate

$$\ln TC_{it} = \alpha_0 + \alpha_1 \ln Q_{it} + \frac{1}{2}\alpha_2 \ln Q_{it}^2 + \sum_k \beta_k \ln w_{k,it} + \sum_k \gamma_k \ln Q_{it} \ln w_{k,it} + \frac{1}{2}\sum_k \sum_l \beta_{kl} \ln w_{k,it} \ln w_{l,it} + \qquad (1)$$

Where the total cost is the sum of total interest, non-interest, personnel and other operating expenses, Q represents the bank's output, which is proxied by the total assets (Beck, De Jonghe, et al., 2013; de Guevara et al., 2005). The two input prices include: (i) the price of borrowed funds, computed as the ratio of interest expense to total assets (Leroy & Lucotte, 2017), and (ii) the price of labor and fixed capital, computed as the ratio of non-interest expense (sum of personnel and other operating expenses) to total assets. Since the data for personnel expense was not available, the two costs are aggregated together following the literature in dual financial markets (Meslier et al., 2017). Time and bank specialisation dummies are included to account for unobserved time and bank entity type fixed effects. To ensure that the cost function is derived from a well-behaved production function input price interactions are constrained to be symmetric, specifically: $\beta_{kl} = \beta_{lk} \forall k \neq l$. Homogeneity of degree one in input prices is obtained by imposing the following three restrictions: $\sum_{k=1}^{2} \beta_k = 1, \sum_{k=1}^{2} \gamma_k = 0$, and $\sum_{k=1}^{2} \beta_{kl} = 0\ \forall l$. The cost function is estimated with a constrained regression (Leroy & Lucotte, 2017). The estimated coefficients are used to compute the marginal cost as:

$$MC_{i,t} = \frac{\vartheta TC_{it}}{\vartheta Q_{it}} = \frac{\vartheta TC_{it}}{Q_{it}}\left(\hat{\alpha}_1 + \hat{\alpha}_2 \ln Q_{it} + \sum_k \hat{\gamma}_k \ln w_{k,it}\right) \qquad \text{(A1)}$$

When computing the Lerner indices for the Islamic and conventional sectors separately, we reestimate the marginal cost specifically for each sector.

Table A1. Panel unit root tests

	Levin, Lin & Chu	Im, Pesaran & Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
ΔCoVaR	-5.35*	-6.95*	603.46*	713.82*
ΔCoVaR (Islamic sector)	-6.15*	-7.94*	240.83*	283.60*
ΔCoVaR (Conventional sector)	-5.29*	-6.93*	474.14*	521.20*
Lerner index	-32.14*	-35.00*	1933.8*	2487.5*
Lerner index (Islamic sector)	-14.43*	-21.62*	605.32*	772.63*
Lerner index (Conventional sector)	-15.08*	-19.63*	1031.7*	1352.4*
Size (lnTA)	-19.40*	-7.43*	657.25*	762.48*
Profitability (ROA)	-59.71*	-18.17*	729.57*	794.5*
Operating Efficiency	-29.38*	-30.73*	1869.1*	2809.8*
Liquidity	-6.30*	-11.03*	696.09*	787.73*
Credit risk	-14.05*	-13.21*	562.66*	592.27*
Financial Freedom	-5.36*	-9.22*	537.23*	196.84
Property Rights	8.12	4.35	462.40*	278.5
Business Freedom	-2.77*	-2.69*	576.59*	247.53
Inflation	-48.82*	-50.6*	2934.8*	3404.7*
Real GDP growth	-10.33*	-33.32*	2102.2*	3381.9*

Notes: The table reports unit root tests for all the variables used in the analysis. ΔCoVaR is the change in the conditional value at risk method of systemic risk and the Lerner index of market power is used as a proxy of competition. These measures are computed for (i) the full financial sector (using both the Islamic and conventional financial institutions), (ii) the Islamic financial sector, (iii) the conventional financial sector. The null hypothesis of all unit root tests—namely, the Levin, Lin & Chu (LLC), Im, Pesaran & Shin (IPS) W-statistic, ADF-Fisher Chi-square, and PP-Fisher Chi-square—is that the series possesses a unit root. * denotes significance at 1% level.