

The Interplay of Regulatory Frameworks, Market Competition, and Financial Transparency in Shaping Bank Risk-Taking Behavior: Evidence from Iraq

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ABSTRACT

This study aimed to investigate the independent and interactive effects of regulatory frameworks, market competition, and financial transparency on the risk-taking behavior of commercial banks in Iraq. A quantitative, longitudinal, causal-explanatory design was employed using quarterly panel data from 21 Iraqi commercial banks over 2010–2024, producing an unbalanced dataset of 1,086 bank-quarter observations. Bank risk-taking was primarily measured by the non-performing loan ratio, with the Z-score used for robustness analysis. Regulatory strength, market concentration, financial transparency, capital adequacy, profitability, liquidity, lending intensity, bank size, GDP growth, inflation, exchange-rate volatility, and oil-price changes were incorporated into the models. Pooled OLS, fixed-effects, random-effects, and two-step System-GMM estimations were applied, together with interaction effects, diagnostic tests, ownership-specific estimations, and alternative model specifications. Fixed-effects estimates showed that stronger regulation ($\beta = -2.964, p < .001$), greater financial transparency ($\beta = -3.487, p < .001$), and higher market concentration ($\beta = -9.847, p < .05$) significantly reduced non-performing loans. System-GMM results confirmed persistence in bank risk ($\beta = 0.618, p < .001$) and retained significant effects for regulation ($\beta = -2.417, p < .001$), transparency ($\beta = -2.931, p < .001$), and concentration ($\beta = -8.362, p < .05$). Transparency strengthened the risk-reducing effect of regulation ($\beta = -2.147, p < .01$) and mitigated competition-related risk ($\beta = -7.516, p < .05$). Robustness analyses using the Z-score, alternative concentration measures, winsorized data, and ownership subsamples produced consistent results. Bank risk-taking in Iraq is shaped by the combined effects of prudential regulation, competitive pressure, and disclosure quality, with financial transparency functioning as a key disciplinary mechanism that reinforces regulatory effectiveness and constrains competition-induced risk.

Keywords: Bank risk-taking; regulatory framework; market competition; financial transparency; non-performing loans; System-GMM; Iraqi banking sector.

1. Introduction

Bank risk-taking is a central issue in financial economics and banking regulation because the willingness of banks to assume credit, liquidity, market, and operational risks has direct implications for institutional solvency, financial stability, credit allocation, and the resilience of the wider economy. Banks perform an essential intermediation function by mobilizing deposits, extending credit, transforming maturities, and allocating financial resources to productive activities; however, the same activities expose them to risks that may become systemic when incentives, governance arrangements, competitive conditions, or regulatory mechanisms are inadequate. The global financial crises of recent decades have reinforced the view that bank risk-taking cannot be explained solely by balance-sheet characteristics or managerial preferences. Instead, it emerges from the interaction between internal bank conditions and the external institutional environment in which banks operate. Capital requirements, liquidity regulation, supervisory intensity, competitive pressure, disclosure practices, and governance arrangements collectively influence how bank managers evaluate risk and how aggressively institutions expand lending, allocate capital, and structure their asset portfolios (Ashraf et al., 2020; Hunjra et al., 2020; Zhang et al., 2021). Understanding these interactions is particularly important in banking systems characterized by institutional transition, heterogeneous ownership structures, changing supervisory practices, and uneven levels of financial disclosure.

Regulation represents one of the most important external mechanisms through which bank risk-taking is constrained. Prudential regulation is designed to limit excessive leverage, preserve liquidity, strengthen loss-absorbing capacity, and discourage institutions from transferring the costs of excessive risk to depositors, governments, or the broader financial system. Capital requirements are especially important because they require banks to maintain a minimum financial buffer against unexpected losses and can therefore alter the relative attractiveness of risky lending and portfolio expansion. International evidence indicates that the relationship between capital regulation and bank risk is substantial but not necessarily uniform across institutional settings. Stronger capital rules may reduce excessive risk by increasing the private cost of risky strategies, yet their effectiveness depends on supervisory enforcement, deposit insurance arrangements, bank incentives, and prevailing economic conditions (Ashraf et al., 2020). More recent

research also emphasizes that banks may respond strategically to capital requirements, including through regulatory avoidance, portfolio restructuring, or migration toward exposures that minimize measured regulatory burdens without necessarily reducing underlying systemic risk (Miao et al., 2025). Regulation should therefore be understood not simply as a formal set of minimum ratios but as an institutional framework whose effects depend on implementation, behavioral responses, and the interaction between multiple sources of banking risk.

The theoretical complexity of prudential regulation becomes even more evident when credit risk and liquidity or run risk are considered simultaneously. Regulatory policies that are optimal for one source of risk may alter incentives in another dimension, meaning that a banking system cannot necessarily be stabilized through a single instrument. Capital regulation, liquidity requirements, and supervisory intervention may have complementary roles in controlling bank behavior when both borrower default risk and depositor withdrawal risk are present (Kashyap et al., 2024). Liquidity regulation is particularly relevant because banks are structurally exposed to maturity transformation, and insufficient liquidity can amplify the consequences of deteriorating credit quality or abrupt market disruptions. Regulatory requirements related to liquidity buffers and funding structures can therefore constrain the extent to which banks rely on unstable funding or illiquid assets and may influence the overall level of risk they are willing to accept (Mohd Amin & Abdul-Rahman, 2020). From this perspective, bank risk-taking is shaped by a multidimensional regulatory environment rather than by capitalization alone.

Internal governance mechanisms also affect the extent to which regulatory requirements translate into actual risk-control practices. Formal rules can establish minimum standards, but the effectiveness of those standards depends on how they are interpreted, implemented, monitored, and embedded within organizational decision-making. Evidence concerning internal risk governance suggests that board oversight, risk-management systems, and external capital regulation jointly influence both bank risk-taking and performance (Zhang et al., 2021). Effective risk governance can improve the identification, communication, and control of risk exposures, while weak internal governance may allow managerial incentives to diverge from prudential objectives. Research on Islamic banks likewise indicates that risk governance can act as an important mechanism linking broader governance arrangements and risk-management

practices to institutional performance (Jallali & Zoghلامي, 2022). These findings imply that the impact of external regulation should not be viewed independently of the informational and governance infrastructure through which banks respond to supervisory requirements.

Transparency constitutes another fundamental component of this infrastructure. Financial transparency reduces information asymmetry between banks and their stakeholders by improving access to relevant information about asset quality, capital adequacy, liquidity, profitability, loan-loss provisions, funding structures, and risk exposures. Greater transparency may strengthen market discipline because shareholders, depositors, creditors, analysts, and regulators are better able to evaluate the financial condition of institutions and respond to excessive risk-taking. Regulation may itself promote transparency by imposing disclosure requirements and accountability mechanisms, but organizational implementation remains critical. Evidence from banking institutions shows that regulation can shape risk control by strengthening both transparency and accountability, thereby connecting formal supervisory requirements with operational practices inside banks (Kashyap & Iveroth, 2021). Transparency is therefore not merely an accounting outcome; it can operate as a behavioral mechanism that affects managerial incentives and the effectiveness of external supervision.

The measurement of banking transparency is nevertheless challenging because the quantity of disclosed information does not necessarily correspond to its quality or usefulness. Risk disclosure must be sufficiently specific, comparable, and decision-relevant to permit stakeholders to assess the nature and magnitude of bank exposures. Credit-risk disclosure is especially important because lending remains one of the principal sources of risk in commercial banking. Content-analysis approaches have therefore been developed to measure the quality and extent of credit-risk reporting in a systematic manner, demonstrating that meaningful variation exists across institutions in both the comprehensiveness and informativeness of disclosure (Scannella & Polizzi, 2020). Such variation may reflect differences in regulatory pressure, governance quality, institutional sophistication, ownership, and strategic disclosure choices. Consequently, a bank may formally comply with reporting requirements while still providing limited information regarding the underlying distribution or severity of its risks.

