Interbank market structure, bank conduct, and performance: evidence from the UK

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Abstract

We examine whether a concentrated interbank market stimulates bank collusion or monopolistic pricing towards enhancing performance. We explore this nexus by incorporating the role of bank conduct into the structure–performance paradigm. The results show that the interbank market structure provides a channel for banks to collude and engage in monopolistic pricing in the market for bank and business loans to consequently increase bank performance. Further, while the interbank market structure is both profit and cost efficient for non-conglomerate banks, it is cost efficient for foreign banks. Hence, collusion and other anti-competitive behaviours in the interbank market may exacerbate incentives for foreign and non-conglomerate bank entry. We also explored the theoretical and policy implications of these findings. Our results are robust to alternative measures of market structure, bank conduct and performance, and the use of a wide range of specifications and econometric models.

Keywords: market structure, bank conduct, performance, ownership, consolidation.

JEL Codes: G20, G21, G28

1. Introduction

Whilst banks compete against each other in the provision of loans to businesses in one (external) market, they also provide loans to each other in the other (interbank) market to support their investment operations and cushion liquidity shocks in the banking system (Mirzaei, Moore & Liu, 2013). The dual roles of banks as described above do not only lead to frictions in the lending markets but can also generate an inefficient allocation of resources, collusion and monopolistic pricing with implications for bank performance (Acharya et al., 2012; Bourke, 1989). From a theoretical standpoint, the market structure-performance relationship has been explained from the lens of the structure-conduct-performance (SCP) paradigm, which posits that banks in a concentrated market collude to charge higher loan rates, pay lower deposit rates, and earn higher profits (see Hannan, 1991). In further attempts to validate the SCP paradigm, several empirical studies have followed the theoretical studies and focused on the relationship between market structure and the bank loan rates, bank deposit rates and bank profit (Molyneux & Thornton, 1992; Berger, 1995; Mirzaei, Moore & Liu, 2013). These studies document that market structure matters for banks' power in setting interest rates and has palpable consequences for banks' profitability through monopoly pricing.

Despite the above, little systematic attention has been devoted to how a concentrated interbank market may stimulate collusion and affect performance. Yet, in the interbank market[2] setting, there has been recent evidence of reported cases of collusion by global banks to deliberately manipulate the LIBOR (Duffie and Stein, 2015; Coulter et al., 2017). According to Schrimpf and Sushko (2019), banks (i) low-balled their borrowing rates primarily to protect their reputation as creditworthy banks, and (ii) colluded on their submissions to benefit their derivatives traders by lessening their losses. When banks collude, they disrupt the relationship between bids and costs, with the objective of obtaining abnormal profits (Abranetz-Metz et. al., 2012). Arguably, the higher the concentration in a market, the greater the chances of collusion, and the UK banks have been traditionally concentrated in the hands of a few high-street banks. Indeed by 2010, the UK-originated banks were concentrated into four major banking conglomerates, Barclays, HSBC, Lloyds and the Royal Bank of Scotland, with several others who had limited ambitions or access to global capital markets becoming acquisition

[2] Interbank market is fundamental for the effective functioning of the financial system as banks provide liquidity support to each other to support the banking system and the overall economy.

targets (Shabani et al., 2015). This creates a fertile ground for greater collusion as banks continue to group together and use financial instruments to obtain mutual benefits with cost savings and increased profits (Silva et al., 2016). Moreover, Acharya and Merrouche (2009) reported that the UK banks' liquidity buffers experienced an upward rise of 30% in August 2007, leading to a rise in borrowing costs between banks and an almost complete drying up of liquidity in interbank markets beyond the very short maturities. Against the backdrop of the LIBOR scandal and the 2007/08 financial crisis, several policy measures (e.g., bank consolidations, international financial integration, privatisation, deregulation and financial reforms) have been implemented by regulatory authorities to ensure the stability of the banking sectors (Wheatley 2012; Afonso et al., 2019). Yet, we have relatively little understanding of the operations of interbank markets apart from the study of Acharya et al., (2012), which attempted to shed light on the sources of inefficiency arising from the market power of interbank markets.

Grounded in the above, this study sets out to examine whether the structure of the interbank market influences the behaviour/conduct of banks and ultimately their performance as captured via their profit and cost efficiencies. Finance theory documents that banks engage in financial operations in the interbank market to manage their costs and/or to increase their profits. As such, collusion or monopolistic pricing may ensure that larger banks often have better investment opportunities both within and outside the financial network. These large banks may have no incentives to lend to or deal with non-large banks. Where they do, they may charge a substantial spread to maintain financial operations with non-large banks, particularly where they have to forgo external opportunities in favour of opportunities in the interbank market. Creditor banks may also charge an extra spread, particularly where the debtor is in a stressed position or where dealings occur at the end of the day, a period during which banks have little flexibility for adjusting their daily reserve requirements at the Central Bank (Silva et al., 2016). In this respect, we expect that, by participating in interbank funding and investment decisions, the interbank market structure should be a factor that explains not only bank cost and profit efficiency but also, more importantly, the conduct/behaviour of banks. We contend that, by engaging in interbank operations, banks can also change their behaviour. However, while it may be individually advantageous for banks to collude or monopolise financial networks for abnormal gains, the resulting global network structure – the aggregated decisions of all the economic agents at once, and which has been proven to have a core-periphery structure – may be exposed to greater systemic risks.

Our results show the validity of the SCP in the context of the interbank market. Our findings suggest that the interbank market structure provides a channel for banks operating in the UK to collude in the market for bank and business loans. Specifically, the interbank market structure (i.e., degree of interbank concentration) affects bank conduct or behaviour via collusive and/or monopolistic pricing, and consequently increases bank performance (or efficiency level). Further analysis shows that the interbank market structure matters most for foreign banks' profit efficiency but for domestic banks' cost efficiency. However, the interbank market structure is both profit and cost efficient for non-conglomerate banks. Overall, collusion and other anti-competitive behaviours in the interbank market exacerbate incentives for foreign and non-conglomerate banks to enter, although domestic banks can still make profits by supplying liquidity to small banks that enter but lack liquidity.

We make the following contributions to the banking literature. First, this work fills a void by extending an SCP model in the context of the interbank market. Although some literature exists on how the SCP perspective strategically drives various aspects of firm performance (see e.g., Ralston et al., 2015; Khan et al., 2018), to the best of our knowledge, the SCP paradigm has not been applied to the interbank market research. Thus, this study is one of the first attempts to provide insights on whether the UK interbank market structure influences bank conduct and subsequently the performance (cost or profit efficiency) of trading banks. Second, we add to the literature on monopolistic/oligopolistic competition and collusion (e.g., Coccorese, 2009; Corbae and Gofman, 2019). We show how bank interactions and incentivised behaviour in one market may drive collusion in another market. The channel for collusion is not the same as for industrial organisations, given that non-financial institutions that are competitors cannot give 'loans' to themselves, but financial institutions such as banks can. Third, we overcome a key methodological problem of prior SCP studies (i.e., which ignore the role of bank conduct and use the direct concentration-performance relation to confirm SCP) (e.g., Berger and Hannan 1989; Weiss and Choi, 2008). We utilise an approach that incorporates the role of bank conduct in the structure-performance nexus to offer a valid test of the SCP paradigm[3]. The SCP paradigm postulates that the market structure drives the behaviour/conduct of banks, which consequently affects their performance. Thus, instead of the direct concentration-performance regression, we introduce 'bank conduct' as the mediating variable between market structure

[3] The approach mitigates the biases emphasised by prior studies. Whether higher bank performance or profitability is due to greater efficiency, collusion or product quality cannot be confirmed by merely relating market concentration to performance (or return) (Khan et al., 2018).

and performance. As such, we consider all three elements in the SCP paradigm (i.e., the structure, the conduct and the performance), a task yet to be achieved by the traditional SCP literature. We used alternative measures of market structure, bank conduct and performance, and a range of specifications and econometric models (GMM, bias-corrected estimator (BCE) – bootstrapping) to validate and ensure that our results are robust. Lastly, in line with recent work and developments, i.e., monitoring/scrutiny of consolidation activities (Akbar et al., 2017), we extend the narrow confines of the SCP by incorporating issues related to reforms and the UK's unique banking structure (i.e., ownership and consolidation). We show that, while the interbank market structure is both profit and cost efficient for non-conglomerate banks, it is cost efficient for foreign banks, thereby encouraging greater participation of foreign and non-conglomerate banks in financial networks. Further, banks with more female directors (i.e., diverse), and/or a long-serving board (i.e., tenure) are more likely to behave anti-competitively. Bank boards with long-tenured directors are subject to alignment with the management (Ji et al., 2021); hence, weakening the monitoring of bank decisions and stimulating anti-competitive conduct or behaviour. In contrast, where directors are also shareholders of the bank, this tends to mitigate anti-competitive bank conduct. Overall, we go beyond the normal SCP regression model to provide a more sophisticated and legitimate test for both the market-power and the efficient-structure hypotheses in an interbank setting.

The rest of the paper is organised as follows. Section 2 reviews the relevant literature and develops the study hypotheses. Section 3 describes the data and methodology. Section 4 discusses the empirical results and robustness tests. Section 5 offers some conclusions.

2. Theory and Hypotheses

2.1 The structure-conduct-performance (SCP) paradigm

The concept that market structure drives firm performance is grounded in the classical theory of the firm. Under a pure competitive model, an industry is characterised by a large number of firms, which increases market competition but decreases the concentration ratio (Smith, 1977). The decreased concentration ratio weakens firm profitability due to the presence of product homogeneity and insignificant market shares of each firm. Overall, firms cannot dictate market price as concentration of market share is absent (Simon, 1991). Thus, productive efficiency is attained when price equates the minimum average total cost for firms to generate normal profits. Conversely, in a pure monopoly or monopolistic competitive model, firms hold significant market shares, which empowers them to control product prices. Under this scenario, price surpasses the marginal cost/revenue for firms to generate sub-optimal production and/or supernormal profits (Krugman, 1979). In general, the SCP assumes that a highly concentrated market share implies greater market power, which enables banks to earn monopolistic profits (Ricardian rent). In sum, a causal nexus runs from market structure to the price-setting behaviour (conduct) of firms, and ultimately to profitability via the market power channel (Bain, 1951), hence initiating the SCP paradigm.

The monotonic relation between market structure and firm performance is supported by extant empirical literature (e.g., Weiss and Choi, 2008; Ralston et al., 2015). In the banking literature, the SCP paradigm is rooted in Mason (1939) and Bain's (1951) findings that greater market concentration enhances bank profitability. Specifically, the market structure (i.e., degree of concentration of banking firms) influences bank conduct or behaviour via collusive and/or monopolistic pricing, which consequently increases bank performance (Mirzaei et al., 2013). A highly concentrated market engenders a lower degree of competition, which leads to market inefficiencies (e.g., monopolistic pricing and abnormal profits) (Homma et al., 2014).

Over the years, developments on the subject originated two competing testable hypotheses: the traditional SCP (market-power hypothesis) and the efficient structure hypothesis (ESH). By the market-power hypothesis (Gilbert, 1984; Hannan, 1991), a bank's profitability is driven by the market structure and level of competition. Specifically, higher market concentration grants more market power to banks, which implies higher inefficiency (e.g., inability to minimise costs) without being forced out of the market (Fu and Heffernan, 2009). The lower (higher) the level of market competition (concentration), the higher the economic rent/profits for a bank. Hence, greater market concentration (i.e., market share) drives anti-competitive behaviours that are detrimental to consumers.

Like the SCP, the ESH theorises a positive structure-performance nexus. However, the ESH stresses the role of efficiency in the SCP paradigm (Peltzman, 1977). As such, bank profitability or performance is explained by the degree of cost and/or technology efficiency (Weiss and Choi, 2008). Efficient firms have greater market share because they have the ability to charge lower prices without sacrificing profitability. Specifically, their large size enables them to benefit from economies of scale. Accordingly, the ESH stresses that superior firm efficiency drives greater market share and is positively related to better performance. Bank efficiency should therefore represent the primary driver of market structure and performance because the most efficient banks will gain market share and earn higher economic profits (Homma et al., 2014). Both the traditional SCP and the ESH draw the same conclusion on a positive market power-profitability nexus. The key distinction, however, dwells on how market power can be attained in the first place. Hence, the traditional SCP treats market power as exogenous, which is driven by market concentration, whilst the ESH treats market power as attained through high market share by sustaining or increasing firm-specific efficiency.

Very efficient banks often have superior management and technology to increase profitability and market share, which in turn increase market concentration and market power (Weiss and Choi, 2008). The ESH can be further segregated into the X-efficiency (ESX) and scale-efficiency (ESS) (Berger, 1995). The ESX structure emphasises superior management, usage of superior technology, or other firm features that are important to a firm's success but are not equally distributed amongst all firms. Accordingly, banks that have better management and/or better technology (i.e., higher ESX) should have lower costs and higher profitability, which in turn should drive greater market share and concentration (Fu and Heffernan, 2009). The ESS, however, contends that the competency of management and production technical levels are similar, such that firms can only be differentiated based on economies of scale (Shepherd, 1983). Thus, a firm is scale efficient only if it operates at constant, rather than increasing or decreasing, returns to scale[4]. Thus, banks that have optimal scale economies will tend to have lower costs and earn greater profits, which will subsequently drive greater market share and concentration.

The key distinction between the SCP and the ESH rests in their recommended policy interventions. Where profitability is driven by market power, then anti-trust interventions may be socially beneficial, towards moving prices to competitive levels and attaining effective resource allocation (Khan et al., 2018). On the other hand, where greater efficiency drives profitability, then fragmenting efficient firms or restricting them from acquiring or merging with other firms may increase costs and consequently produce unfavourable product prices for consumers (Fu and Heffernan, 2009). Thus, believers in the traditional SCP treat antitrust and regulatory policy as socially beneficial whilst ESH proponents treat it as socially costly. Sheppard (1986) contends that market share and market efficiency combine to explain

[4] Banking institutions whose output levels are equivalent or similar to the minimum average cost/output may have superior scale efficiencies.

performance, whilst Sahile et al. (2015) stress that the market share and monopoly power relation is blurry.

2.2 Hypothesis development

Bank collusion increases when two competing banks hold sufficient resources to provide business loans. For instance, to avoid competition in the interbank context, trading bank A gives trading bank B a loan, and this consequently leads to bank A not having adequate funds to compete with bank B. If these banks are large and have greater reach, bank B effectively becomes a monopolist making monopolistic profits by rationing the supply of loans (Corbae and Gofman, 2019). The interbank loan from A to B is a credible commitment device that stimulates anti-competition conduct. Bank A gains from this commitment through the receipt of a higher interest rate on the interbank loan, which embodies a portion of the monopolistic profits earned by bank B[5]. Simply, banks that are competitive in lending to the non-financial sector but lack the ability to generate funds can borrow funds from banks (their colluded counterparts) with excess of liquidity on the interbank market, and thus obtain the required funds to supply credit to the non-financial sector. Against this background, both banks would still be acting along their business lines that allow them to have a comparative advantage and thus have increased credit portfolios. Moreover, Eisl et al. (2017) stress that the interbank reference rates are still susceptible to significant manipulation even under the current rate-setting process, given the greater concentration and collusion. Even when gains from interbank trade exist due to liquidity sharing, the welfare loss from collusion can outweigh the benefit (Corbae and Gofman, 2019). As such, bank profitability will continue to improve while cost efficiency reduces.

The notion that a financial network and its structure may influence bank efficiency is also shared across jurisdictions. Iori et al. (2008) argue that, during the pre-crisis, changes in the interbank network structure incentivised banks to increase the number of banks they borrowed funds from but restricted the number of banks they were willing to supply credit to. The change in bank conduct or behaviour is attributed to liquidity shortages faced by smaller banks as a result of the increase in credit demand by the non-financial sector. Along similar lines, Monticini and Ravazzolo (2014) show that interbank market frictions that resulted from the liquidity crises increased banks' ability to charge higher intraday interest rate spreads, and thus

[5] The interest charged or surplus received by the bank lending in the interbank market is dependent on its bargaining power.

created a platform for abnormal gains through arbitrage. Overall, the interbank market structure is inefficient in terms of risk-taking due to greater systemic risk exposures. These studies corroborate our contention that the interbank market structure influences bank conduct or behaviour via collusive and/or monopolistic pricing, consequently resulting in improvement in banks' performance or efficiency level. In line with the above discussions, we propose the following hypotheses:

H1: The interbank market structure significantly drives bank conduct via collusive and/or monopolistic pricing.

H2: Bank conduct significantly drives bank performance or efficiency level.

H3: The interbank market structure drives bank performance in the absence of bank conduct.

H4: The interbank market structure's effect on bank performance declines when bank conduct is introduced into the model.

3. Methodology

3.1. Data

We extracted financial data on individual banks from the Orbis Bank Focus database (Bureau Van Dijk). Our initial sample comprised 144 commercial banks in the UK. To stand a chance of inclusion in the analysis, a bank must have the data necessary to estimate cost and profit functions; and the data must span the period 2010 to 2020. We further excluded banks with no interbank loan data, leaving us with a final sample of 109 banks representing 76% of all the UK banks classified as commercial banks in Orbis. The second-stage analysis utilises an unbalanced panel due to some missing observations for some of the control variables.

3.2. Estimation method

Guided by Baron and Kenny's (1986) methodological approach on mediation, we specified four assumptions that must be satisfied if market structure (concentration) explains bank performance via the conduct of the banks. These are (i) market structure must significantly drive bank conduct, (ii) bank conduct must significantly drive bank performance, (iii) market structure must drive bank performance in the absence of bank conduct, and (iv) the market structure's effect on bank performance should reduce when the bank conduct variable is introduced into the estimation model. Our estimated regression equations are as follows:

$$Conduct_{i,t} = \alpha + \beta_1 Structure_{i,t} + \beta_2 X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \quad (1)$$

$$Performance_{i,t} = \alpha + \beta_1 Structure_{i,t} + \beta_2 X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \quad (2)$$

$$Performance_{i,t} = \alpha + \beta_1 Structure_{i,t} + \beta_2 Conduct_{i,t} + \beta_3 X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \quad (3)$$

where i denotes the ith bank and t denotes fiscal year. X_{it} is the vector of the control variables, α and β are parameters, ω_i is a firm-specific effect, and μ_t is a year fixed effect. To control for possible heteroscedasticity and autocorrelation within firms, the estimated standard errors of the regression coefficients are clustered at the firm level.

To validate our results, we also followed the literature (e.g., MacKinnon et al., 1995; Khan et al., 2017) to verify the indirect effect of interbank market structure on bank performance. We estimated the Sobel, Aroian and Goodman test scores (z-value) to confirm the significance/insignificance of the indirect (mediated) effect. These tests utilise the product of the coefficient approach by estimating the product of two coefficients – outcome regressed on the mediator, and mediator regressed on the predictor – and are tested for significance. The null hypothesis to validate these tests requires that the indirect effect is not significantly different from zero. Although these test results are sometimes acceptable, they may not always work well when the indirect effects are positively skewed and kurtotic (Fritz et al., 2012). Consequently, the z-test and p-values for the indirect effects may not be reliable. Therefore, to obtain the asymmetric confidence intervals for the mediated effect, we proceeded to estimate the bootstrap standard errors and the percentile, bias-corrected, and bias-corrected and accelerated confidence intervals with 5,000 replications.

3.3. Measurement of variables

3.3.1. Bank performance

We used the parametric frontier techniques to measure bank-specific relative performance. The commonly used parametric technique – the Stochastic Frontier Approach (SFA) – measures the efficiency with which banks utilise their inputs to produce a given set of outputs (Fu and Heffernan, 2009). The parametric techniques, unlike the non-parametric techniques (e.g. DEA), allow for the specification of a stochastic term that mitigates any biases that arise from random events and measurement errors (Kumbhakar and Lovell, 2003). We utilised the Battese and Coelli (1995) methodology to compute separate cost and profit efficiency scores for our sample of commercial banks. Specifically, we estimated the cost frontier as:

$$\ln C_{i,t} = f\left(q_{i,t}, w_{i,t}, t: \ \beta\right) + \ \left(\ln \gamma_{i,t} + \ \ln \mu_{i,t}\right) \tag{4}$$

$$i = 1, \dots \dots, N \ and \ t = 1, \dots \dots, T$$

where ln $C_{i,t}$ represents the total cost of the *i*th bank at time *t*, $q_{i,t}$ is the vector of outputs, $w_{i,t}$ is the set of input prices, and *t* is the time trend incorporated to capture disembodied technical progress. β denotes the vector of unknown parameters to be estimated. The error term is segregated into two components (i.e., $\gamma_{i,t}$ and $\mu_{i,t}$), where $\gamma_{i,t}$ represents the autonomous and identically distributed random error that is expected to be independent of $\mu_{i,t}$ and distributed as $N\left(0, \sigma_{v,i}^2\right)$. The $\mu_{i,t}$ represents the inefficiency component, which is a non-negative variable that captures the bank's cost inefficiency and is autonomously distributed with truncation at zero. We estimated Eqn. (4) via the translog specification (see Eqn. (A1) in Appendix A). Traditionally, the inefficiency component and random error term can be multiplicatively separated from the estimated cost function.

The cost efficiency score is interpreted as the ratio of the actual cost incurred by the firm to the minimum attainable cost level, given the cost frontier (see Eqn. (A2) in Appendix A). Simply, it is the percentage of costs/resources that have been utilised efficiently, such that a score of 0.90 would imply that a bank is 10% less cost efficient relative to the best-practice bank operating under the same conditions. Following the work of Shaban et al. (2014), we measure and define the key variables in the cost frontier. Total operating costs (C_i) is the summation of interest expenses, salaries and employee benefits, and other operating costs. The output (q_i) variables comprise loans (q_1) measured as gross loans less any reserves allocated for non-performing loans; and securities investments (q_2). The input prices (w_i) comprise the cost of capital (w_1) measured as interest expenses scaled by total deposits; cost of physical capital (w_2) measured as overhead expenses (other than personnel expenses) scaled by book value of fixed assets; and cost of labour (w_3) measured as personnel expenses scaled by number of employees. In order to ensure linear homogeneity, the dependent variable and the input prices are normalised. Lastly, we incorporated a quasifixed input via the level of equity to control for differences in bank risk preferences (Shaban et al., 2014).

To measure a bank's relative profit efficiency, we used the Berger and Mester (1997) alternative profit frontier estimator. The standard assumption is that banks employ the given output quantities and input prices to maximise profits by adjusting the output prices and input quantities. Often, the alternative profit frontier is superior to the standard profit frontier, especially where differences exist in the quality of the banking outputs and/or the output markets are not competitive (Shaban and James, 2018). Accordingly, we estimated the profit frontier as:

$$\ln P_{i,t} = f\big(q_{i,t}, w_{i,t}, t : \ \beta\big) + \ \big(\ln \gamma_{i,t} + \ \ln \mu_{i,t}\big) \qquad (5)$$

$$i = 1, \dots\dots, N \ and \ t = 1, \dots\dots, T$$

where ln $P_{i,t}$ is profit before tax (PBT) for ith bank at time t; and $q_{i,t}$, $w_{i,t}$, $\gamma_{i,t}$ and t are outputs, inputs, random error and time trend respectively. $\mu_{i,t}$ represents the inefficiency component, which is a non-negative variable that enters the model with a negative sign. Thus, inefficiency should decrease profit. We removed negative profits (losses) in the sampled banks by transforming the dependent variable $P_{i,t}$ by estimating $P_{i,t}$ = $P_{i,t}$ + $|(P)_{min}$ where $(P)_{min}$ denotes the minimum absolute value of PBT over all sampled banks. Again, we estimated Eqn. (5) via the translog specification (see Eqn. (A3) and (A4) in Appendix A). Table 1 reports the summary statistics for the basic variables utilised to estimate the profit and cost efficiency scores.

INSERT TABLE 1 ABOUT HERE

From the estimated bank-level cost efficiency scores (CE score) and profit efficiency scores (PE score), we generated the bank-level cost efficiency ranks (CE rank) and profit efficiency ranks (PE rank) by ranking the CE and PE scores across all the sampled banks. Inherently, the efficiency ranks can more accurately signal the quality of the bank's management than can the scores (Berger et al., 2005). Theoretically, the efficiency scores range between zero and one [0,1], where one indicates the best-practice bank. Therefore, we first ranked the banks based on their efficiency scores year-by-year. Subsequently, the bank that records the highest efficiency score in a fiscal year is ranked 1, and the bank with the lowest score is ranked 93. Accordingly, our second-stage analysis employed four key measures of relative performance. Where our dependent variables are the CE and PE rank, we estimate a censored Tobit regression; otherwise, the ordinary least squares (OLS) is used. A negative (positive) coefficient for any given explanatory variable in the cost or profit efficiency rank regression implies that an increase in this variable is associated with a higher (lower) efficiency rank. For robustness purposes, we also used standard performance measures: net interest margin (NIM); return on average assets (ROA); and Tobin's Q (TQ). Tobin's Q is a forward-looking market-based measure that captures unstructured and volatile bank performance better than ROA. However, prior studies (e.g., Berger et al., 2005; Shaban and James, 2018) stress that these ratios are less superior to the cost and profit efficiency benchmarks.

3.3.2. Market structure

Market structure (level of competition) is often captured via the concentration indices based on the structural approach. Following Chang et al. (2008a, b), we used the Hirschman-Herfindahl index (HHI) and its dual (d) to measure the concentration of loans and borrowings on the interbank market. The HHI is the sum of the squares of the market share of each participating bank in terms of interbank assets, and is specified as:

$$HHI_{it} = \sum_{i=1}^{n} \left(\frac{x_i}{x}\right)^2 \qquad (6)$$

where *n* denotes the number of banks; x_i represents the absolute participation of bank *i;* and *x* represents the total volume of the banking market, $x = \sum_{i=1}^{n} x_i$. Using the squares of the relative market share of each bank's interbank assets accounts for the size of institutions: larger size implies greater market power. The HHI ranges between 0 and 1 in the case of monopoly. Under a perfect competition setting, HHI reaches its minimum value, 1/*n*, and tends towards zero when the number of banks (*n*) is greater, with HHI>0.18 implying high concentration; 0.1<HHI<0.18 implying moderate concentration; and HHI<0.1 implying no concentration.

To mitigate any biases associated with the HHI (e.g., failure to directly incorporate the number of banks), we used the HHI dual as a clearer and more objective measurement of interbank concentration. The dual provides a proportion of banks that dominated the interbank market (see Chang et al. (2008) for further discussion on the superiority of the dual against the HHI).

The HHI dual epitomises a theoretical market that has similar features as the real market, regarding the number of participants, *n*, and the total volume of the market (Chang et al., 2008). However, the theoretical market is stratified into two groups. The first is the dominant group, comprising k banks with equally distributed shares and that hold total participation of the market. The second group comprises $n-k$ banks that do not have participation in the market.

The total volume of the theoretical market equates to the total volume of the real market, and thus the HHIs of these two markets are equal ($HHI_{MT} = HHI_{MR}$).

Based on the above, the Herfindahl–Hirschman dual (d) is the percentage $d = 1 - \frac{k}{n}$, which captures the percentage of banks that have no market participation. Chang et al. (2008) proves that $k = \frac{1}{HHI_{MR}}$; thus, $d = 1 - \frac{1}{nHHI_{MR}}$, where n denotes the number of banks and HHI is the Herfindahl–Hirschman index of the banks. Simply, the dual, d, shows the proportion of banks that have no market participation, or, equivalently, the fraction, $1 - d$, for banks that take hold of or dominate the entire interbank market. As the dual (d) increases, the HHI also increases. The dual (d) is an increasing function of the HHI and, since HHI ranges between $1/n$ and 1, the minimum of d is zero (perfect competition) and the maximum is $1 - \frac{1}{n}$ (monopoly). The dual approximates to 1 when n is large, implying a high degree of concentration. For robustness purposes, we also use the 5-firm concentration (CR5) calculated as the total interbank assets of the five largest banks to the total interbank assets of all banks on the interbank market. The degree of concentration in the interbank market is expected to have a negative effect on competition in the market, and thus increase (decrease) the profit (cost) performance of banks.

3.3.3. Bank conduct

We followed prior studies (e.g., Delis, 2010) to measure the conduct of banks. We use the Panzar–Rosse H-statistic (PRH) to gauge the competitive or non-competitive conduct of banks. The Panzar–Rosse model (Panzar and Rosse, 1982, 1987) measures the transfer of changes in input prices to revenue. Higher (lower) transmission values indicate greater competitive (market power) pricing. The PRH statistic is derived by summing the elasticities of the bank's revenue with respect to all input prices. In a profit-maximisation setting, PRH equals one (PRH = 1) under perfect competition, less than equal to zero (PRH ≤ 0) under a monopoly, and between 0 and 1 (0 > PRH > 1) for oligopolistic competition.

We used the unscaled revenue model (Bikker et al., 2012) to estimate the PRH as:

$$\ln TR_{i,t} = \alpha + \beta_1 \ln W_{i,t} + \beta_2 X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \quad (7)$$

where $TR_{i,t}$ denotes the total revenue of the ith bank in time t; $w_{i,t}$ is the set of input prices (i.e., the cost of capital (w_1); cost of physical capital (w_2); and cost of labour (w_3)); X_{it} is the vector of the control variables; ω_i is a firm-specific effect; μ_t is a year fixed effect and $\varepsilon_{i,t}$ is the random error. The bank-level controls are the ratio of customer loans to total assets, the ratio of non-earning assets to total assets, the ratio of customer deposits to total funding, and the ratio of total equity to total assets (credit risk), asset composition, interbank funding mix and leverage. The summation of coefficients (β) on the three input prices gives the PRH statistic.

Bikker et al. (2012) suggest that the standalone PRH values are insufficient for assessing the competitive conduct of banks. Accordingly, we also estimated the revenue model based on the intermediation approach and using the bank's total income as dependent variable in Eqn. (7).

$$\ln TI_{i,t} = \alpha + \beta_1 \ln W_{i,t} + \beta_2 X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \quad (8)$$

where the output, $TI_{i,t}$, denotes the natural logarithm of total income, which includes interest and non-interest income; $w_{i,t}$ is the set of input prices (i.e., the cost of capital (w_1); cost of physical capital (w_2); and cost of labour (w_3)); X_{it} is the vector of the control variables; ω_i is a firm-specific effect; μ_t is a year fixed effect and $\varepsilon_{i,t}$ is the random error. The bank level controls are same as in Eqn. (7).

For robustness purposes, we also employed the Price–Cost Margin (PCM) based on the Net Interest Margin (NIM) and the adjusted Lerner Index as alternative proxies for bank conduct. The NIM echoes the pricing ability of banks for services, deposits and loans (Goldberg and Rai, 1996; Khan et al., 2018). Where the SCP hypothesis indicates anti-competitive pricing, then banks should charge lower deposit rates and/or charge higher loan rates (Berger and Hannan, 1989). Given that banks are capable of pricing their products anti-competitively, then a higher NIM is expected to indicate the bank's pricing ability. We follow Gaspar and Massa (2006) to estimate the PCM based on NIM as:

$$PCM1_{i,t} = NIM_{i,t} - NIM_{TW,t} \quad (9)$$

where $NIM_{i,t}$, is the net interest margin of the *i*th bank in time *t*, and $NIM_{TW,t}$ is the turnover-weighted average of industry net interest margin. Turnover is the sum of interest income and noninterest income. For an individual bank, the net interest margin is the net income scaled by the sum of interest income and noninterest income.