Research on risk disclosure further suggests that governance structures play an important role in determining

whether financial transparency functions effectively as a disciplinary mechanism. Audit committees are expected to strengthen oversight of financial reporting and risk communication by challenging management, improving reporting integrity, and promoting more complete disclosure of material risks. Evidence from commercial banks indicates that audit committee characteristics can influence corporate risk disclosure practices (Kyari et al., 2020). Similar findings from Islamic banking show that corporate governance mechanisms are associated with variations in the extent of risk disclosure, reinforcing the proposition that transparency is partly an outcome of governance quality rather than a purely mechanical consequence of regulation (Mukhibad et al., 2020). Evidence from Nigerian banks also links corporate governance with risk-disclosure practices, suggesting that stronger governance structures may improve the availability of information necessary for stakeholder monitoring (Oghuma & Garuba, 2021). These studies collectively highlight the importance of considering disclosure quality as an economically meaningful determinant of risk behavior.

The economic consequences of disclosure extend beyond the provision of information itself. Risk disclosure may influence firm value, the credibility of risk-management structures, investor perceptions, and the quality of reported financial outcomes. Evidence from banks suggests that the presence and functioning of risk-management committees, together with the quality of risk disclosure, are related to bank value (Malahim, 2023). Research in the Indonesian banking industry also connects risk disclosure with earnings quality, fair-value practices, diversification, and financial stability, indicating that disclosure operates within a broader system of financial reporting and institutional risk management (Prisadi & Firmansyah, 2022). Accordingly, transparency may influence bank risk-taking directly by increasing accountability and indirectly by reinforcing the effectiveness of regulatory monitoring and market discipline.

A further determinant of risk-taking arises from the competitive structure of the banking market. Competition can influence risk through several competing channels. On one hand, greater competition may improve efficiency, broaden access to financial services, and constrain market power. On the other hand, intensified competition can reduce lending margins and franchise value, potentially encouraging banks to search for yield, relax lending standards, increase leverage, or move toward riskier borrowers and activities. The effect of competition on bank

risk is therefore theoretically ambiguous and may depend on the regulatory environment, market structure, ownership configuration, and institutional characteristics of the banking system. Research on dual banking systems demonstrates that competition and regulation interact in shaping systemic risk, indicating that competitive pressure cannot be analyzed independently of supervisory arrangements (Ermaningsih, 2024). Similarly, evidence on diversification, governance, regulation, and bank risk-taking indicates that bank behavior reflects the combined influence of strategic, governance, and regulatory forces rather than any single determinant operating in isolation (Hunjra et al., 2020).

The relationship between competition and transparency is also important. Competitive pressure may create incentives for institutions to differentiate themselves through stronger reporting and risk governance, but it may also encourage selective disclosure when banks perceive proprietary or reputational costs. Evidence from the ASEAN-5 banking sector indicates that risk governance and market competition are associated with the quality of operational risk disclosure (Karyani et al., 2021). This suggests that competition can influence not only the amount of risk banks assume but also the extent to which that risk is communicated to external stakeholders. From a regulatory perspective, this interaction is highly consequential. If stronger transparency improves the ability of supervisors and market participants to detect aggressive risk-taking, it may mitigate adverse competitive incentives. Conversely, weak transparency can allow risk accumulation to remain obscured until deterioration in asset quality becomes visible through realized losses or non-performing loans.

Bank-specific financial conditions must also be considered because externally imposed regulation and market competition operate through institutions with different capacities, strategies, and balance-sheet structures. Credit risk varies systematically with factors such as capitalization, profitability, liquidity, asset composition, bank size, and the characteristics of local markets. Evidence from Italian banks shows that bank-specific characteristics are important determinants of credit risk and that their effects may vary across different market environments (Barra & Ruggiero, 2023). This reinforces the need to control for observable heterogeneity when evaluating the effects of regulation, competition, and transparency. A poorly capitalized or weakly profitable bank may react to competition differently from a strongly capitalized institution, while a highly liquid bank may possess greater capacity to absorb shocks than a bank dependent on unstable

funding. Failure to account for these differences may lead to misleading conclusions regarding the independent effects of the broader institutional environment.

The Iraqi banking sector offers a particularly relevant setting for examining these relationships. Commercial banks operate within an economy in which banking activity is closely connected to macroeconomic conditions, public-sector financial flows, oil-market developments, exchange-rate movements, and evolving supervisory requirements. The coexistence of state-owned, privately owned, and foreign-affiliated institutions creates substantial heterogeneity in market position, organizational capacity, capital structure, disclosure practices, and responsiveness to competitive incentives. These characteristics make it important to distinguish between structural differences across banks and temporal changes occurring within the same institutions. They also increase the relevance of examining whether regulatory strengthening has uniform consequences throughout the sector or whether its effectiveness depends on the transparency and competitive position of individual banks.

The macroeconomic environment can reinforce or weaken these institutional effects. Bank risk-taking does not occur independently of economic growth, inflation, currency conditions, or major external revenue shocks. Strong economic activity can improve borrower income and repayment capacity, whereas recessions or abrupt macroeconomic disruptions may increase default rates and weaken asset quality. Inflation can alter real repayment burdens, funding costs, and interest-rate conditions, while exchange-rate volatility may directly affect borrowers and financial institutions with foreign-currency exposures. In an economy with strong exposure to oil revenues, fluctuations in international oil prices can also influence government spending, liquidity, business activity, credit demand, and borrower solvency. Accordingly, an empirical investigation of banking risk in Iraq requires a framework that simultaneously considers institutional determinants and macroeconomic controls rather than attributing movements in risk solely to bank-level decisions.

Despite the extensive literature on prudential regulation, risk governance, competition, and disclosure, important gaps remain. First, a substantial share of previous research examines regulation, competition, or transparency separately, even though their effects are likely to be interdependent. Strong regulation may be less effective when reporting quality is poor, while financial transparency may become more valuable under intense competitive

pressure. Second, prior research has often concentrated on developed banking systems, large emerging economies, Islamic banking samples, or cross-country settings, leaving comparatively less evidence on banking systems in institutionally complex and resource-dependent economies. Third, studies of disclosure frequently focus on its determinants or reporting quality rather than its direct and moderating effects on observable bank risk-taking. Fourth, static models may not adequately capture the persistence of bank risk or the possibility of reverse causality between regulation, transparency, and risk outcomes. Banks that become riskier may attract stronger supervisory attention, while institutions experiencing financial deterioration may simultaneously alter their disclosure behavior, producing endogeneity that requires dynamic econometric treatment.

These gaps are particularly relevant because contemporary regulatory research increasingly recognizes that formal prudential standards can generate heterogeneous behavioral responses. Banks may adjust portfolios, capital structures, or reporting practices in ways that alter the actual relationship between regulatory compliance and systemic safety (Miao et al., 2025). Likewise, optimal regulation depends on the interaction of multiple risk channels rather than on a single observable ratio (Kashyap et al., 2024). The implication is that empirical banking research should move beyond isolated regulatory coefficients and examine whether the effect of regulation varies according to the quality of financial transparency and the intensity of market competition. Such an approach provides a more realistic representation of the environment in which banks make risk decisions.

The present study addresses these limitations by integrating regulatory frameworks, banking-market competition, and financial transparency within a unified longitudinal framework of bank risk-taking in Iraq. The analysis employs quarterly bank-level observations over an extended period and incorporates both institution-specific characteristics and macroeconomic conditions. The use of alternative risk measures enables the analysis to distinguish realized credit deterioration from broader financial stability, while alternative competition measures permit assessment of whether results depend on a particular representation of market structure. Most importantly, the empirical framework explicitly evaluates the interaction between regulation and transparency and between competition and transparency, thereby examining whether disclosure acts as a mechanism that reinforces regulatory effectiveness and moderates competitive incentives. Dynamic panel

estimation further allows persistence, unobserved heterogeneity, and potential endogeneity to be addressed more rigorously than would be possible using cross-sectional or exclusively static approaches.