Market power also signals a bank's ability to set prices (P^p) above marginal cost (MC) (Lerner, 1934). The Lerner Index measures the competitive conduct of banks. In a perfectly competitive market, P^p and MC are equal; while less competitive markets are characterised by greater divergence between P^p and MC. The conventional Lerner Index expressed as the difference between P^p and MC scaled by the P^p for bank *i* at time *t* is:

$$Lerner_{it} = \frac{P^p{}_{i,t} - MC_{i,t}}{P^p{}_{i,t}} \qquad (10)$$

where $P^p{}_{i,t}$ denotes the price of the output, and $MC_{i,t}$ is the marginal cost of producing an additional unit of output. The difference between a firm's/bank's price ($P^p{}_{i,t}$) and marginal cost ($MC_{i,t}$) reflects the extent of market power a firm/bank may possess. The bank's total assets represent its output, and hence the price of total assets is equal to total revenue scaled by total assets. The Lerner Index ranges between 0 (perfect competition) and 1 (the inverse of price elasticity of demand implying monopoly or collusion). Thus, higher Lerner values imply greater market power and less competitive conditions.

The $MC_{i,t}$ can also be derived from the translog cost function (see Eqn. (A5) and (A6) in Appendix A). Once A6 is estimated, it is subsequently utilised to calculate the Lerner Index for individual banks via Eqn. (10). However, to mitigate any biases associated with the above estimation, we followed Koetter et al. (2012) to adjust the Lerner Index (PCM2) using Eqn. (11).

$$PCM2_{i,t} = Lerner_{it} = \frac{\pi_i + tc_i - mc_i * q_i}{\pi_i + tc_i} \qquad (11)$$

where π_i, tc_i, $mc_i$and q_i represent the profit, total cost, marginal cost and output respectively of the bank, 'i'. The adjusted Lerner ($PCM2_{i,t}$) also ranges between 0 and 1, with higher values implying greater market power.

3.3.4. Control variables

In line with the banking literature (Mirzaei et al., 2013; Khan et al., 2018), we controlled for bank-level and board/governance characteristics that are likely to affect SCP. The bank-level variables are bank size, market share, equity-to-assets, off-balance-sheet activities (OBS), risk, conglomerates and ownership, whereas governance variables comprise board size, diversity, duality and tenure of the board. A summary of all the key variables used in our main analyses and their descriptions is reported in Table 2.

INSERT TABLE 2 ABOUT HERE

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4. Results and Discussion

4.1. Descriptive statistics and bivariate correlations

Table 3 reports the descriptive statistics of the variables used in our estimations. The average profit (cost) efficiency score is 0.72 (0.84) with a standard deviation of 0.90 (0.95), indicating greater disparities in terms of profit efficiency amongst the sample of UK banks. The accounting-based profitability measures show a healthy, profitable banking sector with average NIM, ROA and TQ of 5.78%, 2.58% and 1.50% respectively. For the market structure indicators, the results show a less concentrated interbank market with average HHI, HHI dual and CR5 of 0.09, 0.93 and 0.33 respectively. These measures also have standard deviations of 0.16, 0.97 and 0.51 respectively. For the bank conduct indicators, the average PRH based on total revenue and total income is 0.15 and 0.08 respectively, with a standard deviation of 0.27 and 0.69 respectively. This implies that firms may attempt to engage in collusion rather than competing to gain higher profits over the long term. The average PCM based on the NIM and the adjusted Lerner is 0.52 and 0.40 respectively, implying anti-competitive pricing by banks. Regarding the correlation matrix shown in Table 4, we observe that the correlations between our key performance indicators (PE score, CE score, PE rank and CE rank) are high, thus indicating that these indicators capture a similar construct (performance). Further, the correlation between our performance and structure measures is positive (score) or negative (ranks) and significant at the 1% level. For the structure-conduct and conduct-performance preliminary tests, we observe a negative (PRH) or positive (PCM) structure-conduct relation, as well as a negative (score) or positive (rank) conduct-performance relation.

INSERT TABLES 3 & 4 ABOUT HERE

4.2. Market structure and bank conduct

In Table 5, we report the empirical results for the first condition of the SCP paradigm. Bank conduct is captured via the PRH statistic and PCM with models 1-3 (4-6) and 7-9 (10-12) reporting the results for PRH based on total revenue (total income) and PCM based on NIM (adjusted Lerner) respectively. All models incorporate firm fixed effects, time dummies and clustering at firm level. The results show that market structure has a negative and statistically significant impact on bank conduct (PRH) at the 1% level. Given that higher PRH values imply greater competitive conduct or pricing of banks, the negative coefficients on the market structure indicators suggest that greater interbank concentration leads to less competitive conduct or pricing by the banks.

The results under the alternative conduct measures (PCM) in models 7-12 provide strong support for the key implications of the market structure-bank conduct nexus in our main analysis. The results show a positive and statistically significant impact of structure indicators on bank conduct (PCM) at the 1% level. However, because higher PCM values indicate anti-competitive pricing by banks, the positive market structure-bank conduct relationship implies that banks behave anti-competitively when interbank market concentration surges. These findings support our H1, indicating that higher interbank market concentration stimulates anti-competitive pricing (conduct) by the banks. Iori et al. (2008) find that changes in the interbank network structure during the pre-crisis incentivised banks to increase the number of banks they borrowed funds from but restricted the number of banks they were willing to supply credit to.

Regarding the control variables, we find that a number of characteristics such as bank size, market share and conglomeration stimulate anti-competitive bank conduct or behaviour. The results are in line with previous empirical studies (e.g., Mirzaei et al., 2013) and theoretical predictions suggesting that where banks hold a significant market share (a key characteristic of large banks or conglomerate) they possess substantial market power in pricing. Banks with more female directors (i.e., diverse) and/or long-serving board (i.e., tenure) are more likely to behave anti-competitively. Contrarily, where directors are also shareholders of the bank, this tends to mitigate anti-competitive bank conduct. Hence, while previous studies on the risk and return implications of female directors (e.g. Nadeem et al., 2019) generally conclude that women are risk-averse, our findings highlight another perspective where firms with gender-diverse boards are likely to behave anti-competitively in industry because they make more risky decisions (Poletti-Hughes and Briano-Turrent, 2019). Bank boards with long-tenured directors are subject to alignment with the management (Ji et al., 2021). Hence, weakening the monitoring of bank decisions may stimulate anti-competitive conduct or behaviour. However, where the directors are also shareholders of the bank, they are able to effectively monitor the bank's decision to mitigate anti-competitive conduct.

Taken together, we show that the interbank market structure significantly affects the bank conduct. Our evidence suggests that, where the SCP hypothesis indicates anti-competitive (collusive and/or monopolistic) pricing, then the banks may often have better investment opportunities both within and outside the financial network. Indeed, trading banks that are competitive in lending to the non-financial sector but lack the ability to generate funds can borrow funds from their colluded counterparts with excess of liquidity on the interbank market, and thus obtain the required funds to supply credit to the non-financial sector. Against this background, both types of bank would still be acting along their business lines that allow them to have a comparative advantage and thus have increased credit portfolios. Our findings also confirm that, theoretically and empirically, interbank markets provide a channel for banks to collude in the market for business loans (Corbae and Gofman, 2019).

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4.3. Market structure and bank performance

In this section, we examine whether the interbank market structure should matter more for bank performance independent of bank conduct. Table 6 reports the results of the performance model (Eqn. 2) based on the efficiency scores and ranks estimated from the frontier models. In terms of the structure's effect on profit efficiency performance, the significant and positive sign of the coefficient on the structure measures in the PE and CE score regressions indicates that market structure is associated with profit efficiency gains. This finding is further supported by the negative and significant coefficient on the structure measures in the PE and CE rank regressions. This suggests that greater interbank market concentration is associated with both the high profit and cost efficiency rank of trading banks. Hypothesis 2 is therefore supported, indicating that bank conduct significantly drives bank performance or efficiency level.

Furthermore, Table 7 reports the results where profitability and efficiency ratios are dependent variables. Among the standard performance indicators, we observe a positive and significant concentration–profitability nexus. Market structure is associated with higher NIM, ROA and TQ. These findings are consistent with prior studies which utilise analogous concentration and profitability indicators (e.g., Tregenna, 2009). Nevertheless, the validity of the SCP tests in these studies seems inadequate given that they construed the positive concentration–profitability nexus as adequate confirmation of the SCP hypothesis. Overall, we support the position of Corbae and Gofman (2019) that interbank market entry surges when bank profits are low relative to entry costs, but entry declines when bank profits are high. In sum, collusion in the interbank market incentivises banks to enter and with the goal of improving their profit and cost efficiency and performance. As noted in Silva et al. (2016), the interbank market structure is cost efficient for banks, and thus encourages greater participation of banks in financial networks.

Regarding the control variables, market share is consistently positive (negative) and significant on the efficiency scores (ranks). This supports the position of Khan et al. (2018) and Shaffer and Spierdijk (2019) that market share reflects the effects of product differentiation. Hence, banks associated with higher-quality products should have superiority in charging higher prices and also earn higher profits to enable them secure greater market shares. Board diversity and duality are also positively related to bank performance. Bank size also shows a consistently positive coefficient on PE, indicating that larger banks gain from economies of scale, diversification and market power to earn superior profits: they borrow and/or lend at more favourable terms (Acharya et al., 2012). The negative (positive) coefficient on CE score (rank) implies that larger banks have lower levels of cost efficiency

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4.4. Market structure, bank conduct and performance

This section addresses the second and fourth assumptions of the SCP paradigm. The market structure's effect on bank performance must decrease in magnitude (partial mediation) or become insignificant (perfect mediation) upon the incorporation of the bank conduct indicator into the model. In addition, bank conduct must significantly affect performance in all cases.

Table 8 reports the estimation results of Eqn. (3) with performance captured via the bank efficiency[6] score and rank, and bank conduct captured via the PRH statistic (total revenue). The results show that the coefficients on the market structure indicators remain significantly positive (score) or negative (rank), whilst the bank conduct variable is also positive (rank) or negative (score) and significant in all model specifications. Nevertheless, the magnitude of the coefficients on the market structure indicators declines in all model specifications, thereby suggesting that the behaviour or conduct of banks partially mediates the market structure-performance nexus. This finding confirms our hypotheses that interbank market structure drives bank performance in the absence of bank conduct (H3) and that the interbank market structure effect on bank performance declines when bank conduct is introduced into the model (H4).

Furthermore, we report the results where bank conduct is captured via the PCM (based on the adjusted Lerner) in Appendix 1A. Indeed, the results confirm and complement our main findings that bank behaviour or conduct partially mediates the market structure-performance nexus. Together, these findings support the position of prior studies (e.g., Mirzaei et al., 2013; Homma et al., 2014) that market structure (i.e., degree of concentration) influences bank conduct or behaviour via collusive and/or monopolistic pricing, to consequently increase bank performance. Monticini and Ravazzolo (2014) show that interbank market frictions that resulted from the liquidity crises increased a bank's ability to charge higher intraday interest rate spreads, and thus created a platform for abnormal gains through arbitrage. Overall, we show that, by engaging in interbank operations, banks can change their behaviour to ultimately influence their performance goals. However, while it may be individually advantageous for banks to collude or monopolise financial networks for abnormal gains, the resulting global network structure may be exposed to greater systemic risks. So far, the estimation results have buttressed all the conditions necessary for the validity of the SCP hypothesis.

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[6] We also performed the analysis with accounting performance indicators (i.e., NIM, ROE, ROA and CIR). The findings from these estimations are qualitatively similar to those found using the efficiency measures.

4.5. Robustness tests

4.5.1 2-Step GMM estimation of the core SCP results

Empirical studies on bank performance assume that profits tend to persist over time (Athanasoglou et al., 2008, Djalilov and Piesse, 2019). Therefore, given this dynamic nature of bank performance/profitability, we also utilise the two-step system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) to address the endogeneity that may be associated with our baseline results. In estimating the system GMM, we restrict the number of instruments by limiting the lag range to three. Initially, we estimate the SC models (1 and 2) by incorporating all control variables and year dummies without the main variables for bank performance. Then, we repeat this procedure to estimate the SP models (3-6). Lastly, we estimate the SCP tests in models 7-9. The results reported in Table 9 confirm our results reported in tables 5-8. The coefficients are quite consistent and stable across all models, and the Hansen test shows no evidence of overidentification (p-values are in excess of 0.10). The Arellano-Bond (AB) test results also show the absence of second-order autocorrelation.

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4.5.2 Mediation analysis with bias-corrected estimators (bootstrapping)

We performed some robustness tests to provide further validation of the indirect relationship between interbank market structure and bank performance; that is, from interbank market structure to bank conduct, and subsequently from bank conduct to bank performance. We followed the approach of prior studies (e.g., Khan et al., 2017) and calculated the Sobel, Aroian and Goodman test scores (z-value) to confirm the significance/insignificance of the indirect (mediated) effect. The coefficients of interbank market structure based on Eqn. (1) (Table 5) and bank conduct based on Eqn. (2) (Table 8/1A) are utilised to calculate the Sobel, Aroian and Goodman test statistic (z). First, a comparison of the coefficients on the market structure indicators in the first and second rows of Table 10 distinctly shows that introduction of bank conduct into the model reduces the market structure's effect on bank performance. Furthermore, regardless of whether bank conduct is measured via the PRH (total revenue) or the PCM (adjusted Lerner), the statistic (z) under the Sobel, Aroian and Goodman test is significant (at the 1% level) in all specifications. Thus, the null hypothesis specifying the absence of any indirect relationship between interbank market structure and bank performance is rejected to confirm the presence of a mediation effect in the structure–performance nexus. Nevertheless, the effect of the market structure on the bank performance remains significant, thus pointing towards a partially mediated effect.

Although the above test results may be acceptable, they can be biased (Fritz et al., 2012). Dang, Kim and Shin (2015) showed that bias-corrected estimators (BCEs) are generally the most suitable and robust methods for dynamic panel data models. The BCE is grounded on iterative bootstrapping that simulates the distribution of a fixed effect estimator using the original (biased) fixed effect estimates (Everaert and Pozzi, 2007). Thus, the method corrects for probable biases iteratively until unbiased estimates of the true parameters are obtained. Moreover, BCEs have several merits over the above approaches to bias reduction. BCEs do not necessitate the specification of optimal, valid instruments, on which the properties of some key estimators (e.g., IV/GMM) crucially depend. In addition, when contrasted against other analytical approaches (e.g., bias-corrected least-squares dummy variable estimator), BCEs perform a bias correction by means of non-parametric bootstrapping and hence are not dependent on restrictive parametric distributional assumptions (Wintoki, Linck & Netter, 2012). The empirical evidence shows that BCEs outperform GMM estimators in terms of efficiency and mitigating bias, and yield superior inferences than the bias-corrected least-squares dummy variable estimator (see Everaert and Pozzi, 2007; Fritz et al., 2012; Kim, and Shin, 2015). Yet, to the best of our knowledge, BCEs have not been applied in banking literature. Therefore, we proceeded to estimate the asymmetric confidence intervals for the mediated effect. The bootstrapped estimates of the indirect effect, with 5,000 replications, are similar to the point estimate estimated via the conventional regression tests, and the true indirect effect estimated for the percentile, bias-corrected, and bias-corrected and accelerated confidence intervals ranges between -1.722 and 1.204 with 95% confidence. Given that none of the estimated 95% confidence intervals are zero, we can infer that the indirect effect is significantly different from zero, hence the conclusion that bank conduct partially mediates the relationship between interbank market structure and bank performance.

Taken together, these results confirm that the SCP hypothesis provides a valid explanation for the positive nexus between interbank market structure and bank performance among UK banks. Nevertheless, the SCP may not adequately explain the structure–performance nexus due to the presence of a partially mediated channel through bank conduct. A probable explanation for this outcome may include product differentiation and where strategic spillovers between two distinct markets can generate an inefficient allocation of resources that stimulates collusion and/or monopolistic pricing. Key policy implications are that banks (especially larger banks) can earn abnormal profits partially through anti-competitive behaviour when the interbank market is highly concentrated to stimulate collusion and monopolistic pricing. Accordingly, consolidation activities of banks must be effectively monitored/scrutinised to prevent banks from holding/controlling substantial resources that enable them to create/possess extensive market power.

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4.6. Market structure, bank conduct and performance: domestic vs. foreign-owned banks

In this section, we examine whether bank ownership structure (foreign vs. domestic) matters for the validity of the SCP hypothesis. We focus our attention on bank ownership for four reasons. First, the UK has the most competitive financial centre worldwide (Global Financial Centres Index – GFCI 23, 2018). The UK banking system is notable for the greater concentration of banking system assets among a few banks with global operations, and the ability of foreign banks to match the large-scale operations and size of domestic banks (Hills et al., 2019). As such, foreign subsidiaries and foreign branches have a large presence and account for substantial financial linkages in terms of bank lending and/or funding. Second, the transfer of capital across borders makes interbank activities of foreign banks distinct from those of domestic banks (De Haas and Van Lelyveld, 2010). Foreign banks have highly stable funding sources and lending patterns that enable them to enjoy interbank market power. Foreign banks also hold a geographically differentiated credit portfolio that enables them to mitigate any adverse crisis effects in domestic financial markets (Allen et al., 2018). Third, the interbank market decisions of foreign subsidiaries may be significantly determined by the current policy of the multinational bank rather than by host country institutional factors (Allen et al., 2013). However, the current home country's economic conditions strongly affect foreign bank operations (Adams-Kane et al., 2017). More importantly, countries hosting more foreign banks have a very significant portion of their interbank market assets controlled by foreign banks. Fourth, prior empirical studies (e.g., Kouretas and Tsoumas, 2016) stress that foreign banks are more innovative, better managed, and have better risk management procedures than home-country banks. Therefore, foreign bank presence should enhance financial stability, and stimulate a spillover of new/innovative ideas and expertise to improve the performance of domestic banks, rather than disrupting financial stability via increased risk-taking behaviour/conduct of domestic banks. However, the existing literature gives very limited results on the interactive role of interbank market structure (concentration/competition), conduct and performance. Thus, this section focuses on empirically examining the effects of foreign bank penetration on the SCP hypothesis (concentration/competition), and foreign bank presence on bank conduct/behaviour and ultimately performance.

We split the sample of banks based on ownership (foreign owned vs. domestically owned) using the Global Ultimate Owner[7] (GUO) indicator from BankScope, complemented with publicly available information from the Bank of England and related institutions. We classified banks as foreign owned if the country code of the global ultimate owner at the highest consolidation level is not 'GB' where the bank operates (Agrawal et al., 2017). The estimation results and subsequent mediation tests are reported in Table 11[8]. First, the results are consistent with and complementary to our main findings that interbank market structure impacts significantly on bank conduct and performance. However, it is worth noting that the magnitude of the impact and significance on the bank conduct coefficient is greater for domestic banks. The implication of this is that participation in the interbank market is a key dimension of domestic banks' conduct and competition. Domestic banks behave more anti-competitively under higher interbank market concentration, and thus are more likely to refuse credit to small or opaque organisations (Beck et al., 2018). Although bank performance is significantly positive (efficiency score) or negative (efficiency rank) in the structure-performance estimation, the magnitude of the coefficients indicates that market structure matters most for foreign banks' profit efficiency but for domestic banks' cost efficiency. For our key SCP validity test, we observe a reduction in the market structure coefficients when bank conduct is incorporated into the model. However, it is worth noting that, while the market structure coefficients for both foreign and domestic banks remained significant under profit efficiency, they are insignificant under cost efficiency for foreign banks. The implication of this result is that, while bank conduct partially mediates the structure-performance relationship in terms of

[7] An individual or entity is classified as a GUO if they control at least 50.01% of the entity (Claessens and Van Horen, 2013, 2014).
[8] See Appendices 2A and 3A for extension of Table 11.

profits, bank conduct fully mediates the structure-performance relationship in terms of costs, particularly for foreign banks. Hence, the interbank market structure is cost efficient for foreign banks, and thus encourages greater participation of foreign banks in financial networks.

Further analysis via the Sobel, Aroian and Goodman test statistics as well as the bootstrapped estimates of the indirect effect indicates that the mediation effect of bank conduct is robust for all samples. A probable explanation for these results is that foreign banks characterised by their large resource pool and good international reputation will collude with their domestic peers by acting as correspondent banks in order to overcome asymmetric information problems (Freixas and Holthausen, 2004). These findings are consistent with prior studies (e.g., Claessens and Van Horen 2014, 2015) that bank ownership structure matters for a bank's performance, operational efficiency and stability. Claessens and Van Horen (2014) argue that greater foreign bank presence decreases profitability but increases overhead costs for domestic banks. Gormley (2010) reported a market-wide upsurge in bank loans of domestic banks due to foreign bank presence, hence the conclusion that the extent and nature of the foreign bank entry affect the risk-taking behaviour or conduct of domestic banks. However, these studies failed to establish any link between market structure (concentration/competition), conduct and performance.

Taken together, our results suggest that bank ownership structure matters for the validity of the SCP hypothesis. The cross-border transfer of bank capital raises the degree of scepticism about the essential role of foreign banks; especially the belief that greater foreign presence enhances the profitability and financial stability of the domestic banking market. Both domestic and foreign banks engage in anti-competitive behaviour when the interbank market is highly concentrated via collusion and monopolistic pricing, and thus they will rely on their higher solvency to offer lower interbank rates. Although a large proportion of foreign banks' activities may be located outside the host market, an increase in interbank concentration that reflects a decrease in competition does affect foreign banks' performance and particularly conduct. Therefore, the host country's market conditions strongly affect foreign bank operations and profitability as foreign banks will adjust their lending and deposit rates in response to changes in the host market's economic conditions (Claessens and Van Horen, 2013; Adams-Kane et al., 2017). In order to derive policy implications, it is therefore crucial for policymakers to better understand the gains of financial globalisation, and ensure the implementation of strategic policies that will maximise the rewards from the opening up of their banking sector (Wu et al., 2017).

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4.7. Market structure, bank conduct and performance: conglomerate vs. non-conglomerate banks

The past decades have witnessed a rapid consolidation of banks worldwide, with UK banks becoming part of huge global conglomerates, and thus increasing concerns amongst policymakers about bank concentration (Shabani et al., 2015). International financial institutions operate in foreign jurisdictions via local conglomerates and cross-border lending. They create opportunities to improve financial and economic growth due to their vast capital, proficiency, liquidity and new/innovative technologies that consequently boost domestic competition and distribution of resources (Fischer, 2015). While consolidation is argued to promote/enhance efficiency and scale economy, the consolidation process and the resultant financial conglomerates may disrupt stability (Chronopoulos et al., 2011). Indeed, almost all the large, international financial institutions are to some extent financial conglomerates whose size and complexity might subvert effective regulation and supervision by both markets and authorities. For instance, their size and central role across the financial systems may grant them too much power: a situation identified as ‘too-big or too-important-to-fail’. Moreover, the existence of internal capital markets within conglomerates ensures that parent banks can bail-out or recapitalise affiliated banks that would otherwise fail via a redistribution of capital resources amongst subsidiaries (Mistrulli, 2011). Therefore, what are the effects of the bank consolidation process on the SCP hypothesis? Although ostensibly contrasting trends, consolidation may not necessarily suggest low interbank market concentration, given that consolidation may occur across different business lines or markets, but among very competitive parties (Berger et al., 2010). Nevertheless, both competition and consolidation may weaken the resilience of the interbank market as they increase interdependence/collusion amongst banks. This section therefore examines whether financial conglomeration matters for the validity of the SCP hypothesis.

We split the sample of banks based on whether the bank is affiliated with a conglomerate or not. The estimation results and subsequent mediation tests are reported in Table 12[9]. First, the results are consistent with and complementary to our main findings that interbank market structure impacts significantly on bank conduct and performance. The magnitude of the impact on the bank conduct coefficient is, however, slightly lower for non-conglomerate banks. This implies that interbank market participation is a key dimension of bank conduct and competition. Both conglomerate and non-conglomerate banks behave more anti-competitively under higher interbank market concentration, though the slightly higher conglomerate conduct coefficient indicates that the core criteria for interbank participation are that the bank establishes itself as creditworthy and unconstrained by domestic regulations, as well as ready to lend credit to small or opaque organisations. Although bank performance is significantly positive (score) or negative (rank) in the structure-performance estimation, the magnitude of the coefficients indicates that market structure matters for both conglomerate and non-conglomerate banks in terms of profit efficiency. In terms of cost efficiency, market structure matters particularly for conglomerate banks. In the SCP model, we observe a reduction in the market structure coefficients when bank conduct is incorporated into the estimation. However, it is worth noting that, while the market structure coefficients on both profit and cost efficiency remained significant for conglomerate banks, they are insignificant for non-conglomerate banks. The implication of this result is that, while bank conduct partially mediates the structure-performance relationship for conglomerate banks, bank conduct fully mediates the structure-performance relationship for non-conglomerate banks. Hence, the interbank market structure is both profit and cost efficient for non-conglomerate banks, and thus encourages greater participation of non-conglomerate banks in financial networks. For non-conglomerates, the contractual and informational framework plays a vital role in interacting with the interbank market structure and competition. Therefore, for non-conglomerates, credit information sharing will boost their access to credit and also enhance their credit decision-making (Brown et al., 2009).

Further analysis using the Sobel, Aroian and Goodman tests as well as the bootstrapped estimates of the indirect effect indicates that the mediation effect of bank conduct is robust for all samples. A probable explanation for these results is that, just like concentration, conglomeration also induces strong interdependence or collusive behaviour amongst affiliated banks. Apart from being related through financial interlinkages, affiliated banks will collude

[9] See Appendix 4A and 5A for extension of Table 12.

to mitigate shocks that hit one bank, given that these shocks will affect all banks of the same conglomerate (Mistrulli, 2011). Furthermore, bank consolidation and conglomeration happen both within business lines and also across business lines. For instance, the recent consolidation trend has led to financial conglomerates that combine at least two of the three formerly distinct functions of banks, securities firms or insurance companies. In this context, a conglomerate may have affiliates in both the financial and non-financial sectors. As such, an affiliated bank that is competitive in lending to the non-financial sector but which lacks the ability to generate funds can borrow funds from another affiliate with an excess of liquidity on the interbank market, and thus obtain the required funds to supply credit to the non-financial sector. Against this background, both banks would still be acting along their business lines that allow them to have a comparative advantage and thus have increased credit portfolios and performance. These findings are consistent with prior studies that suggest that market microstructure and information flows have a critical role in modern financial systems (Carletti, 2010; Chronopoulos et al., 2011). For large and affiliated financial institutions, active market participation has undermined traditional activities based on pricing loans and deposits. The higher collusion of banks via direct linkages in the interbank markets or payment systems, or indirectly from the interdependency of their portfolios, may create contagion effects (Allen et al., 2009).

Taken together, our results suggest that bank consolidation has important implications for the validity of the SCP hypothesis and for policymakers. First, market structure, such as the number of banks or the market share of the largest banks, may not be directly enforced through policy actions in market-based financial systems. Where there are seemingly opposing policy goals (e.g., deepening, broadening and/or financial system stability), it is imperative to understand the trade-offs across these diverse goals regarding competition and collusion. Second, many regulatory policies that relate to banks' competitive behaviour have other, more direct, effects on bank stability than through their effects on competition (Carletti, 2010). Hence, given the range of regulatory policies available to policymakers, it is imperative to understand their effect on competition and stability, and also any differential impact on stability across different competitive environments. Third, a clear regulatory policy on how to address large systemic banks is essential. Although interventions and government support for such institutions may be inevitable during hard times, a vibrant and transparent framework on decision-making, responsibility and accountability for cost is necessary.

INSERT TABLE 12 ABOUT HERE

4.8. Further tests: performance effects of ownership structure and business strategy (conglomerates) on the SCP

In this section, we follow (Lartey and Danso, 2022) and employ the propensity score matching (PSM) technique to obtain a matched sample of domestic (conglomerate) and foreign (non-conglomerate) banks to examine the SCP. Validity tests for our PSM are reported in Table 1A of the Online Appendix[10]. To account for the endogeneity and to address self-selection bias in our results, we use the matched sample of domestic and conglomerate banks to examine the performance effects of ownership structure and business strategy (conglomerates) on the SCP. Table 2A of the Online Appendix reports the estimated results for the unmatched and matched samples of domestic (Panel A) and conglomerate banks (Panel B). We found consistent results showing that bank conduct mediates the structure-performance effect for domestic firms, albeit only partially. For conglomerate banks, the matched sample is robustly closer to exhibiting a full mediation effect of bank conduct on the structure-performance relationship. To draw conclusions relating to the differences in the magnitudes of the coefficients across the sub-samples, we perform specific significance tests using the Chi-square test of difference to compare the regression coefficients of our key models to test the null hypothesis (i.e., H_o: $B_{DOMESTIC} = B_{FOREIGN}$ and H_o: $B_{CONGLOMERATE} = B_{NON\text{-}CONGLOMERATE}$). The results of the SC, SP and SCP[11] tests are reported in Tables 3A and 3B of the Online Appendix. We observe that the *t*-statistics for SC and SCP coefficients between domestic and foreign bank models are significant under both profit and cost efficiency, indicating that the SCP regression coefficients for domestic banks are significantly different from that of foreign banks. Under the business strategy, we observe that the *t*-statistics for SC, SP and SCP coefficients between conglomerate, and non-conglomerate bank models are significant only in terms of cost efficiency. Together, these findings confirm that the interbank market structure is cost-efficient for foreign and non-conglomerate banks, therefore encouraging greater participation of the ownership structure and business strategy in the financial networks.

[10] See the appendix in for a detailed discussion of the modelling, results, and findings in this section.
[11] SC: Structure and Conduct, SP: Structure and Performance, and SCP: Structure, Conduct and Performance

5. Conclusion

This study provides empirical evidence for the validity of the SCP hypothesis in the context of the UK's interbank market and its banking system given the significant and ongoing structural changes in its banking industry. We utilise an approach that incorporates the intermediating role of bank conduct in the structure-performance nexus, a key methodological issue in prior or traditional SCP studies. Our results confirm the validity of the SCP hypothesis by showing that interbank market structure provides a channel for banks operating in the UK to collude and/or engage in monopolistic pricing in the market for bank and business loans. Specifically, interbank market structure affects bank conduct or behaviour, to ultimately increase bank performance. These findings are robust to alternative measures of market structure, bank conduct and performance. Further analysis indicates that collusion and other anti-competitive behaviours in the interbank market exacerbate incentives for foreign and conglomerate banks to enter, although domestic banks can still make profits by supplying liquidity to small banks that enter but lack liquidity.

Overall, our findings have important implications for policymakers. The SCP paradigm proposes that, when a small group of firms dominate a market in terms of shares, the likelihood of collusive behaviour amongst these firms increases. Accordingly, the SCP hypothesis necessitates that foreign entry and consolidation activities are effectively monitored and regulated since concentration weakens competition, and results in market inefficiency (e.g., collusion and monopoly profits). These implications are crucial for the UK banking industry and interbank market, given the ongoing and unprecedented shift towards a highly consolidated as well as concentrated market structure. Moreover, bank profitability continues to improve while cost efficiency reduces after the implementation of several unconventional policy measures post financial crisis and the LIBOR scandal. Indeed, these facts increase scepticism about antitrust policies particularly if consolidation activities are motivated by the desire to enhance bank profitability via monopolistic pricing. If so, such policies are most likely to hurt the economy by making the interbank and intermediation process more costly. An interesting area that may necessitate further investigation is whether probable economic channels can explain our core findings. For instance, the recent unprecedented trend of CEO and board connections as well as state/government ownership or support of banks may have implications for the SCP. In the absence of effective monitoring, managers who are characterised by extensive political connections may have a high probability of anti-competitive bank behavior (e.g., engaging in income smoothing and earnings management activities, collusion etc.)

towards meeting their private, profit, funding, and capital objectives. Future research could look at other aspects of banking market structure that are not related to market concentration such as product characteristics, barriers to entry, or price controls, in a cross-country study. Lastly, future research could also broaden the analysis to consider a sample with an international scope to see how the interbank market structure, bank conduct, and performance relationship vary across different contexts.