Accordingly, the aim of this study is to investigate the independent and interactive effects of regulatory frameworks, market competition, and financial transparency on the risk-taking behavior of commercial banks in Iraq.

2. Methods and Materials

The present study employed a quantitative, longitudinal, causal-explanatory research design to examine how regulatory frameworks, market competition, and financial transparency shape the risk-taking behavior of commercial banks operating in Iraq. The unit of analysis was the individual commercial bank, while the empirical structure of the study was based on bank-level panel data observed at quarterly intervals from the first quarter of 2010 through the fourth quarter of 2024. This period was selected because it provides a sufficiently long time horizon to capture changes in banking regulation, competitive conditions, disclosure practices, and bank risk profiles across different phases of Iraq's economic and financial development. The target population comprised licensed commercial banks operating under the supervision of the Central Bank of Iraq, including state-owned commercial banks, domestically owned private commercial banks, and foreign-affiliated commercial banks for which sufficiently consistent financial and regulatory information was available. Banks were included in the analytical sample when they had identifiable quarterly observations for the principal balance-sheet and income-statement variables required to construct the study measures and when their reporting periods could be matched reliably with sector-level regulatory and competition indicators. Institutions with substantial gaps in financial statements, inconsistent reporting periods, or insufficient information for constructing the principal risk-taking and transparency indicators were excluded only from estimations requiring the missing variables. Consequently, the study used an unbalanced panel structure rather than eliminating otherwise informative banks solely because of a limited number of unavailable quarterly observations. This approach increased the use of available information while preserving comparability across institutions and periods.

The conceptual framework treated bank risk-taking behavior as the principal dependent construct and regulatory frameworks, market competition, and financial transparency

as the major explanatory dimensions. Bank-specific characteristics and macroeconomic conditions were incorporated as control variables to distinguish the effects of the principal explanatory factors from differences arising from bank size, capitalization, profitability, liquidity, asset composition, ownership, and changing economic conditions. The use of repeated quarterly observations made it possible to account for persistent differences across banks as well as changes within the same bank over time. Lagged measures of risk were also incorporated into the dynamic specifications because bank risk-taking is inherently persistent: current credit quality, capitalization, liquidity exposure, and portfolio risk are partly determined by decisions and accumulated conditions from previous periods. Ownership structure was retained as an important bank characteristic because state-owned, privately owned, and foreign-affiliated institutions may respond differently to prudential requirements, competitive pressures, and transparency expectations. The design therefore allowed the relationships of interest to be assessed both for the Iraqi commercial banking sector as a whole and, in robustness analyses, across major ownership categories and different regulatory periods.

Data were collected through a structured secondary-data extraction procedure based primarily on audited and officially reported financial information. Bank-level financial data were obtained from quarterly and annual financial statements, published bank reports, and banking-sector disclosures covering the study period. These records were used to construct measures of bank risk-taking and the principal bank-specific control variables. Risk-taking was operationalized using accounting-based indicators reflecting credit and balance-sheet risk, particularly the non-performing loan ratio and alternative measures based on capitalization and the volatility or stability of bank earnings. The non-performing loan ratio was calculated as non-performing loans relative to gross loans and represented the principal measure of realized credit risk, with higher values indicating greater deterioration in the quality of the loan portfolio. Where the required data were available, complementary measures such as the Z-score were employed to capture overall bank stability. The Z-score combined profitability, capitalization, and the variability of returns and was interpreted inversely in relation to risk, such that higher values indicated a greater distance from insolvency and therefore lower overall risk-taking. Employing alternative proxies reduced dependence on a single accounting indicator and enabled assessment of

whether the estimated relationships remained consistent across different dimensions of bank risk.

Regulatory frameworks were measured using observable indicators of prudential requirements and supervisory conditions applicable to Iraqi banks. Information was drawn primarily from regulations, supervisory publications, statistical bulletins, and banking-sector reports issued by the Central Bank of Iraq. The measurement focused on changes in capital adequacy requirements, liquidity requirements, loan classification and provisioning rules, supervisory compliance standards, and other prudential measures capable of constraining or altering bank risk incentives. Where regulatory provisions changed over the sample period, time-varying variables or regulatory-period indicators were created to capture the timing and intensity of the regulatory environment rather than treating regulation as constant throughout 2010–2024. Bank-level capital adequacy and regulatory compliance indicators were used where consistently disclosed, while sector-wide regulatory variables were aligned with the quarter in which the respective requirement was effective. This construction permitted examination of whether stronger regulatory constraints were associated with lower risk-taking and whether banks differed in their responses according to ownership and financial characteristics.

Market competition was operationalized using banking-sector concentration and bank-level market-position measures. Quarterly information on total assets, loans, or deposits was aggregated across commercial banks to calculate conventional concentration indicators. The Herfindahl–Hirschman Index was used as a principal measure of market concentration by summing the squared market shares of individual banks within each quarter. Higher index values represented a more concentrated banking market and therefore weaker competitive intensity, whereas lower values represented a more dispersed market structure and relatively stronger competition. Concentration ratios based on the market shares of the largest banks were used as supplementary measures where appropriate. Bank-specific market share was also calculated to distinguish the effects of overall market structure from the competitive position of individual banks. The use of alternative competition indicators was important because the relationship between competition and bank risk may depend on whether competition is understood as system-wide concentration or as the relative market power of an individual institution.

Financial transparency was measured from the extent and quality of publicly available financial disclosure. A structured disclosure index was developed from information contained in banks' audited financial statements and accompanying reports. The index captured the availability and consistency of disclosures related to asset quality, non-performing loans, capital adequacy, liquidity, profitability, credit-risk exposure, loan-loss provisions, funding structure, and other material financial information required for evaluating the financial condition of a bank. Each disclosure component was coded according to whether sufficiently identifiable information was provided for the relevant reporting period, after which the components were aggregated into a bank-period transparency score. Higher scores represented greater financial transparency and more comprehensive disclosure. Because accounting and disclosure practices may have evolved during the study period, particular attention was given to maintaining consistent variable definitions across reporting years. Changes in disclosure format were reviewed before constructing continuous series, and equivalent financial items were harmonized whenever terminology or presentation differed between banks or reporting periods.

The empirical models additionally incorporated control variables commonly associated with bank risk-taking. Bank size was measured as the natural logarithm of total assets; capitalization was measured using the equity-to-assets ratio or the reported capital adequacy ratio, depending on the specification; profitability was represented by return on assets; liquidity was measured using liquid assets relative to total assets or a comparable liquidity indicator; and lending intensity was represented by gross loans relative to total assets. Ownership dummy variables distinguished state-owned, privately owned, and foreign-affiliated banks. Macroeconomic control variables were matched to the corresponding quarter and included real economic growth, inflation, exchange-rate movements, and international oil-price changes. These variables were included because changes in economic activity, domestic price conditions, currency stability, and oil-market conditions can affect borrowers' repayment capacity, banking-sector liquidity, credit growth, and ultimately the degree of risk assumed by banks. Prior to estimation, all observations were checked for data-entry errors, inconsistent reporting units, duplicated reporting periods, and implausible values. Financial variables expressed in monetary units were standardized to ensure comparability, ratios were recalculated from underlying values where necessary, and continuous

variables with highly influential extreme observations were examined before robustness estimation.

Data analysis was conducted using longitudinal panel-data econometric techniques appropriate for repeated observations of multiple banks over time. The analytical process began with descriptive statistics for the dependent, independent, and control variables, including the mean, standard deviation, minimum, maximum, and distributional characteristics. Pairwise correlation coefficients were subsequently examined to identify preliminary relationships among regulatory, competitive, transparency, risk, and control variables. Multicollinearity was assessed using correlation matrices and variance inflation factors, with particular attention to variables derived from related balance-sheet items. The panel structure was then evaluated to determine the appropriate static specification. Pooled ordinary least squares estimates were initially obtained as a benchmark, followed by bank fixed-effects and random-effects models. Fixed-effects estimation was particularly important because it controlled for time-invariant characteristics of individual banks that could simultaneously affect their regulatory responses, transparency practices, competitive behavior, and risk-taking decisions. Model-selection procedures, including specification tests comparing pooled, fixed-effects, and random-effects estimators, were used to determine whether unobserved bank heterogeneity should be treated as fixed or random. Time effects were also included where appropriate to absorb common quarterly or annual shocks affecting all banks.

The baseline empirical specification modeled bank risk-taking as a function of regulatory conditions, banking-market competition, financial transparency, and the selected bank-specific and macroeconomic control variables. To investigate whether the effects of regulation and competition depended on the quality of financial disclosure, interaction terms between regulatory measures and financial transparency and between market competition and financial transparency were introduced into extended models. These interaction terms made it possible to determine whether greater transparency strengthened the risk-reducing effect of prudential regulation or altered the relationship between competitive pressure and risk-taking. Because interaction coefficients cannot be interpreted independently of their constituent variables, marginal effects were examined across relevant values of the transparency indicator. Additional specifications tested whether the relationships varied according to bank ownership and regulatory period.

Given the possibility of persistence and endogeneity in bank risk-taking, the principal dynamic estimations were performed using the two-step System Generalized Method of Moments estimator. A lagged dependent variable was included to capture the persistence of bank risk over time, while potentially endogenous bank-level regressors were instrumented using appropriate internal lags. System-GMM was selected because regulatory compliance, capitalization, transparency, competition, and risk-taking may be jointly determined. For example, regulation can influence bank risk, but supervisory authorities may also tighten regulatory requirements in response to increasing banking-sector risk; similarly, financially risky banks may alter the amount of information they disclose, producing reverse causality between transparency and risk. The dynamic panel framework therefore provided a more rigorous basis for causal interpretation than static regression alone. To reduce the risk of instrument proliferation, the instrument matrix was restricted by limiting lag depth and, where necessary, collapsing the instrument set. The number of instruments was maintained at a level appropriate relative to the number of cross-sectional banking units.

The validity of the dynamic models was assessed through standard post-estimation diagnostic procedures. The Arellano–Bond tests for first- and second-order serial correlation in the differenced residuals were examined, with the absence of statistically significant second-order serial correlation treated as a necessary condition for model adequacy. Hansen or Sargan overidentification tests, depending on the specification, were used to assess the joint validity of the instrument set. Static panel models were also examined for heteroskedasticity, serial dependence, and cross-sectional dependence, and robust or clustered standard errors were applied where required. Stationarity properties of the major continuous series were evaluated using panel unit-root procedures when the time-series characteristics of the variables made such testing necessary. Variables showing strong skewness or scale differences were transformed where theoretically and statistically appropriate, while definitions of ratio variables were maintained to preserve economic interpretability.

Robustness analysis was conducted through alternative measurements and subsample estimations. The primary risk-taking model was re-estimated using alternative risk indicators to determine whether the substantive conclusions depended on the selected proxy. Market competition was alternatively represented by the Herfindahl–Hirschman Index, concentration ratios, and bank market share, while

financial transparency was assessed using alternative versions of the disclosure score where data availability permitted. Additional estimations were conducted separately for state-owned, domestic private, and foreign-affiliated banks to identify potential ownership-related heterogeneity. Regulatory-period comparisons were also employed to examine whether structural changes in prudential oversight modified the relationships among regulation, competition, transparency, and risk-taking. The direction, magnitude, and statistical significance of coefficients were compared across pooled OLS, fixed-effects, random-effects, and System-GMM estimates. Statistical significance was evaluated primarily at the 5% level, while 1% and 10% levels were also reported where relevant. Together, these procedures provided a systematic framework for assessing the independent and interactive effects of regulatory frameworks, market competition, and financial transparency on the risk-taking behavior of Iraqi commercial banks while accounting for dynamic persistence, observed financial characteristics, macroeconomic conditions, unobserved bank heterogeneity, and potential endogeneity.

3. Findings and Results

The final analytical sample consisted of 21 licensed commercial banks operating in Iraq for which sufficiently consistent financial, regulatory, and disclosure information was available during the period from the first quarter of 2010 to the fourth quarter of 2024. Because several banks entered the market after the beginning of the observation period or had incomplete quarterly disclosures for particular years, the dataset constituted an unbalanced panel containing 1,086 bank-quarter observations out of a theoretical maximum of 1,260 observations. Of the 21 institutions included in the final sample, 5 banks were classified as state-owned commercial banks, 11 as domestically owned private commercial banks, and 5 as foreign-affiliated commercial banks. State-owned banks accounted for approximately 23.8% of the institutions but represented a considerably larger proportion of total banking assets because of their historically dominant position in the Iraqi banking system. Private domestic banks represented 52.4% of the sampled institutions and contributed the largest number of bank-quarter observations, whereas foreign-affiliated banks represented the remaining 23.8%. The distribution of observations across the study period was sufficiently broad to capture variation in prudential requirements, disclosure practices, competitive conditions, exchange-rate

developments, oil-market shocks, and changing macroeconomic circumstances. Preliminary examination of the panel showed meaningful heterogeneity across banks in asset size, capitalization, asset quality, liquidity, profitability, market share, and transparency, supporting the use of panel estimators capable of controlling for unobserved

bank-specific characteristics. The dependent variable used in the principal estimations was the non-performing loan ratio as a direct measure of realized credit risk, while the bank Z-score was subsequently employed as an alternative inverse measure of overall financial risk in robustness analysis.

Table 1

Descriptive Statistics of the Main Study Variables

Variable	Observations	Mean	SD	Minimum	Maximum
Non-performing loan ratio (%)	1,086	8.74	5.61	1.12	28.46
Bank Z-score	1,041	18.63	8.47	4.92	46.15
Regulatory framework index	1,086	0.641	0.173	0.284	0.918
Market concentration (HHI)	1,086	0.137	0.029	0.091	0.196
Bank market share (%)	1,086	4.76	6.18	0.18	31.64
Financial transparency index	1,086	0.684	0.161	0.294	0.956
Capital adequacy ratio (%)	1,073	18.92	6.73	8.41	42.36
Equity-to-assets ratio (%)	1,086	14.28	6.12	4.76	36.91
Return on assets (%)	1,079	1.67	1.38	-3.42	6.81
Liquid assets/total assets (%)	1,086	31.74	11.26	9.83	66.27
Gross loans/total assets (%)	1,086	36.58	12.91	8.64	69.45
Bank size, ln(total assets)	1,086	21.49	1.53	18.14	25.37
Real GDP growth (%)	1,086	3.12	5.94	-12.04	13.79
Inflation (%)	1,086	3.84	2.91	-0.91	12.86
Exchange-rate volatility	1,086	0.036	0.031	0.004	0.164
Oil-price change (%)	1,086	1.46	18.37	-53.21	48.76

As shown in Table 1, Iraqi commercial banks exhibited considerable variation in their risk profiles during the observation period. The mean non-performing loan ratio was 8.74%, with a standard deviation of 5.61 percentage points and a range from 1.12% to 28.46%, indicating substantial differences in credit quality across banks and quarters. The relatively wide dispersion of the non-performing loan ratio suggested that credit risk was not evenly distributed across the banking sector and that some institutions experienced considerably greater loan-quality deterioration than others. The mean bank Z-score was 18.63, although its standard deviation of 8.47 also demonstrated marked heterogeneity in overall financial stability. The regulatory framework index averaged 0.641 on a scale ranging approximately from zero to one, suggesting a moderate-to-relatively strong average prudential environment, while its variation over time reflected gradual strengthening of capital, liquidity, provisioning, and supervisory requirements. The average HHI was 0.137, indicating a moderately concentrated market structure rather than either a highly fragmented or extremely concentrated banking system. Nevertheless, individual bank market share varied from only 0.18% to 31.64%, demonstrating pronounced differences in competitive

position between smaller private institutions and large incumbent banks. The mean transparency index was 0.684, suggesting that, on average, slightly more than two-thirds of the disclosure items included in the constructed index were adequately reported. However, the minimum transparency score of 0.294 indicated that disclosure remained relatively weak for some institutions or periods, whereas the maximum of 0.956 reflected near-comprehensive reporting by the most transparent banks.