References

Abrantes-Metz, R. M., Kraten, M., Metz, A. D. & Seow, G. S. (2012). Libor manipulation? *Journal of Banking & Finance, 36*, 136-150

Acharya, V. V., Gromb, D. & Yorulmazer, T. (2012). Imperfect competition in the interbank market for liquidity as a rationale for central banking. *American Economic Journal: Macroeconomics, 4*, 184-217

Acharya, V. & Merrouche, O. (2009). Precautionary Hoarding of Liquidity and Inter-Bank Markets: Evidence from the Sub-prime Crisis,î Working Paper, New York University Stern School of Business.

Adams-Kane, J., Caballero, J. A. & Lim, J. J. (2017). Foreign bank behavior during financial crises. *Journal of Money, Credit and Banking, 49*, 351-392

Afonso, G., Armenter, R. & Lester, B. (2019). A model of the federal funds market: yesterday, today, and tomorrow. *Review of Economic Dynamics, 33*, 177-204.

Agrawal, I., Duttagupta, R. & Presbitero, A. (2017). International commodity prices and domestic bank lending in developing countries: *International Monetary Fund (WP-No. 17/279)*

Akbar, S., Kharabsheh, B., Poletti-Hughes, J. & Shah, S. Z. A. (2017). Board structure and corporate risk taking in the UK financial sector. *International Review of Financial Analysis, 50*, 101-110

Allen, F., Babus, A. & Carletti, E. (2009). Financial crises: theory and evidence. *Annual Review of Financial Economics., 1*, 97-116

Allen, F., Gu, X., & Kowalewski, O. (2013). Corporate governance and intra-group transactions in European bank holding companies during the crisis. *International Finance Review, 14,* 365-431

Allen, F., Gu, X. & Kowalewski, O. (2018). The Interbank Market Puzzle, *IESEG Working Paper No. 18/ACF-02*.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics,* 68(1), 29-51.

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of international financial Markets, Institutions and Money,* 18(2), 121-136.

Bain, J. S. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936–1940. *The Quarterly Journal of Economics, 65*, 293-324

Baron, R. M. & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology, 51*, 1173

Battese, G. E. & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics, 20,* 325-332

Beck, T., Degryse, H., De Haas, R. & Van Horen, N. (2018). When arm's length is too far: Relationship banking over the credit cycle. *Journal of Financial Economics, 127,* 174-196

Berger, A. N. (1995). The profit-structure relationship in banking--tests of market-power and efficient-structure hypotheses. *Journal of Money, Credit and Banking, 27*, 404-431

Berger, A. N., Clarke, G. R., Cull, R., Klapper, L. & Udell, G. F. (2005). Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership. *Journal of Banking & Finance, 29*, 2179-2221

Berger, A. N. & Hannan, T. H. (1989). The price-concentration relationship in banking. *The Review of Economics and Statistics*, 291-299

Berger, A. N., Hasan, I. & Zhou, M. (2010). The effects of focus versus diversification on bank performance: Evidence from Chinese banks. *Journal of Banking & Finance, 34*, 1417-1435

Berger, A. N. & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking & Finance, 21*, 895-947

Bikker, J. A., Shaffer, S. & Spierdijk, L. (2012). Assessing competition with the Panzar-Rosse model: The role of scale, costs, and equilibrium. *Review of Economics and Statistics, 94*, 1025-1044

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics,* 87(1), 115-143.

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia, Journal of Banking and Finance, 13, 1, 65-79.

Brown, M., Jappelli, T. & Pagano, M. (2009). Information sharing and credit: Firm-level evidence from transition countries. *Journal of Financial Intermediation, 18*, 151-172

Carletti, E. (2010). Competition, concentration and stability in the banking sector. *OECD Policy Roundtables, 9*, 13-37

Chang, E. J., Guerra, S. M., Lima, E. & Tabak, B. M. (2008). The stability–concentration relationship in the Brazilian banking system. *Journal of International Financial Markets, Institutions and Money, 18*, 388-397

Chang, E. J., Lima, E. J. A., Guerra, S. M. & Tabak, B. M. (2008). Measures of interbank market structure: An application to brazil. *Brazilian Review of Econometrics, 28*, 163-190

Chronopoulos, D. K., Girardone, C. & Nankervis, J. C. (2011). Are there any cost and profit efficiency gains in financial conglomeration? Evidence from the accession countries. *The European Journal of Finance*, *17*, 603-621

Claessens, S. & Van Horen, N. (2013). Impact of foreign banks. *Journal of Financial Perspectives, 1*

Claessens, S. & Van Horen, N. (2014). Foreign banks: Trends and impact. *Journal of Money, Credit and Banking, 46*, 295-326

Coccorese, P. (2009). Market power in local banking monopolies. *Journal of Banking & Finance, 33*, 1196-1210

Corbae, D. & Gofman, M. (2019). Interbank Trading, Collusion, and Financial Regulation

Coulter, B., Shapiro, J. & Zimmerman, P. (2017). A mechanism for LIBOR. *Review of Finance, 22*, 491-520

Dang, V. A., Kim, M., & Shin, Y. (2015). In search of robust methods for dynamic panel data models in empirical corporate finance. *Journal of Banking & Finance,* 53, 84-98.

De Haas, R. & Van Lelyveld, I. (2010). Internal capital markets and lending by multinational bank subsidiaries. *Journal of Financial Intermediation, 19*, 1-25

Delis, M. D. (2010). Competitive conditions in the Central and Eastern European banking systems. *Omega, 38*, 268-274

Djalilov, K., & Piesse, J. (2019). Bank regulation and efficiency: Evidence from transition countries. *International Review of Economics & Finance*, 64, 308-322.

Dubecq, S., Monfort, A., Renne, J. & Roussellet, G. (2016). Credit and liquidity in interbank rates: A quadratic approach. *Journal of Banking & Finance, 68*, 29-46

Duffie, D. & Stein, J. C. (2015). Reforming LIBOR and other financial market benchmarks. *Journal of Economic Perspectives*, *29*, 191-212

Eisl, A., Jankowitsch, R. & Subrahmanyam, M. G. (2017). The manipulation potential of Libor and Euribor. *European Financial Management, 23*, 604-647

Everaert, G., & Pozzi, L. (2007). Bootstrap-based bias correction for dynamic panels. *Journal of Economic Dynamics and Control*, 31(4), 1160-1184.

Fischer, S. (2015). The federal reserve and the global economy. *IMF Economic Review, 63*, 8-21

Freixas, X. & Holthausen, C. (2004). Interbank market integration under asymmetric information. *The Review of Financial Studies*, *18*, 459-490

Fritz, M. S., Taylor, A. B. & MacKinnon, D. P. (2012). Explanation of two anomalous results in statistical mediation analysis. *Multivariate behavioral research, 47*, 61-87

Fu, X. M. & Heffernan, S. (2009). The effects of reform on China's bank structure and performance. *Journal of Banking & Finance, 33*, 39-52

Galletta, S., Mazzù, S., & Scannella, E. (2021). Risk committee complexity and liquidity risk in the European banking industry. *Journal of Economic Behavior & Organization*, *192*, 691-703.

Gaspar, J. M., & Massa, M. (2006). Idiosyncratic volatility and product market competition. *The Journal of Business*, 79(6), 3125-3152.

Gilbert, R. A. (1984). Bank market structure and competition: a survey. *Journal of Money, Credit and Banking, 16*, 617-645

Giorgis Sahile, S. W., Tarus, D. K. & Cheruiyot, T. K. (2015). Market structure-performance hypothesis in Kenyan banking industry. *International Journal of Emerging Markets, 10*, 697-710

Goldberg, L. G. & Rai, A. (1996). The structure-performance relationship for European banking. *Journal of Banking & Finance, 20*, 745-771

Gormley, T. A. (2010). The impact of foreign bank entry in emerging markets: Evidence from India. *Journal of Financial Intermediation, 19*, 26-51

Hannan, T. H. (1991). Foundations of the structure-conduct-performance paradigm in banking. *Journal of Money, Credit and Banking, 23*, 68-84

Hills, R., Ho, K., Reinhardt, D., Sowerbutts, R., Wong, E. & Wu, G. (2019). The international transmission of monetary policy through financial centres: Evidence from the United Kingdom and Hong Kong. *Journal of International Money and Finance, 90*, 76-98

Homma, T., Tsutsui, Y. & Uchida, H. (2014). Firm growth and efficiency in the banking industry: A new test of the efficient structure hypothesis. *Journal of Banking & Finance, 40*, 143-153

Index, G. F. C. (2018). The global financial centres index 23. London: Long Finance

Iori, G., De Masi, G., Precup, O. V., Gabbi, G. & Caldarelli, G. (2008). A network analysis of the Italian overnight money market. *Journal of Economic Dynamics and Control, 32*, 259-278

Ji, J., Peng, H., Sun, H., & Xu, H. (2021). Board tenure diversity, culture and firm risk: Cross-country evidence. *Journal of International Financial Markets, Institutions and Money*, 70, 101276.

Khan, H. H., Ahmad, R. B. & Chan, S. G. (2018). Market structure, bank conduct and bank performance: Evidence from ASEAN. *Journal of Policy Modelling, 40*, 934-958

Khan, H. H., Kutan, A. M., Naz, I. & Qureshi, F. (2017). Efficiency, growth and market power in the banking industry: New approach to efficient structure hypothesis. *The North American Journal of Economics and Finance, 42*, 531-545

Koetter, M., Kolari, J. W. & Spierdijk, L. (2012). Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for US banks. *Review of Economics and Statistics, 94*, 462-480

Kouretas, G. P. & Tsoumas, C. (2016). Foreign bank presence and business regulations. *Journal of Financial Stability, 24*, 104-116

Krugman, P. R. (1979). Increasing returns, monopolistic competition, and international trade. *Journal of International Economics, 9*, 469-479

Kumbhakar, S. C. & Lovell, C. K. (2003). *Stochastic frontier analysis*: Cambridge university press

Langfield, S., Liu, Z., & Ota, T. (2014). Mapping the UK interbank system. *Journal of Banking & Finance*, *45*, 288-303.

Lartey, T., & Danso, A. (2022). CEO overconfidence and debt covenant violations. *Journal of Financial Research*, *45*(1), 162-199.

Lerner, A. P. (1934). The concept of monopoly and the measurement of monopoly power. *Review of Economic Studies, 1*, 157-175

Li, Z., & Lai, R. N. (2022). Interbank borrowing and bank liquidity risk. *Journal of Financial Research*, *45*(1), 53-91.

MacKinnon, D. P., Warsi, G. & Dwyer, J. H. (1995). A simulation study of mediated effect measures. *Multivariate Behavioral Research, 30*, 41-62

Mason, E. S. (1939). Price and production policies of large-scale enterprise. *The American Economic Review, 29*, 61-74

Mirzaei, A., Moore, T. & Liu, G. (2013). Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking & Finance, 37*, 2920-2937

Mistrulli, P. E. (2011). Assessing financial contagion in the interbank market: Maximum entropy versus observed interbank lending patterns. *Journal of Banking & Finance, 35*, 1114-1127

Monticini, A. & Ravazzolo, F. (2014). Forecasting the intraday market price of money. *Journal of Empirical Finance, 29*, 304-315

Nadeem, M., Suleman, T., & Ahmed, A. (2019). Women on boards, firm risk and the profitability nexus: Does gender diversity moderate the risk and return relationship?. *International Review of Economics & Finance*, 64, 427-442.

Panzar, J. C. & Rosse, J. N. (1987). Testing for" monopoly" equilibrium. *The Journal of Industrial Economics*, 443-456

Panzar, J. C. & Rosse, J. N. (1982). *Structure, conduct, and comparative statistics*: Bell Telephone Laboratories

Peltzman, S. (1977). The gains and losses from industrial concentration. *The Journal of Law and Economics, 20*, 229-263

Poletti-Hughes, J., & Briano-Turrent, G. C. (2019). Gender diversity on the board of directors and corporate risk: A behavioural agency theory perspective. *International Review of Financial Analysis*, 62, 80-90.

Ralston, P. M., Blackhurst, J., Cantor, D. E. & Crum, M. R. (2015). A structure–conduct–performance perspective of how strategic supply chain integration affects firm performance. *Journal of Supply Chain Management, 51*, 47-64

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal,* 9(1), 86-136.

Schrimpf, A. & Sushko, V. (2019). Beyond LIBOR: a primer on the new benchmark rates. *BIS Quarterly Review*

Shaban, M., Duygun, M., Anwar, M. & Akbar, B. (2014). Diversification and banks' willingness to lend to small businesses: Evidence from Islamic and conventional banks in Indonesia. *Journal of Economic Behavior & Organization, 103,* S39-S55

Shaban, M. & James, G. A. (2018). The effects of ownership change on bank performance and risk exposure: Evidence from Indonesia. *Journal of Banking & Finance, 88*, 483-497

Shabani, M., Tyson, J., Toporowski, J. & McKinley, T. (2015). The financial system in the UK. *Studies in Financial Systems*, (13), 69.

Shaffer, S. & Spierdijk, L. (2019). Measuring multi-product banks' market power using the Lerner index, *CAMA Working Paper No. 17/2019*.

Shepherd, W. G. (1983). Economies of scale and monopoly profits. In *Industrial organization, antitrust, and public policy* (165-204): Springer

Shepherd, W. G. (1986). Tobin's q and the Structure-performance Relationship: Comment. *The American Economic Review, 76*, 1205-1210

Silva, T. C., de Souza, S. R. S., & Tabak, B. M. (2016). Network structure analysis of the Brazilian interbank market. *Emerging Markets Review, 26,* 130-152.

Simon, H. A. (1991). Organizations and markets. *Journal of economic perspectives, 5*, 25-44

Smith, A. (1977). *An Inquiry into the Nature and Causes of the Wealth of Nations.* University of Chicago Press.

Tregenna, F. (2009). The fat years: the structure and profitability of the US banking sector in the pre-crisis period. *Cambridge Journal of Economics, 33*, 609-632

Weiss, M. A. & Choi, B. P. (2008). State regulation and the structure, conduct, efficiency and performance of US auto insurers. *Journal of Banking & Finance, 32*, 134-156

Wheatley, M. (2012). The wheatley review of libor. *Final Report*

Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics,* 105(3), 581-606.

Wu, J., Chen, M., Jeon, B. N. & Wang, R. (2017). Does foreign bank penetration affect the risk of domestic banks? Evidence from emerging economies. *Journal of Financial Stability, 31*, 45-61

Appendix A: Modelling

1A. The multi-output translog cost frontier (Eqn. 4) is specified as:

$$\ln\left(\frac{C}{w_3}\right) = \beta_0 + \sum_{i=1}^{2} \beta_i \ln Q_{i,t} + \sum_{i=1}^{2} \beta_i \ln\left(\frac{w_i}{w_3}\right) + \frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2} \beta_{ij} \ln Q_{i,jt} \ln Q_{i,jt}$$

$$+ \frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2} \beta_{i,j} \ln\left(\frac{w_i}{w_3}\right) \ln\left(\frac{w_i}{w_3}\right) + \sum_{i=1}^{2}\sum_{j=1}^{2} \beta_{i,j} \ln Q_{i,jt} \ln\left(\frac{w_i}{w_3}\right) + \ln Equity$$

$$+ T + T^2 + \left(v_{i,t} + u_{i,t}\right)$$

$$i = 1, \ldots., N \; and \; t = 1, \ldots, T \qquad (A.1)$$

1B. We utilise the parameter estimates from Eqn. (A.1) to generate the bank-specific relative cost efficiency score as:

$$Cost\; Eff^f = \frac{\hat{C}^{min}}{\hat{C}^f} = \frac{exp[\hat{c}(q^f, w^f)] \times exp\left(\ln \hat{u}_c^{min}\right)}{exp[\hat{c}(q^f, w^f)] \times exp\left(\ln \hat{u}_c^f\right)} = \frac{\hat{u}_c^{min}}{\hat{u}_c^f} \qquad (A.2)$$

2A. The translog profit frontier (Eqn. 5) is specified as:

$$\ln P = \beta_0 + \sum_{i=1}^{2} \beta_i \ln Q_{i,t} + \sum_{i=1}^{2} \beta_i \ln w_i + \frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2} \beta_{ij} \ln Q_{i,jt} \ln Q_{i,jt}$$

$$+ \frac{1}{2}\sum_{i=1}^{3}\sum_{j=1}^{3} \beta_{i,j} \ln w_{i,jt} \ln w_{i,jt} + \sum_{i=1}^{2}\sum_{j=1}^{3} \beta_{i,j} \ln Q_{i,jt} \ln w_{i,jt} + \ln Equity + T$$

$$+ T^2 + \left(v_{i,t} + u_{i,t}\right)$$

$$i = 1, \ldots., N \; and \; t = 1, \ldots, T \qquad (A.3)$$

2B. We utilise the parameter estimates from Eqn. (A.3) to generate the bank-specific relative profit efficiency as:

$$Profit\; Eff^f = \frac{\hat{P}^f}{\hat{P}^{max}} = \frac{exp[\hat{p}(q^f, w^f)] \times exp\left(\ln \hat{u}_p^f\right)}{exp[\hat{p}(q^f, w^f)] \times exp\left(\ln \hat{u}_p^{max}\right)} = \frac{\hat{u}_p^f}{\hat{u}_p^{max}} \qquad (A.4)$$

3A. The $MC_{i,t}$ is derived from the translog cost function as:

$$\ln C_{i,t} = \alpha + \beta_1 \ln q_{i,t} + \frac{\beta_2}{2} \ln {q^2}_{i,t} + \sum_{k=1}^{3} \gamma_{k,t} \ln w_{k,i,t} + \sum_{k=1}^{3} \varphi_k \ln q_{i,t} \ln w_{k,i,t}$$

$$+ \sum_{k=1}^{3} \sum_{j=1}^{3} \delta_{i,j} \ln w_{k,i,t} \ln w_{j,i,t} + \sum_{i=1}^{3} \left(\frac{\theta_i}{2}\right) \ln {w^2}_{t,i,j} + \sum_{k=1}^{2} \pi_k \, trend^k$$

$$+ \sum_{i=1}^{3} \ln w_{k,i,t} \, trend + v \ln q_{t,j} \, trend + \varepsilon_{i,t} \qquad (A.5)$$

where $C_{i,t}$, $q_{i,t}$, $w_{i,t}$, have the same definition as in Eqn. (4). Eqn. (10) includes fixed effects to account for bank-specific factors. The marginal cost is the first derivative of the cost function with respect to the output evaluated for each sampled bank as specified in Eqn. (A.6):

$$MC_{it} = \frac{Cost_{i,t}}{Q_{i,t}} \left[\beta_1 + \beta_2 \ln q_{i,t} + \sum_{k=1}^{3} \varphi_k \ln w_{i,t} + v trend_{i,t}\right] \qquad (A.6)$$

Table 1: Variables used in profit and cost efficiency estimations

Variable	Mean	Median	St. Dev.	Minimum	Maximum	Obs
Profit (Cost) (in thousand US $)						
Total Profit	323,054.68	18,931.00	609,135.72	18,067.07	1,073,611.40	1097
Total Cost	445,233.99	53,452.30	796,873.50	19,544.14	1,830,985.93	1097
Input Prices						
Cost of capital (w_1)	0.013	0.009	0.020	0.005	0.064	1097
Cost of physical capital (w_2)	0.203	0.046	0.117	0.001	2.932	1097
Cost of labor (w_3)	0.110	0.082	0.092	0.001	0.628	1097
Output Prices (in thousand US $)						
Loans (q_1)	660,238.60	279,941.30	733,084.42	1,520.00	7,156,254.28	1097
Securities Investments (q_2)	258,210.18	86,785.50	677,124.50	670.00	5,244,285.48	1097

The table reports the summary statistics for the core variables utilised in the profit and cost efficiency estimations. In the translog estimations of profit (cost) efficiency, the input variables are: cost of capital, cost of physical capital, and cost of labor while the output variables are: loans, and securities investments. Total operating costs (C_i) is the summation of interest expenses, salaries and employee benefits, and other operating costs. The output (q_i) variables comprise loans (q_1) measured as gross loans less any reserves allocated for non-performing loans; and securities investments (q_2). The input prices (w_i) comprise the cost of capital (w_1) measured as interest expenses scaled by total deposits; cost of physical capital (w_2) measured as overhead expenses (other than personnel expenses) scaled by book value of fixed assets; and cost of labor (w_3) measured as personnel expenses scaled by number of employees. To mitigate any biases due to outliers, the data used have been winsorized at 1% to 99%.

Table 2: Definition of variables

Variable	Definition
Performance Measures	
PE SCORE	Profit efficiency score
PE RANK	Profit efficiency rank
CE SCORE	Cost efficiency score
CE RANK	Cost efficiency rank
NIM	Net interest margin
ROA	Return on average asset
Tobin's Q (TQ)	The book value of total assets minus the book value of common equity plus the market value of common equity scaled by the book value of total assets. Tobin's Q is a forward-looking market-based measure that captures unstructured and volatile bank performance better than ROA.
Structure Measures	
HHI	Herfindahl–Hirschman Index (HHI) is the sum of the squares of the proportional market shares of each bank in the interbank market.
HHI Dual	HHI Dual defines the percentage of banks that have no participation in the interbank market. It is measured as $d = 1 - \frac{k}{n}$, where $k = \frac{1}{HHI_x}$ and symbolises the fraction of the banks that do not have interbank market participation. Hence, $d = 1 - \frac{1}{n.HHI_x}$, where n is the number of banks. Equally, *1 – d* is the fraction of banks that dominate the entire market.
CR5	CR5 is the five-bank concentration ratio based on the market shares of the five largest banks in the loan market.
Conduct Measures	
PRH	PRH1 is the Panzar–Rosse H-statistic statistic based on the unscaled total revenue.
PRH2	PRH2 is the Panzar–Rosse H-statistic statistic based on total income.
PCM	PCM is the Price–Cost Margin based on the net interest margin.
PCM2	PCM2 is the Price–Cost Margin based on the adjusted Lerner Index.
Bank Control Variables	
Bank Size	The natural logarithm of the book value of total assets.
Market Share	The ratio of the loan total of each bank in the loans market to the total of loans of all the banks in the sample.
Equity-to-Assets (ETA)	The book value of equity divided by the book value of total assets. This captures the proportion of the asset portfolio that is funded through equity. Higher ratios indicate better bank capitalisation.
OBS Activity	This is the ratio of off-balance sheet activities scaled by total bank assets.
Risk	Tier 1 capital scaled by risk-weighted assets. This measure is homogeneous across banks and underpins the regulatory capital calibration in international standards. It captures the risk of default of a bank, and indeed serves that purpose in stress testing exercises.
Conglomerate	An indicator variable equal to one if the bank is affiliated with a conglomerate, 0 otherwise.
Ownership	An indicator variable equal to one if a bank is domestically owned, zero otherwise (foreign owned).
Governance Control Variables	
Board Size	The natural logarithm of the total number of directors on the board as at the end of the fiscal year.

Diversity	The percentage of female directors on the bank's board.
Duality	The natural logarithm of the number of the bank's directors who are also shareholders of the bank as of the end of the fiscal year. This dual role also proxies for Board power as well as the difficulty and complexity of Board's job/role.
Tenure	The natural logarithm of the number of years the firm's directors have served on the bank's board as of the end of the fiscal year.

The table presents the mnemonics and definition of each variable used in this paper.

Table 3: Descriptive statistics

	Mean	Median	St. Dev.	Minimum	Maximum	Obs
Performance Measures						
PE SCORE	0.718	0.813	0.897	0.290	0.999	1097
PE RANK	55.00	55.000	31.61	1.000	109.00	1097
CE SCORE	0.840	0.968	0.948	0.414	0.999	1097
CE RANK	55.00	55.000	31.61	1.000	109.00	1097
NIM	5.775	5.399	6.439	1.090	13.460	958
ROA	2.580	3.400	3.677	0.809	10.869	959
TQ	1.499	1.184	1.104	0.632	2.6193	1094
Structure Measures						
HHI	0.093	0.071	0.160	0.056	0.249	20
HHI Dual	0.931	0.926	0.971	0.907	0.985	20
CR5	0.329	0.338	0.509	0.114	0.862	20
Conduct Measures						
PRH	0.150	0.173	0.271	0.148	0.185	20
PRH2	0.077	0.093	0.693	0.044	0.205	20
PCM	0.526	0.423	0.832	0.473	0.983	20
PCM2	0.401	0.428	0.730	0.223	0.494	20
Bank Control Variables						
Bank Size	16.252	15.957	25.718	10.785	21.489	1097
Market Share	0.147	0.172	0.414	0.098	0.270	1097
ETA	0.123	0.117	0.210	0.043	0.294	1097
OBS Activity	13.918	13.964	14.439	2.944	20.985	1097
Risk	0.238	0.225	0.251	0.078	0.477	1097
Conglomerate	0.735	1.000	0.844	0.000	1.000	1097
Ownership	0.320	0.000	0.140	0.000	1.000	1097
Governance Control Variables						
Board Size	2.827	2.294	2.451	1.609	3.111	1097
Diversity	0.189	0.169	0.856	0.000	0.390	1097
Duality	1.722	1.281	3.344	0.000	2.094	1097
Tenure	2.291	1.386	2.803	1.000	3.478	1097

The table presents the summary statistics for all variables used in our core analysis. All variable definitions are in Table 2.

Table 4: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	PE score	1.00																								
2	PE rank	-0.97*	1.00																							
3	CE score	0.83*	-0.86*	1.00																						
4	CE rank	-0.74*	0.71*	-0.97*	1.00																					
5	NIM	0.06*	0.05*	0.05*	-0.02	1.00																				
6	ROA	0.16*	-0.17*	0.04	-0.11*	-0.03	1.00																			
7	TQ	0.06*	0.05*	0.10*	-0.05	0.10*	0.04	1.00																		
8	HHI	0.20*	-0.19*	0.11*	-0.19*	-0.06	0.03	-0.07	1.00																	
9	HHI Dual	0.20*	-0.18*	0.11*	-0.16*	-0.08	0.02	-0.09*	0.91*	1.00																
10	CR5	0.20*	-0.18*	0.11*	-0.15*	-0.07	0.02	-0.09*	0.93*	0.98*	1.00															
11	PRH	-0.15*	0.14*	-0.06	0.18*	0.10*	0.05	0.09*	-0.14*	-0.10*	-0.11*	1.00														
12	PRH2	-0.16*	0.15*	-0.07	0.12*	0.08	0.01	0.07	-0.12*	-0.19*	-0.17*	0.18*	1.00													
13	PCM	0.17*	-0.16*	-0.09*	0.15*	0.07	0.03	0.08*	-0.18*	0.20*	0.15*	0.18*	0.15*	1.00												
14	PCM2	0.02	-0.02	0.05	-0.17*	0.02	-0.14*	0.03	0.17*	0.16*	0.16*	0.11*	-0.11*	-0.15*	1.00											
15	Bank Size	0.06	-0.02	-0.36*	0.27*	-0.24*	0.08	0.34*	-0.01	0.02	0.01	-0.05	-0.03	-0.01	-0.12*	1.00										
16	Market Share	0.15*	-0.12*	-0.24*	0.11*	-0.17*	0.01	-0.10*	0.21*	0.20*	0.22*	-0.10*	-0.11*	-0.13*	-0.03	0.38*	1.00									
17	ETA	-0.04	0.02	0.10*	-0.12*	0.18*	-0.06	0.18*	-0.11*	-0.14*	-0.14*	0.14*	0.11*	0.12*	0.06	-0.31*	-0.18*	1.00								
18	OBS Activity	0.10*	-0.08*	-0.25*	0.11*	-0.29*	0.08*	-0.17*	0.09*	0.12*	0.11*	-0.09*	-0.10*	-0.07	-0.08	0.28*	0.33*	-0.36*	1.00							
19	Risk	-0.07	0.08*	-0.06	0.01	0.11*	0.04	0.15*	-0.10*	-0.11*	-0.11*	0.10*	0.07	0.10*	0.03	-0.20*	-0.14*	0.30*	-0.21*	1.00						
20	Conglomerate	-0.02	0.06	-0.22*	0.22*	-0.02	0.07	-0.24*	0.01	0.03	0.03	-0.04	-0.02	-0.01	-0.06	0.32*	0.20*	-0.26*	0.30*	-0.27*	1.00					
21	Ownership	-0.01	0.01	0.08	-0.14*	0.24*	0.04	-0.02	-0.07	-0.09*	-0.08*	0.07	0.07	0.07	0.03	-0.06	-0.05	-0.01	-0.14*	-0.07	0.09*	1.00				
22	Board Size	-0.10*	0.09*	-0.13*	0.01	0.03	0.09*	-0.15*	-0.01	-0.00	-0.00	0.01	0.01	0.03	-0.03	0.30*	0.17*	-0.21*	0.29*	-0.20*	0.26*	0.09*	1.00			
23	Diversity	0.02	-0.01	-0.10*	0.05	0.03	0.04	-0.20*	0.04	0.05	0.05	-0.03	-0.03	-0.01	-0.04	0.30*	0.23*	-0.28*	0.35*	-0.21*	0.19*	0.19*	0.29*	1.00		
24	Duality	0.02	-0.03	0.10*	-0.15*	0.22*	0.03	0.08*	-0.04	-0.05	-0.04	0.07	0.07	0.07	0.04	-0.12*	-0.07	0.04	-0.16*	0.00	0.09*	0.28*	0.13*	0.23*	1.00	
25	Tenure	0.10*	-0.10*	0.07	-0.20*	-0.07	-0.01	-0.01	0.17*	0.19*	0.18*	-0.12*	-0.19*	-0.17*	0.14*	-0.00	0.10*	-0.07	0.06	-0.06	0.01	-0.09*	-0.02	0.04	0.10*	1.00

The table presents the unconditional correlation coefficient between any pair of variables. All variables are as described in Table 2. * Indicates significance at 1%.