The control variables further confirmed substantial structural heterogeneity. The average capital adequacy ratio was 18.92%, exceeding commonly applied minimum prudential thresholds, although the range from 8.41% to 42.36% demonstrated considerable variation in capital buffers. Banks held equity equivalent to an average of 14.28% of total assets, while mean return on assets was 1.67%, with some loss-making observations reflected in the negative minimum value. Liquid assets represented approximately 31.74% of total assets, whereas gross loans accounted for 36.58%, indicating substantial differences in intermediation intensity and liquidity strategies. The dispersion in the logarithm of total assets confirmed the coexistence of very large and relatively small banking

institutions. Macroeconomic conditions were also volatile over the sample period. Real GDP growth averaged 3.12% but ranged from -12.04% to 13.79%, while oil-price changes displayed particularly high variability, consistent with Iraq's

exposure to international energy-market fluctuations. These descriptive patterns provided a sufficient empirical basis for subsequent multivariate analysis of how regulation, competition, and transparency influenced bank risk-taking.

Table 2

Static Panel Regression Estimates for Bank Risk-Taking

Variable	Pooled OLS	Fixed Effects	Random Effects
Regulatory framework index	-3.842*** (0.914)	-2.964*** (0.861)	-3.126*** (0.846)
Market concentration (HHI)	-11.638** (5.271)	-9.847** (4.486)	-10.236** (4.571)
Financial transparency index	-4.216*** (0.736)	-3.487*** (0.702)	-3.621*** (0.696)
Capital adequacy ratio	-0.118*** (0.029)	-0.091*** (0.027)	-0.096*** (0.026)
Return on assets	-0.384*** (0.094)	-0.316*** (0.088)	-0.329*** (0.087)
Liquid assets/total assets	-0.031** (0.014)	-0.027** (0.013)	-0.028** (0.013)
Gross loans/total assets	0.046*** (0.012)	0.039*** (0.011)	0.041*** (0.011)
Bank size	-0.271*** (0.081)	-0.184** (0.086)	-0.213*** (0.079)
Real GDP growth	-0.073*** (0.022)	-0.061*** (0.020)	-0.064*** (0.020)
Inflation	0.094** (0.041)	0.083** (0.038)	0.086** (0.039)
Exchange-rate volatility	7.846*** (2.413)	6.928*** (2.204)	7.116*** (2.261)
Oil-price change	-0.011** (0.005)	-0.009** (0.004)	-0.010** (0.004)
Constant	17.934*** (2.241)	15.826*** (2.357)	16.417*** (2.218)
Bank fixed effects	No	Yes	No
Time effects	Yes	Yes	Yes
Observations	1,021	1,021	1,021
R ² / Within R ²	0.486	0.571	0.534
F/Wald statistic	39.72***	31.86***	412.57***
Hausman χ^2	—	37.84***	—

Table 2 presents the baseline static panel estimates. The results were substantively consistent across pooled OLS, fixed-effects, and random-effects specifications, although the Hausman test was statistically significant, $\chi^2 = 37.84$, $p < .001$, supporting the fixed-effects specification as the preferred static estimator. In the fixed-effects model, the regulatory framework index had a negative and statistically significant association with bank risk-taking, $\beta = -2.964$, $SE = 0.861$, $p < .001$. This result indicated that strengthening prudential regulation was associated with a lower non-performing loan ratio after controlling for observed bank characteristics, macroeconomic conditions, common time shocks, and time-invariant bank heterogeneity. A 0.10 increase in the regulatory index was associated with an approximately 0.30 percentage-point reduction in the non-performing loan ratio, other factors held constant. The magnitude was economically meaningful given the sector-wide mean non-performing loan ratio of 8.74%.

Market concentration, measured by the HHI, also showed a statistically significant negative coefficient in the preferred fixed-effects model, $\beta = -9.847$, $SE = 4.486$, $p < .05$. Because a higher HHI represented greater concentration and correspondingly weaker competitive intensity, the negative

coefficient implied that risk-taking declined as the banking market became more concentrated and increased as competitive pressure intensified. This result was consistent with the interpretation that stronger competition may encourage banks to accept greater credit risk in an effort to preserve market share, expand lending, or compensate for narrower intermediation margins. Financial transparency had one of the most stable effects across all model specifications. In the fixed-effects model, transparency was significantly and negatively related to the non-performing loan ratio, $\beta = -3.487$, $SE = 0.702$, $p < .001$, indicating that banks with more comprehensive financial disclosure exhibited lower subsequent or contemporaneous credit risk. A 0.10 increase in the transparency index corresponded to an estimated decline of approximately 0.35 percentage points in the non-performing loan ratio.

The coefficients of the control variables were also consistent with theoretical expectations. Greater capitalization significantly reduced risk, $\beta = -0.091$, $p < .001$, suggesting that better-capitalized banks maintained stronger buffers and adopted more conservative lending behavior. Profitability had a significant negative effect, $\beta = -0.316$, $p < .001$, while liquidity was likewise negatively associated

with credit risk, $\beta = -0.027$, $p < .05$. In contrast, a higher loan-to-asset ratio was significantly associated with greater risk, $\beta = 0.039$, $p < .001$, demonstrating that more intensive loan expansion increased banks' exposure to deterioration in asset quality. Larger banks showed somewhat lower non-performing loan ratios, $\beta = -0.184$, $p < .05$, after controlling for bank fixed effects. Favorable macroeconomic growth reduced bank risk, $\beta = -0.061$, $p < .01$, whereas inflation, β

$= 0.083$, $p < .05$, and exchange-rate volatility, $\beta = 6.928$, $p < .01$, increased it. Oil-price improvements were associated with a modest but statistically significant reduction in banking risk, $\beta = -0.009$, $p < .05$, reflecting the importance of oil-market conditions for income, government expenditure, borrower liquidity, and credit performance in Iraq. Overall, the fixed-effects model explained 57.1% of the within-bank variation in the non-performing loan ratio.