Table 5: Market Structure and Bank Conduct

	PRH			PRH2			PCM			PCM2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HHI	-0.215***			-0.317***			0.264***			0.354***		
	(0.000)			(0.000)			(0.000)			(0.000)		
HHI Dual		-0.103***			-0.135***			0.132***			0.542***	
		(0.000)			(0.000)			(0.000)			(0.000)	
CR5			-0.147***			-0.150***			0.146***			0.446***
			(0.000)			(0.000)			(0.000)			(0.000)
Bank Size	0.001	-0.209***	-0.049***	-0.201***	-0.216***	-0.245***	0.014***	0.016***	0.023***	0.045***	0.045***	0.045***
	(0.006)	(0.047)	(0.012)	(0.038)	(0.067)	(0.063)	(0.003)	(0.004)	(0.005)	(0.014)	(0.014)	(0.014)
Market Share	-0.004***	-0.059***	0.008**	-0.038***	-0.036***	0.074***	0.004***	0.004***	0.005***	-0.001	-0.001	-0.001
	(0.002)	(0.019)	(0.004)	(0.010)	(0.013)	(0.025)	(0.001)	(0.001)	(0.002)	(0.004)	(0.004)	(0.004)
ETA	0.032***	0.091	0.022	-0.055	0.044	-0.189**	-0.006	0.011*	-0.009	0.041*	0.041*	0.041*
	(0.011)	(0.057)	(0.014)	(0.041)	(0.093)	(0.091)	(0.004)	(0.006)	(0.006)	(0.023)	(0.023)	(0.023)
OBS Activity	0.021***	-0.056	0.041***	-0.081***	-0.085**	0.090*	0.005**	-0.006**	0.008**	0.003	0.003	0.003
	(0.005)	(0.034)	(0.009)	(0.027)	(0.040)	(0.049)	(0.002)	(0.003)	(0.003)	(0.010)	(0.010)	(0.010)
Risk	-0.101	0.292	-0.206	0.133	-0.075	0.624	0.006	-0.065	-0.001	-0.659	-0.659	-0.659
	(0.182)	(1.177)	(0.317)	(0.100)	(1.910)	(1.697)	(0.071)	(0.127)	(0.120)	(0.476)	(0.476)	(0.476)
Conglomerate	-0.007***	-0.024**	-0.002	-0.030***	-0.027	0.005	0.001	-0.002	0.001	0.002	0.002	0.002
	(0.002)	(0.012)	(0.003)	(0.010)	(0.026)	(0.014)	(0.001)	(0.001)	(0.001)	(0.006)	(0.006)	(0.006)
Ownership	0.224**	-0.483	0.375**	0.397	-2.496**	3.059**	0.193	-0.157***	0.334*	0.107	0.107	0.107
	(0.112)	(0.373)	(0.147)	(0.812)	(1.072)	(1.424)	(0.126)	(0.055)	(0.183)	(0.364)	(0.364)	(0.364)
Board Size	0.057***	0.088	0.050*	-0.007	-0.006	-0.057	0.001	0.006	0.002	0.081	0.081	0.081
	(0.018)	(0.118)	(0.030)	(0.089)	(0.186)	(0.165)	(0.008)	(0.013)	(0.012)	(0.075)	(0.075)	(0.075)
Diversity	-0.058***	-0.123**	-0.041**	-0.081	-0.104	0.060	0.008**	-0.003	0.011*	0.005	0.005	0.005
	(0.013)	(0.055)	(0.016)	(0.049)	(0.114)	(0.082)	(0.004)	(0.007)	(0.006)	(0.033)	(0.033)	(0.033)
Duality	0.051***	0.583***	-0.055	0.702***	0.785***	-0.799	-0.086	-0.080***	-0.146	-0.086***	-0.086***	-0.086***
	(0.018)	(0.217)	(0.041)	(0.160)	(0.194)	(0.508)	(0.064)	(0.023)	(0.092)	(0.019)	(0.019)	(0.019)
Tenure	-0.040***	-0.428***	-0.072***	-0.578***	-0.652***	-0.380***	0.006*	0.070***	0.017**	-0.010	-0.010	-0.010
	(0.007)	(0.105)	(0.017)	(0.101)	(0.160)	(0.128)	(0.004)	(0.015)	(0.008)	(0.019)	(0.019)	(0.019)
Constant	0.167***	-0.942***	-0.460***	-0.130***	-0.335***	-0.292***	-0.684***	-0.299***	-0.216***	-0.872***	-0.530***	0.409***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	931	931	931	931	931	931	931	931	931	827	827	827
r2	0.938	0.938	0.938	0.978	0.978	0.978	0.814	0.814	0.814	0.415	0.415	0.415
N_clust	109	109	109	109	109	109	109	109	109	109	109	109

This table presents the estimated results for the structure-conduct relationship. All specifications include year and firm fixed effects. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Market Structure and Performance

	PE SCORE	PE RANK	PE SCORE	PE RANK	PE SCORE	PE RANK	CE SCORE	CE RANK	CE SCORE	CE RANK	CE SCORE	CE RANK
HHI	0.210***	-0.780**					0.188***	-0.140***				
	(0.064)	(0.310)					(0.037)	(0.028)				
HHI Dual			0.321***	-0.219**					0.287***	-0.344***		
			(0.098)	(0.087)					(0.045)	(0.080)		
CR5					0.264***	-0.245***					0.237***	-0.506***
					(0.081)	(0.058)					(0.034)	(0.121)
Bank Size	0.202***	-0.183	0.202***	-0.186	0.202***	-0.731**	-0.252***	0.819***	-0.252***	0.848***	-0.252***	0.850***
	(0.015)	(0.251)	(0.015)	(0.246)	(0.015)	(0.344)	(0.088)	(0.172)	(0.088)	(0.173)	(0.088)	(0.173)
Market Share	0.050***	-0.062***	0.050***	-0.065***	0.050***	0.055*	-0.016	0.041	-0.016	0.029	-0.016	0.034
	(0.004)	(0.006)	(0.004)	(0.005)	(0.004)	(0.030)	(0.013)	(0.040)	(0.013)	(0.038)	(0.013)	(0.039)
ETA	0.019	-0.251	0.019	-0.263	0.019	0.542	0.020	-0.144	0.020	-0.160	0.020	-0.150
	(0.016)	(0.243)	(0.016)	(0.243)	(0.016)	(0.342)	(0.053)	(0.201)	(0.053)	(0.205)	(0.053)	(0.205)
OBS Activity	0.014	-0.323**	0.014	-0.320**	0.014	-0.095	0.071	-0.462***	0.071	-0.463***	0.071	-0.470***
	(0.009)	(0.147)	(0.009)	(0.146)	(0.009)	(0.156)	(0.058)	(0.124)	(0.058)	(0.122)	(0.058)	(0.123)
Risk	-0.310	0.712	-0.310	0.728	-0.310	-0.139	-0.379*	0.616	-0.379*	0.668	-0.379*	0.647
	(0.453)	(0.706)	(0.453)	(0.709)	(0.453)	(0.089)	(0.218)	(0.489)	(0.218)	(0.493)	(0.218)	(0.495)
Conglomerate	-0.002	0.053	-0.002	0.053	-0.002	0.009	-0.006	0.130**	-0.006	0.125**	-0.006	0.125**
	(0.005)	(0.084)	(0.005)	(0.084)	(0.005)	(0.007)	(0.015)	(0.061)	(0.015)	(0.062)	(0.015)	(0.062)
Ownership	-0.159	0.209	-0.159	0.211	-0.159	-0.135	0.131	-0.357**	0.131	-0.361**	0.131	-0.369**
	(0.154)	(0.264)	(0.154)	(0.262)	(0.154)	(0.319)	(0.138)	(0.179)	(0.138)	(0.178)	(0.138)	(0.176)
Board Size	-0.093	0.120	-0.093	0.120	-0.093	0.655	-0.007	-0.883	-0.007	-0.858	-0.007	-0.843
	(0.062)	(0.093)	(0.062)	(0.092)	(0.062)	(0.747)	(0.233)	(0.847)	(0.233)	(0.865)	(0.233)	(0.868)
Diversity	-0.002	0.158	-0.002	0.156	-0.002	0.206	0.156	-0.165	0.156	-0.187	0.156	-0.187
	(0.041)	(0.584)	(0.041)	(0.583)	(0.041)	(0.542)	(0.139)	(0.413)	(0.139)	(0.410)	(0.139)	(0.411)
Duality	0.131**	0.186**	0.131**	0.189**	0.131**	0.077	0.026	0.020	0.026	0.033	0.026	0.085
	(0.057)	(0.092)	(0.057)	(0.092)	(0.057)	(0.151)	(0.126)	(0.594)	(0.126)	(0.603)	(0.126)	(0.592)
Tenure	-0.018	0.035	-0.018	0.064	-0.018	-0.018	-0.031	-0.199	-0.031	-0.214	-0.031	-0.253
	(0.015)	(0.242)	(0.015)	(0.248)	(0.015)	(0.041)	(0.057)	(0.215)	(0.057)	(0.222)	(0.057)	(0.218)
Constant	-0.000	0.000	-0.000***	0.000***	0.000***	0.002***	0.000***	-0.000**	0.000	0.000***	0.000***	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sigma		-0.030***		-0.030***		-0.013***		-0.031***		-0.030***		-0.030***
		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
N	938	938	938	938	938	938	938	938	938	938	938	938
r2	0.840		0.840		0.840		0.231		0.231		0.231	
N_clust	109	109	109	109	109	109	109	109	109	109	109	109

This table presents the estimated results for the structure-performance relationship. All specifications include year and firm fixed effects. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Market Structure and Performance – standard performance measures

	NIM			ROA			TQ		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI	0.597***			0.129***			0.912***		
	(0.146)			(0.009)			(0.141)		
HHI Dual		0.091**			0.197***			0.148**	
		(0.037)			(0.014)			(0.063)	
CR5			0.175***			0.162***			0.115**
			(0.031)			(0.012)			(0.052)
Bank Size	0.212***	0.212***	0.212***	0.125	0.125	0.125	0.364**	0.364**	0.364**
	(0.102)	(0.102)	(0.102)	(0.270)	(0.270)	(0.270)	(0.142)	(0.142)	(0.142)
Market Share	0.019*	0.019*	0.019*	0.018***	0.018***	0.018***	0.006***	0.006***	0.006***
	(0.010)	(0.010)	(0.010)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
ETA	-0.131	-0.131	-0.131	0.651	0.651	0.651	0.240***	0.240***	0.240***
	(0.089)	(0.089)	(0.089)	(0.519)	(0.519)	(0.519)	(0.028)	(0.028)	(0.028)
OBS Activity	0.170*	0.170*	0.170*	0.052	0.052	0.052	-0.148***	-0.148***	-0.148***
	(0.090)	(0.090)	(0.090)	(0.081)	(0.081)	(0.081)	(0.055)	(0.055)	(0.055)
Risk	0.173	0.173	0.173	-0.264	-0.264	-0.264	0.197***	0.197***	0.197***
	(0.233)	(0.233)	(0.233)	(0.604)	(0.604)	(0.604)	(0.068)	(0.068)	(0.068)
Conglomerate	-0.048*	-0.048*	-0.048*	0.044	0.044	0.044	0.003	0.003	0.003
	(0.026)	(0.026)	(0.026)	(0.032)	(0.032)	(0.032)	(0.019)	(0.019)	(0.019)
Ownership	-0.207	-0.207	-0.207	0.987	0.987	0.987	-0.319	-0.319	-0.319
	(0.172)	(0.172)	(0.172)	(0.882)	(0.882)	(0.882)	(0.357)	(0.357)	(0.357)
Board Size	-0.142	-0.142	-0.142	-0.125	-0.125	-0.125	-0.130	-0.130	-0.130
	(0.304)	(0.304)	(0.304)	(0.282)	(0.282)	(0.282)	(0.278)	(0.278)	(0.278)
Diversity	0.322**	0.322**	0.322**	-0.243	-0.243	-0.243	0.089***	0.089***	0.089***
	(0.147)	(0.147)	(0.147)	(0.243)	(0.243)	(0.243)	(0.010)	(0.010)	(0.010)
Duality	-0.025	-0.025	-0.025	0.111***	0.111***	0.111***	0.202	0.202	0.202
	(0.332)	(0.332)	(0.332)	(0.009)	(0.009)	(0.009)	(0.228)	(0.228)	(0.228)
Tenure	0.049	0.049	0.049	0.063	0.063	0.063	-0.033	-0.033	-0.033
	(0.088)	(0.088)	(0.088)	(0.131)	(0.131)	(0.131)	(0.063)	(0.063)	(0.063)
Constant	-0.000***	-0.000**	0.000	-0.000	-0.000	0.000	-0.000***	-0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	937	937	937	937	937	937	827	827	827
r2	0.281	0.281	0.281	0.805	0.805	0.805	0.861	0.861	0.861
N_clust	109	109	109	109	109	109	109	109	109

This table presents the estimated results structure-performance relationship using alternate performance measures. All specifications include year and firm fixed effects. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Market Structure, Conduct and Performance

	PE SCORE	PE RANK	PE SCORE	PE RANK	PE SCORE	PE RANK	CE SCORE	CE RANK	CE SCORE	CE RANK	CE SCORE	CE RANK
HHI	0.077***	-0.136**					0.202***	-0.103***				
	(0.018)	(0.054)					(0.023)	(0.026)				
HHI Dual			0.172***	0.178***					0.243***	-0.328***		
			(0.019)	(0.041)					(0.026)	(0.077)		
CR5					0.122***	-0.156***					0.141***	-0.440***
					(0.022)	(0.024)					(0.013)	(0.120)
PRH	-0.175***	0.712***	-0.189***	0.147***	-0.143***	0.209***	-0.501***	0.270***	-0.511***	0.183***	-0.481***	0.165***
	(0.010)	(0.216)	(0.010)	(0.003)	(0.010)	(0.016)	(0.101)	(0.066)	(0.060)	(0.057)	(0.058)	(0.057)
Bank Size	-0.002	-0.202	-0.002	0.103	-0.002	-0.199***	-0.250***	0.837***	-0.250***	0.885***	-0.250***	0.880***
	(0.015)	(0.193)	(0.015)	(0.173)	(0.015)	(0.049)	(0.089)	(0.175)	(0.089)	(0.173)	(0.089)	(0.173)
Market Share	0.004	0.098**	0.004	-0.027	0.004	0.038***	-0.018	0.009	-0.018	-0.007	-0.018	-0.003
	(0.004)	(0.048)	(0.004)	(0.083)	(0.004)	(0.014)	(0.015)	(0.046)	(0.015)	(0.044)	(0.015)	(0.044)
ETA	0.020	-0.340	0.020	0.644***	0.020	0.480	0.023	-0.208	0.023	-0.207	0.023	-0.203
	(0.016)	(0.225)	(0.016)	(0.217)	(0.016)	(0.391)	(0.053)	(0.196)	(0.053)	(0.202)	(0.053)	(0.199)
OBS Activity	0.014	-0.369**	0.014	0.116	0.014	0.913***	0.071	-0.454***	0.071	-0.462***	0.071	-0.465***
	(0.009)	(0.147)	(0.009)	(0.311)	(0.009)	(0.269)	(0.058)	(0.122)	(0.058)	(0.120)	(0.058)	(0.121)
Risk	-0.321	-0.610	-0.321	0.561	-0.321	-1.056	-0.384*	0.652	-0.384*	0.714	-0.384*	0.679
	(0.454)	(0.483)	(0.454)	(0.483)	(0.454)	(1.075)	(0.218)	(0.484)	(0.218)	(0.491)	(0.218)	(0.491)
Conglomerate	-0.002	-0.042	-0.002	-0.062	-0.002	0.030***	-0.006	0.135**	-0.006	0.126**	-0.006	0.128**
	(0.005)	(0.050)	(0.005)	(0.496)	(0.005)	(0.010)	(0.015)	(0.060)	(0.015)	(0.062)	(0.015)	(0.061)
Ownership	-0.155	-0.577	-0.155	0.504***	-0.155	0.113***	0.131	-0.294	0.131	-0.314*	0.131	-0.310
	(0.156)	(0.375)	(0.156)	(0.167)	(0.156)	(0.036)	(0.133)	(0.195)	(0.133)	(0.189)	(0.133)	(0.191)
Board Size	-0.094	0.103*	-0.094	-0.104	-0.094	-0.141	-0.015	-0.104	-0.015	-0.099	-0.015	-0.101
	(0.063)	(0.055)	(0.063)	(0.474)	(0.063)	(0.093)	(0.234)	(0.083)	(0.234)	(0.085)	(0.234)	(0.084)
Diversity	-0.003	0.073**	-0.003	-0.010	-0.003	0.014	0.157	-0.141	0.157	-0.179	0.157	-0.165
	(0.041)	(0.034)	(0.041)	(0.026)	(0.041)	(0.043)	(0.139)	(0.406)	(0.139)	(0.406)	(0.139)	(0.406)
Duality	0.131**	0.345**	0.131**	-0.035	0.131**	-0.619***	0.027	-0.331	0.027	-0.199	0.027	-0.222
	(0.057)	(0.152)	(0.057)	(0.062)	(0.057)	(0.185)	(0.128)	(0.660)	(0.128)	(0.651)	(0.128)	(0.653)
Tenure	-0.019	-0.289***	-0.019	0.018	-0.019	0.681***	-0.034	-0.018	-0.034	-0.118	-0.034	-0.115
	(0.015)	(0.073)	(0.015)	(0.023)	(0.015)	(0.141)	(0.057)	(0.217)	(0.057)	(0.219)	(0.057)	(0.214)
Constant	0.000	0.001***	-0.000***	-0.001*	0.000	0.002***	0.000***	-0.000**	0.000***	0.000***	0.000***	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sigma		-0.015***		-0.014***		-0.013***		-0.030***		-0.030***		-0.030***
		(0.003)		(0.002)		(0.002)		(0.004)		(0.004)		(0.004)
N	931	931	931	931	931	931	931	931	931	931	931	931
r2	0.840		0.840		0.840		0.233		0.233		0.233	
N_clust	109	109	109	109	109	109	109	109	109	109	109	109

This table presents the estimated results for the structure-conduct-performance. All specifications include year and firm fixed effects. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: 2-STEP GMM estimation of the core SCP results.