Table 3

Dynamic System-GMM Estimates of Regulatory Frameworks, Competition, Transparency, and Bank Risk-Taking

Variable	Model 1: Main Effects	Model 2: Regulation $\times$ Transparency	Model 3: Competition $\times$ Transparency
Lagged non-performing loan ratio	0.618*** (0.061)	0.603*** (0.060)	0.596*** (0.062)
Regulatory framework index	-2.417*** (0.741)	-1.526** (0.693)	-2.184*** (0.719)
Market concentration (HHI)	-8.362** (4.018)	-7.946** (3.891)	-3.724 (4.316)
Financial transparency index	-2.931*** (0.614)	-1.884*** (0.643)	-2.186*** (0.621)
Regulation $\times$ Transparency	—	-2.147*** (0.782)	—
HHI $\times$ Transparency	—	—	-7.516** (3.168)
Capital adequacy ratio	-0.072*** (0.022)	-0.069*** (0.021)	-0.071*** (0.022)
Return on assets	-0.249*** (0.074)	-0.236*** (0.071)	-0.241*** (0.073)
Liquid assets/total assets	-0.021** (0.010)	-0.020** (0.010)	-0.020** (0.010)
Gross loans/total assets	0.031*** (0.009)	0.030*** (0.009)	0.030*** (0.009)
Bank size	-0.142** (0.067)	-0.136** (0.065)	-0.139** (0.066)
Real GDP growth	-0.047*** (0.017)	-0.045*** (0.016)	-0.046*** (0.016)
Inflation	0.067** (0.032)	0.065** (0.031)	0.066** (0.031)
Exchange-rate volatility	5.814*** (1.862)	5.572*** (1.804)	5.693*** (1.821)
Oil-price change	-0.007** (0.003)	-0.007** (0.003)	-0.007** (0.003)
Observations	978	978	978
Banks	21	21	21
Instruments	18	19	19
AR(1), p-value	.002	.003	.003
AR(2), p-value	.384	.417	.401
Hansen test, p-value	.326	.371	.348
Wald χ^2	526.41***	558.73***	547.92***

The dynamic estimations reported in Table 3 confirmed that bank risk-taking was strongly persistent over time. The coefficient of the lagged non-performing loan ratio ranged from 0.596 to 0.618 and was statistically significant at $p < .001$ in all specifications. This finding demonstrated that deterioration in loan quality had a substantial carry-over effect across reporting periods and justified the use of a dynamic estimator rather than relying exclusively on contemporaneous static relationships. Once persistence and potential endogeneity were taken into account, the principal effects of regulation and financial transparency remained negative and statistically significant. In Model 1, the regulatory framework index reduced the non-performing loan ratio, $\beta = -2.417$, $SE = 0.741$, $p < .001$, while greater financial transparency also reduced risk, $\beta = -2.931$, $SE = 0.614$, $p < .001$. Market concentration remained negatively

related to the non-performing loan ratio, $\beta = -8.362$, $SE = 4.018$, $p < .05$. Therefore, even after accounting for the possibility that regulation, transparency, and risk-taking could be jointly determined, stronger prudential frameworks and greater disclosure remained associated with lower bank risk, whereas greater competitive intensity, reflected by lower concentration, was associated with higher risk-taking.

Model 2 examined whether financial transparency altered the effectiveness of regulatory frameworks. The interaction between regulation and transparency was negative and statistically significant, $\beta = -2.147$, $SE = 0.782$, $p < .01$. This result demonstrated that transparency strengthened the risk-reducing effect of regulation. At comparatively low levels of transparency, regulatory requirements were still associated with reduced risk, but the estimated decline in non-performing loans became progressively stronger as the

quality and completeness of bank disclosure increased. This finding indicated complementarity rather than substitution between regulation and transparency: formal prudential rules produced stronger risk-control effects when market participants and supervisors had access to more complete and reliable financial information. The direct effects of both regulation and transparency remained statistically significant in the interaction model, suggesting that each mechanism independently contributed to lower risk even after their joint effect was taken into account.

Model 3 evaluated whether transparency moderated the relationship between competition and risk. The interaction between the HHI and transparency was negative and significant, $\beta = -7.516$, $SE = 3.168$, $p < .05$. Since higher HHI values represented weaker competition, the negative interaction implied that greater transparency dampened the risk-enhancing effects associated with strong competition. In less transparent institutions, intensified competition was associated with a more pronounced deterioration in loan quality, whereas greater financial disclosure weakened this relationship. Consequently, transparency appeared to operate as a disciplinary mechanism capable of restricting aggressive risk-taking responses to competitive pressure. The diagnostic statistics supported the validity of the System-GMM specifications. First-order serial correlation

was significant, as expected for first-differenced residuals, while the AR(2) tests were non-significant in all models, with p-values between .384 and .417, providing no evidence of problematic second-order serial correlation. The Hansen test of overidentifying restrictions was also non-significant in all cases, with p-values ranging from .326 to .371, suggesting that the instrument sets were jointly valid. The number of instruments remained below the number of cross-sectional units, reducing concerns regarding instrument proliferation.

The dynamic models also confirmed the influence of the bank-specific and macroeconomic controls. Higher capital adequacy, profitability, liquidity, bank size, real GDP growth, and oil-price improvements were associated with lower non-performing loan ratios, while greater lending intensity, inflation, and exchange-rate volatility increased bank risk. Exchange-rate volatility displayed a particularly pronounced positive coefficient, ranging from 5.572 to 5.814, suggesting that currency instability constituted an important source of banking-sector vulnerability. The stability of these relationships across the three dynamic specifications further strengthened confidence in the estimated effects of regulation, competition, and transparency.

Table 4

Robustness and Heterogeneity Analysis

Specification	Regulatory Framework	Market Concentration (HHI)	Financial Transparency	Regulation $\times$ Transparency	Competition $\times$ Transparency
Alternative risk measure: Z-score	3.684*** (1.106)	13.972** (6.481)	4.327*** (0.948)	2.516** (1.137)	9.862** (4.732)
State-owned banks	-3.118*** (1.034)	-5.216 (5.671)	-2.306** (0.962)	-2.984** (1.271)	-4.672 (4.188)
Domestic private banks	-2.183*** (0.786)	-10.482** (4.552)	-3.274*** (0.701)	-2.061** (0.894)	-8.214** (3.521)
Foreign-affiliated banks	-1.694** (0.823)	-6.247 (4.921)	-3.891*** (0.927)	-1.746* (0.993)	-6.941* (4.006)
Post-regulatory-strengthening period	-3.276*** (0.884)	-8.694** (4.238)	-3.512*** (0.782)	-2.807*** (0.911)	-8.036** (3.467)
Alternative competition measure: CR5	-2.364*** (0.728)	-0.041** (0.019)	-2.847*** (0.608)	-2.226*** (0.794)	-0.036** (0.017)
Winsorized continuous variables	-2.286*** (0.704)	-8.017** (3.879)	-2.754*** (0.597)	-2.103*** (0.763)	-7.228** (3.104)

The robustness and heterogeneity results presented in Table 4 provided further support for the principal findings. When the bank Z-score was employed as an alternative dependent variable, the signs of the estimated effects changed in the theoretically expected direction because a higher Z-score represents greater financial stability rather than greater risk. The regulatory framework coefficient was positive and significant, $\beta = 3.684$, $p < .001$, financial

transparency was positively associated with stability, $\beta = 4.327$, $p < .001$, and market concentration also increased the Z-score, $\beta = 13.972$, $p < .05$. These findings were substantively equivalent to the negative coefficients obtained when the non-performing loan ratio was used as the dependent variable and showed that the conclusions were not driven by a single operationalization of bank risk. The positive interaction effects in the Z-score specification

likewise indicated that stronger disclosure reinforced regulatory effectiveness and mitigated the destabilizing consequences of competitive pressure.

Ownership-specific estimates revealed some important differences across bank categories. The risk-reducing effect of regulation was strongest among state-owned banks, $\beta = -3.118$, $p < .01$, followed by domestic private banks, $\beta = -2.183$, $p < .01$, and foreign-affiliated banks, $\beta = -1.694$, $p < .05$. However, competition was not statistically significant within the smaller state-owned and foreign-affiliated subsamples, whereas it remained significant among domestic private banks, $\beta = -10.482$, $p < .05$. This pattern suggested that domestic private banks were the institutions most responsive to competitive pressure and therefore the segment in which stronger competition was most clearly associated with higher risk-taking. By contrast, financial transparency had a statistically significant risk-reducing effect in all ownership groups and was particularly strong among foreign-affiliated banks, $\beta = -3.891$, $p < .001$. The regulation-by-transparency interaction remained negative in all ownership categories, although its statistical strength varied, providing evidence that disclosure generally enhanced the effectiveness of prudential oversight.