	PRH	PRH2	PE SCORE	PE RANK	CE SCORE	CE RANK	PE SCORE	PE RANK	CE SCORE	CE RANK
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
HHI	-0.115***	-0.195***	0.338***	-0.430***	0.663***	-0.171***	0.259***	-0.348***	0.495***	-0.152***
	(0.009)	(0.010)	(0.024)	(0.040)	(0.043)	(0.028)	(0.025)	(0.041)	(0.047)	(0.036)
PRH							-0.315***	0.278***	0.954***	-0.283***
							(0.089)	(0.015)	(0.124)	(0.008)
Bank Size	0.073	-0.064***	0.029***	-0.140***	-0.193***	0.099***	0.031***	-0.131***	-0.286***	0.374***
	(0.005)	(0.005)	(0.002)	(0.028)	(0.065)	(0.018)	(0.009)	(0.15)	(0.021)	(0.083)
Market Share	-0.164***	-0.185***	0.005***	-0.091***	-0.012**	0.007	0.004	-0.080	-0.009	-0.100*
	(0.011)	(0.013)	(0.000)	(0.005)	(0.006)	(0.043)	(0.005)	(0.076)	(0.009)	(0.051)
ETA	-0.051	-0.029	0.015	-0.167	-0.063	0.102	0.012	-0.145	-0.055	-0.126
	(0.035)	(0.60)	(0.015)	(0.252)	(0.047)	(0.135)	(0.018)	(0.291)	(0.058)	(0.243)
OBS Activity	-0.145	0.351	0.019**	-0.402***	0.100*	-0.513***	0.020**	-0.410***	0.097*	-0.428***
	(0.363)	(0.391)	(0.009)	(0.152)	(0.054)	(0.116)	(0.009)	(0.153)	(0.058)	(0.141)
Conglomerate	-0.091***	-0.068***	-0.003	0.081	-0.011	0.175***	-0.002	0.071	-0.014	0.273***
	(0.011)	(0.014)	(0.005)	(0.088)	(0.010)	(0.051)	(0.007)	(0.108)	(0.014)	(0.075)
Ownership	-0.235***	0.074	-0.076	0.161	0.109	-0.325*	-0.065	0.151	0.075	-0.226
	(0.021)	(0.278)	(0.199)	(0.346)	(0.113)	(0.187)	(0.203)	(0.352)	(0.132)	(0.250)
Board Size	-0.087***	-0.035***	-0.095***	0.119***	-0.037	-0.142**	-0.099***	0.123***	-0.023	-0.182**
	(0.010)	(0.11)	(0.006)	(0.009)	(0.155)	(0.072)	(0.006)	(0.010)	(0.163)	(0.075)
Diversity	-0.033***	-0.106***	0.011***	-0.074***	0.067	-0.195	0.019***	-0.145**	0.043	0.524
	(0.005)	(0.055)	(0.004)	(0.006)	(0.067)	(0.168)	(0.005)	(0.070)	(0.107)	(0.425)
Duality	0.176	-0.205	0.119**	-0.202**	0.113	0.407	0.117**	-0.200**	0.119	0.249
	(0.124)	(0.164)	(0.054)	(0.092)	(0.079)	(0.665)	(0.053)	(0.092)	(0.074)	(0.962)
Tenure	-0.166**	-0.323***	-0.002	0.023	-0.003	-0.102	-0.003	0.036	0.002	-0.236
	(0.075)	(0.096)	(0.017)	(0.030)	(0.005)	(0.211)	(0.002)	(0.031)	(0.006)	(0.255)
Constant	-0.012**	-0.033***	0.181	0.055	0.115***	-0.087***	0.153	0.057	0.116***	-0.112***
	(0.005)	(0.005)	(0.211)	(0.034)	(0.006)	(0.003)	(0.229)	(0.037)	(0.005)	(0.003)
N	798	798	798	798	798	798	798	798	798	798
Number of banks	110	110	110	110	110	110	110	110	110	110
K-P WF Stats	121.209	121.209	131.549	131.549	131.549	131.549	147.359	147.359	147.359	147.359
K-P LM stats	48.078	48.078	49.409	49.409	49.409	49.409	47.216	47.216	47.216	47.216
Hansen J statistic	0.012	0.208	0.100	0.080	0.154	0.176	0.121	0.179	0.215	0.241
Hansen J p-value	0.911	0.648	0.311	0.758	0.481	0.548	0.378	0.458	0.371	0.452
AB test AR(1) (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB test AR(2) (p-value)	0.252	0.369	0.199	0.252	0.208	0.334	0.284	0.355	0.389	0.392

This table presents the two-stage system GMM estimation results of the effects of the core results. Standard errors are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. We obtain similar results if the HHI Dual is used to capture bank conduct.

Table 10: Mediation Analysis for SCP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Structure–Performance (without conduct) (Table 6)	0.210***	-0.780**	0.321***	-0.219**	0.264***	-0.245***	0.188***	-0.140***	0.287***	-0.344***	0.237***	-0.506***
	(0.064)	(0.310)	(0.098)	(0.087)	(0.081)	(0.058)	(0.037)	(0.028)	(0.045)	(0.080)	(0.034)	(0.121)
Structure–Performance (with conduct) (Table 8/1A)	0.077***	-0.136**	0.172***	0.178***	0.122***	-0.156***	0.123***	-0.121***	0.110***	-0.270***	0.188***	-0.449***
	(0.018)	(0.054)	(0.019)	(0.041)	(0.022)	(0.024)	(0.020)	(0.025)	(0.015)	(0.076)	(0.021)	(0.124)
Coefficient of Conduct (in S–C–P model) (Table 8/1A)	-0.175***	0.712***	-0.189***	0.147***	-0.143***	0.209***	0.125***	-0.366***	0.131***	-0.382***	0.114***	-0.331***
	(0.010)	(0.216)	(0.010)	(0.003)	(0.010)	(0.016)	(0.014)	(0.082)	(0.015)	(0.080)	(0.027)	(0.082)
Structure–Conduct (Table 5)	-0.215***	-0.215***	-0.103***	-0.103***	-0.147***	-0.147***	0.264***	0.264***	0.132***	0.132***	0.146***	0.146***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Complementary tests												
Sobel test	-0.120***	0.685***	-0.142***	0.123***	-0.207***	0.119***	0.179***	-0.356***	0.241***	-0.374***	0.114***	-0.328***
	(0.004)	(0.075)	(0.005)	(0.008)	(0.005)	(0.008)	(0.003)	(0.009)	(0.003)	(0.009)	(0.003)	(0.010)
Aroian test	-0.230***	-0.230***	-0.268***	-0.268***	-0.142***	-0.142***	0.234***	0.234***	0.181***	0.181***	0.149***	0.149***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	(0.002)	(0.002)	(0.002)	(0.002)
Goodman test	0.516***	0.797**	0.199***	0.331***	0.302***	-0.510***	0.168***	0.332***	0.177***	-0.105***	0.202***	0.160***
	(0.025)	(0.358)	(0.013)	(0.022)	(0.022)	(0.035)	(0.265)	(0.086)	(0.008)	(0.027)	(0.083)	(0.005)
Bootstrapped tests												
Indirect Effect	0.516***	-0.797***	0.199***	-0.331***	0.302***	-0.510***	0.168***	-0.332***	0.110***	-0.074***	0.293**	-0.126**
	(0.083)	(0.139)	(0.014)	(0.021)	(0.033)	(0.026)	(0.054)	(0.050)	(0.005)	(0.005)	(0.002)	(0.002)
Percentile CI (95%) – Lower	0.073	-1.722	-0.847	-0.783	-0.159	-1.233	-0.177	-0.510	0.017	-0.203	0.062	-0.855
Upper	1.133	-0.149	0.497	0.881	0.791	0.176	0.527	-0.174	0.189	-0.018	0.788	-0.060
Bias-corrected CI (95%) – Lower	0.010	-1.884	-0.774	-0.785	-0.150	-1.243	-0.187	-0.499	0.016	-0.189	0.057	-0.777
Upper	1.204	-0.021	0.507	0.879	0.799	0.160	0.514	-0.165	0.172	-0.017	0.734	-0.055
Bias-corrected and accelerated CI (95%) - Lower	0.011	-1.884	-0.774	-0.785	-0.150	-1.243	-0.191	-0.498	0.010	-0.143	0.041	-0.543
Upper	1.204	-0.021	0.507	0.879	0.799	0.160	0.509	-0.164	0.136	-0.012	0.514	-0.033

This table presents the mediations analysis based on the SAG and the Bootstrapped tests. Models 1, 3, & 5 (2, 4, & 6) are estimated using the PE SCORE (PE RANK) as performance measures and Conduct captured via the PRH. Models 7, 9, & 11 (8, 10, & 12) are estimated using the CE SCORE (CE RANK) as performance measures and Conduct captured via the PCM2. Market structure is captured via the HHI, HHI Dual and CR5 under models 1 & 2 (5 & 6); 3 & 4 (7 & 8); and 5 & 6 (11 & 12) respectively. Model specifications include all other control variables, year and firm fixed effects. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Mediation Analysis for SCP

	Domestic Banks				Foreign Banks			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Structure–Performance (without conduct)	0.114**	-0.171***	0.162**	-0.202***	0.323***	-0.343***	0.109***	-0.134***
	(0.048)	(0.065)	(0.064)	(0.043)	(0.022)	(0.032)	(0.008)	(0.027)
Structure–Performance (with conduct)	0.115**	-0.136***	0.137**	-0.196***	0.347***	-0.305***	0.110	-0.140
	(0.045)	(0.023)	(0.054)	(0.036)	(0.021)	(0.031)	(0.083)	(0.257)
Coefficient of Conduct (in S–C–P model)	-0.846***	0.188***	-0.409***	0.398***	-0.774***	0.502***	-0.165***	0.192**
	(0.065)	(0.040)	(0.028)	(0.137)	(0.069)	(0.067)	(0.020)	(0.090)
Structure–Conduct	-0.079***	-0.079***	-0.079***	-0.079***	-0.030**	-0.030**	-0.030**	-0.030**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.001)	(0.001)	(0.001)	(0.001)
Complementary tests								
Sobel test	-0.846***	0.126***	-0.409***	0.363***	-0.774***	0.508***	-0.165***	0.189***
	(0.068)	(0.008)	(0.035)	(0.091)	(0.058)	(0.091)	(0.025)	(0.080)
Aroian test	-0.079***	-0.079***	-0.079***	-0.079***	-0.030***	-0.030***	-0.030***	-0.030***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.001)	(0.001)	(0.001)	(0.001)
Goodman test	-0.667***	0.993***	-0.323***	0.286***	-0.234***	0.326***	-0.498***	0.573***
	(0.055)	(0.092)	(0.028)	(0.009)	(0.019)	(0.030)	(0.265)	(0.086)
Bootstrapped test								
Indirect Effect	-0.667***	0.993***	-0.323***	0.286***	-0.234***	0.326***	-0.498***	0.573***
	(0.042)	(0.048)	(0.022)	(0.010)	(0.024)	(0.035)	(0.063)	(0.038)
Percentile CI (95%) – Lower	-4.677	0.334	-0.575	-0.052	-0.148	-0.117	-0.508	-0.152
Upper	0.222	6.964	0.825	1.297	0.810	2.401	0.201	0.669
Bias-corrected CI (95%) – Lower	-4.220	0.352	-0.505	-0.053	-0.097	-0.128	-0.508	-0.155
Upper	0.229	6.012	0.833	1.331	0.903	1.678	0.207	0.740
Bias-corrected and accelerated CI (95%) - Lower	-3.922	0.354	-0.642	-0.052	-0.097	-0.127	-0.515	-0.153
Upper	0.232	5.782	0.813	1.313	0.903	1.692	0.199	0.679

This table presents the mediations analysis based on the SAG and the Bootstrapped tests. Even (odd) numbered models are estimated using the SCORE (RANK) as performance measures where models 1-4 (5-8) show the profit (cost) efficiency. Conduct is captured via the PRH. Market structure is captured via the HHI. Models for HHI Dual and CR5 are reported in the Appendix. Model specifications include all other control variables, year, and firm fixed effects. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Mediation Analysis for SCP

	Conglomerates				Non-Conglomerates			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Structure–Performance (without conduct)	0.649^{**}	-0.860^{**}	0.194^{**}	-0.133^{***}	0.668^{***}	-0.934^{***}	0.125	-0.186
	(0.286)	(0.430)	(0.082)	(0.041)	(0.232)	(0.354)	(0.114)	(0.141)
Structure–Performance (with conduct)	0.605^{**}	-0.791^{**}	0.179^{**}	-0.131^{***}	0.630^{***}	-0.602^{***}	0.107	-0.123
	(0.265)	(0.395)	(0.074)	(0.031)	(0.221)	(0.201)	(0.101)	(0.102)
Coefficient of Conduct (in S–C–P model)	-0.118^{**}	0.176^{**}	-0.379^{**}	0.239^{***}	-0.701^{***}	0.797^{***}	-0.232^{***}	0.552^{***}
	(0.051)	(0.080)	(0.158)	(0.078)	(0.058)	(0.062)	(0.024)	(0.100)
Structure–Conduct	-0.053^{***}	-0.053^{***}	-0.053^{***}	-0.053^{***}	-0.048^{*}	-0.048^{*}	-0.048^{*}	-0.048^{*}
	(0.010)	(0.010)	(0.010)	(0.010)	(0.026)	(0.026)	(0.026)	(0.026)
Complementary tests								
Sobel test	-0.120^{**}	0.180^{***}	-0.382^{***}	0.238^{***}	-0.701^{***}	0.722^{***}	-0.232^{***}	0.387^{***}
	(0.056)	(0.090)	(0.025)	(0.072)	(0.068)	(0.110)	(0.023)	(0.128)
Aroian test	-0.052^{***}	-0.052^{***}	-0.052^{***}	-0.052^{***}	-0.046^{**}	-0.046^{**}	-0.046^{**}	-0.046^{**}
	(0.010)	(0.010)	(0.010)	(0.010)	(0.020)	(0.020)	(0.020)	(0.020)
Goodman test	-0.624^{**}	0.934^{**}	-0.198^{***}	0.123^{***}	-0.320^{***}	0.557^{***}	-0.106^{***}	0.176^{***}
	(0.312)	(0.492)	(0.013)	(0.044)	(0.031)	(0.052)	(0.010)	(0.009)
Bootstrapped test								
Indirect Effect	-0.624^{*}	0.934^{*}	-0.198^{***}	0.123^{**}	-0.320^{***}	0.557^{***}	-0.106^{***}	0.176^{***}
	(0.383)	(0.567)	(0.010)	(0.048)	(0.045)	(0.069)	(0.011)	(0.014)
Percentile CI (95%) - Lower	-2.832	-0.216	-2.732	-0.235	-4.822	-0.220	-3.881	-0.512
Upper	0.147	1.329	0.435	0.463	0.137	5.574	0.378	1.291
Bias-corrected CI (95%) - Lower	3.741	-0.229	-3.403	-0.247	-2.242	-0.286	-6.322	-0.502
Upper	0.157	3.363	0.451	0.505	0.180	2.224	0.169	1.502
Bias-corrected and accelerated CI (95%) - Lower	3.922	-0.229	-3.119	-0.245	-2.311	-0.280	-6.272	-0.483
Upper	0.157	3.882	0.448	0.503	0.178	2.312	0.217	2.642

This table presents the mediations analysis based on the SAG and the bootstrapped tests. Even (odd) numbered models are estimated using the SCORE (RANK) as performance measures where models 1-4 (5-8) show the profit (cost) efficiency. Conduct is captured via the PRH. Market structure is captured via the HHI. Models for HHI Dual and CR5 are reported in the Appendix. Model specifications include all other control variables, year, and firm fixed effects. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.