The post-regulatory-strengthening specification showed that the effect of prudential regulation became stronger during the later part of the sample, $\beta = -3.276$, $p < .001$. The interaction between regulation and transparency was also comparatively large during this period, $\beta = -2.807$, $p < .001$, suggesting that improvements in disclosure were especially important once supervisory standards became more demanding. Replacing the HHI with the five-bank concentration ratio did not alter the substantive conclusion regarding competition. A higher CR5, representing greater concentration and weaker competition, remained associated with lower risk-taking, $\beta = -0.041$, $p < .05$, while its interaction with transparency was also negative and significant, $\beta = -0.036$, $p < .05$. Finally, winsorizing the continuous variables to reduce the influence of extreme observations produced coefficients highly similar to the main System-GMM estimates. Regulation, market concentration, and transparency remained statistically significant, and both interaction terms retained their expected negative signs and significance. Taken together, these robustness exercises demonstrated that the central findings were stable across alternative measures of risk and competition, ownership structures, regulatory periods, and treatments of extreme observations.

Overall, the empirical evidence showed a coherent pattern across the descriptive, static, dynamic, and robustness analyses. Stronger regulatory frameworks were consistently associated with lower bank risk-taking, and the effect remained statistically significant after accounting for bank-specific heterogeneity, risk persistence, potential endogeneity, macroeconomic fluctuations, and alternative model specifications. Greater financial transparency independently reduced risk and also strengthened the effectiveness of prudential regulation. Competitive pressure exhibited a more complex relationship with bank behavior: lower market concentration, indicating stronger competition, was generally associated with greater risk-taking, particularly among domestic private banks. However, greater transparency reduced the magnitude of this competition-related risk effect. The findings therefore indicated that regulation, competition, and transparency should not be viewed as isolated determinants of bank behavior. Rather, their joint operation shaped the incentives and constraints under which Iraqi banks selected lending strategies, maintained capital and liquidity buffers, disclosed financial information, and assumed credit risk.

4. Discussion and Conclusion

The findings of this study provide strong evidence that regulatory frameworks, market competition, and financial transparency jointly shape the risk-taking behavior of commercial banks in Iraq. Across the static panel estimations, dynamic System-GMM models, and robustness analyses, stronger prudential regulation was consistently associated with lower bank risk-taking, greater financial transparency reduced risk independently, and stronger competitive pressure was associated with higher risk, particularly among domestic private banks. In addition, the interaction results demonstrated that transparency strengthened the risk-reducing effect of regulation and mitigated the risk-enhancing consequences of competitive pressure. These findings remained broadly stable when alternative measures of bank risk and competition were used and when the sample was examined across different ownership categories and regulatory periods. Taken together, the results suggest that bank risk-taking in Iraq is not determined by a single institutional factor but is produced through the interaction of prudential constraints, competitive incentives, disclosure quality, bank-specific financial conditions, and the broader macroeconomic environment.

The negative relationship between the regulatory framework index and the non-performing loan ratio indicates that stronger prudential requirements and supervisory conditions were associated with more conservative bank behavior and improved credit quality. This result is consistent with the theoretical expectation that effective capital, liquidity, provisioning, and supervisory rules increase the cost of excessive risk-taking and require banks to maintain greater capacity to absorb losses. The finding is closely aligned with international evidence showing that capital regulation can reduce bank risk when regulatory requirements are sufficiently binding and effectively implemented (Ashraf et al., 2020). It is also consistent with the argument that capital requirements and other prudential tools influence the risk incentives of banks by modifying the relative costs of leverage and risky asset allocation (Kashyap et al., 2024). The present findings are particularly important because they show that the disciplining effect of regulation remains statistically significant after accounting for persistence in bank risk and potential endogeneity. This suggests that the observed relationship is not merely a static association between better-capitalized banks and lower non-performing loans, but reflects a broader regulatory mechanism affecting the evolution of risk over time.

At the same time, the findings should not be interpreted as evidence that regulation automatically eliminates bank risk. The persistence coefficient of the lagged non-performing loan ratio was relatively large and highly significant in the dynamic models, indicating that risk accumulated in previous periods continued to influence current bank performance. This result reflects the path-dependent nature of credit risk, whereby poor lending decisions, weak borrower quality, insufficient monitoring, or deteriorating macroeconomic conditions may continue to affect asset quality over several quarters. The importance of persistence also supports recent arguments that regulatory design should account for multiple risk channels and dynamic feedback mechanisms rather than relying solely on contemporaneous compliance indicators (Kashyap et al., 2024). Furthermore, regulatory requirements may induce banks to alter portfolio composition or engage in forms of regulatory avoidance, meaning that formal compliance does not always translate directly into lower underlying systemic risk (Miao et al., 2025). The present results therefore imply that the effectiveness of regulation in Iraq depends not only on the existence of prudential rules but also on continuous supervision, enforcement quality, and the ability of

regulators to detect strategic adjustments that may obscure actual risk exposure.

The findings regarding financial transparency were equally strong. The transparency index was negatively associated with the non-performing loan ratio across the principal static and dynamic specifications, and positively associated with the bank Z-score in the robustness analysis. This indicates that banks providing more comprehensive and consistent disclosure tended to exhibit both lower realized credit risk and greater overall financial stability. One explanation is that transparency strengthens external monitoring by reducing information asymmetry between bank managers and regulators, investors, depositors, creditors, and other stakeholders. When information on non-performing loans, capital adequacy, liquidity, profitability, and provisioning is more readily available, managers face greater scrutiny regarding aggressive lending and risk accumulation. This interpretation is consistent with evidence that regulation can influence risk control through mechanisms of transparency and accountability (Kashyap & Iveroth, 2021). It is also supported by research emphasizing that high-quality credit-risk disclosure improves stakeholders' ability to assess the risk profile and financial condition of banks (Scannella & Polizzi, 2020).

The transparency result can also be understood through the broader governance literature. Risk disclosure does not occur independently of internal governance arrangements but reflects the effectiveness of audit committees, risk-management structures, board oversight, and reporting systems. Previous research has shown that audit committees can play an important role in strengthening corporate risk disclosure in commercial banks (Kyari et al., 2020), while corporate governance mechanisms have also been found to affect risk disclosure practices in Islamic banking institutions (Mukhibad et al., 2020). Similarly, governance quality has been linked to risk disclosure in conventional banking contexts (Oghuma & Garuba, 2021). These studies support the interpretation that transparency can act as a broader institutional discipline rather than merely a reporting outcome. In the Iraqi context, more transparent banks may have stronger internal reporting systems, more developed risk-management structures, more effective audit functions, or greater managerial accountability, all of which can contribute to reduced risk-taking.

The interaction between regulation and transparency provides one of the most important findings of the study. The negative and statistically significant interaction coefficient indicates that the risk-reducing effect of regulation became

stronger as financial transparency increased. This suggests that regulation and transparency function as complementary institutional mechanisms. Formal prudential requirements appear to be more effective when supervisors and market participants have access to sufficiently detailed and reliable information regarding the bank's financial position. In opaque institutions, regulatory standards may be more difficult to enforce because the underlying quality of assets, provisioning practices, liquidity exposure, or concentration of lending may not be fully observable. By contrast, greater disclosure allows supervisory authorities to evaluate compliance more effectively and increases the reputational and market costs of excessive risk-taking. This result is highly consistent with the argument that transparency and accountability constitute important channels through which regulation influences risk control (Kashyap & Iveroth, 2021). It also complements evidence showing that risk governance mediates the relationship between broader governance arrangements, risk management, and bank performance (Jallali & Zoghلامي, 2022).

The importance of disclosure is further reinforced by studies linking risk reporting to financial stability, bank value, and financial reporting quality. Evidence from the banking sector suggests that risk disclosure and the operation of risk-management committees are associated with bank value, indicating that markets may reward institutions that communicate risk more effectively and maintain credible governance mechanisms (Malahim, 2023). Similarly, research in the Indonesian banking industry has linked risk disclosure to earnings quality, financial stability, and other financial characteristics (Prisadi & Firmansyah, 2022). These findings are consistent with the present result that transparency has both a direct and an interactive role in reducing risk. Financial disclosure appears to operate not only as a means of communicating existing risk but also as a mechanism capable of influencing managerial behavior before risks fully materialize.

The study also found that market concentration was negatively related to bank risk-taking, meaning that stronger competition, reflected by lower concentration, was associated with higher non-performing loan ratios. This result supports the view that intense competition may weaken franchise value, narrow intermediation margins, and encourage banks to assume additional risk in order to defend or expand market share. In competitive environments, banks may relax credit standards, expand lending to marginal borrowers, increase loan concentration, or seek higher-yielding but riskier assets. The finding is consistent with

evidence that competition and regulation jointly affect systemic risk and that the impact of competition depends on the surrounding regulatory framework (Ernaningsih, 2024). It also aligns with research showing that bank risk-taking reflects a combination of competitive pressures, governance arrangements, diversification strategies, and regulatory conditions (Hunjra et al., 2020). The Iraqi results therefore suggest that competition should not be interpreted as uniformly stabilizing or destabilizing; rather, its effect depends on the institutional conditions under which banks compete.

The ownership-specific estimations provide further insight into this relationship. Competitive pressure had its clearest risk-enhancing effect among domestic private banks, while the coefficient was not statistically significant in the smaller state-owned and foreign-affiliated subsamples. This pattern is economically plausible. Domestic private banks may face stronger incentives to increase lending, attract customers, expand deposits, and defend market share, particularly when competing against larger incumbent institutions. State-owned banks, by contrast, may face different objectives, funding structures, or implicit institutional support, while foreign-affiliated institutions may operate under additional group-level governance and risk-management constraints. The importance of market context is supported by evidence that bank-specific determinants of credit risk can vary across local competitive environments (Barra & Ruggiero, 2023). Thus, the Iraqi banking system appears to display substantial heterogeneity in the way competitive pressure translates into credit-risk outcomes.

A particularly important result was that financial transparency moderated the relationship between competition and risk. The significant interaction between market concentration and transparency indicated that greater disclosure reduced the extent to which competitive pressure translated into higher risk-taking. This suggests that transparency acts as a disciplinary constraint when banks face incentives to expand aggressively. Competitive pressure may encourage managers to pursue lending growth or riskier customers, but greater disclosure makes such strategies more visible to supervisors and external stakeholders. This interpretation is consistent with evidence from the ASEAN-5 banking sector showing that market competition and risk governance are related to the quality of operational risk disclosure (Karyani et al., 2021). The present study extends this logic by showing that transparency itself may alter the behavioral consequences of

competition. In other words, competition need not necessarily produce excessive risk when banks operate within a sufficiently transparent and well-monitored informational environment.

The findings concerning internal bank characteristics further reinforce the main results. Higher capital adequacy was associated with lower non-performing loans, which is consistent with the view that stronger capital positions provide greater loss-absorbing capacity and may reduce incentives for aggressive risk-taking (Ashraf et al., 2020). Profitability was also negatively related to risk, suggesting that financially stronger banks have less incentive to search for yield through risky lending. Liquidity had a negative effect on the non-performing loan ratio, supporting the broader argument that liquidity regulation and liquidity management are central components of bank stability (Mohd Amin & Abdul-Rahman, 2020). Conversely, a higher loans-to-assets ratio was associated with increased risk, indicating that greater lending intensity can raise exposure to credit-quality deterioration when loan growth is not matched by adequate underwriting and monitoring.

The results also showed that macroeconomic conditions significantly affected bank risk. Higher real GDP growth reduced the non-performing loan ratio, while inflation and exchange-rate volatility increased risk. These findings indicate that bank-level governance and regulation cannot fully insulate financial institutions from broader economic instability. Stronger economic growth improves borrower cash flows and repayment capacity, whereas inflation and exchange-rate fluctuations can increase financial stress, particularly for firms or households with currency mismatches or unstable income. The significant negative relationship between oil-price changes and bank risk is especially relevant in Iraq, where oil revenues influence government expenditure, domestic liquidity, aggregate demand, and private-sector activity. Consequently, the effectiveness of prudential regulation should be evaluated alongside the macroeconomic conditions under which banks operate.

The robustness analysis strengthened the credibility of the principal findings. When the Z-score was used as an alternative measure of bank stability, the signs of the coefficients reversed in the expected direction: stronger regulation, greater market concentration, and greater transparency were associated with higher financial stability. This consistency indicates that the results are not dependent on the use of non-performing loans alone as the measure of risk. Similarly, replacing the Herfindahl–Hirschman Index

with a concentration ratio produced substantively similar conclusions regarding competition. The persistence of results after winsorization also suggests that the main findings were not driven by extreme financial observations. These results provide empirical support for the argument that regulation, governance, and bank risk should be evaluated across multiple dimensions rather than through a single indicator (Zhang et al., 2021).

Overall, the findings contribute to the banking literature by demonstrating that the relationship between institutional conditions and risk-taking is interactive rather than additive. Regulation reduced risk, but its effect was stronger in more transparent banks. Competition increased risk, but transparency weakened this effect. These results help reconcile strands of the literature that have examined regulation, competition, risk governance, and disclosure separately. Studies of disclosure quality emphasize that the usefulness of information depends on its comprehensiveness and relevance (Scannella & Polizzi, 2020), while studies of governance emphasize the organizational mechanisms supporting risk monitoring and reporting (Jallali & Zoghلامي, 2022; Mukhibad et al., 2020). Research on regulation shows that capital and supervisory requirements can reduce bank risk but may also create incentives for strategic responses or regulatory avoidance (Ashraf et al., 2020; Miao et al., 2025). The present study integrates these perspectives by showing that regulatory effectiveness itself depends partly on the transparency of the institution being regulated and that the consequences of competition depend partly on the extent to which risk-taking is visible.

The study has several limitations that should be considered when interpreting the findings. First, although the quarterly panel provides substantial temporal variation, the analysis is limited to banks for which sufficiently consistent financial and disclosure data were available, and the resulting unbalanced structure may underrepresent institutions with weaker reporting systems. Second, financial transparency was measured through a structured disclosure index based on publicly available information; therefore, the index captures observable reporting quality rather than the full quality of internal information systems or informal communication with supervisors. Third, the principal measure of risk was the non-performing loan ratio, which primarily reflects credit risk and may not fully capture market, liquidity, operational, cybersecurity, or off-balance-sheet risks. Although the Z-score was used as an alternative measure, no single indicator can represent the complete multidimensional risk profile of a bank. Fourth, some

regulatory indicators were necessarily constructed from sector-wide supervisory conditions and may not fully capture differences in enforcement intensity across individual institutions. Finally, while System-GMM helps address endogeneity and dynamic persistence, causal interpretation remains subject to the quality and validity of the instruments and cannot eliminate every possible source of omitted-variable bias.

Future research should extend the present analysis in several directions. Subsequent studies could incorporate market-based measures of risk where suitable financial-market data become available and could examine operational, liquidity, cyber, and sovereign-risk exposures alongside credit risk. More detailed measures of supervisory enforcement could also be developed to distinguish between the formal existence of regulations and the intensity with which those regulations are applied to individual banks. Future work could employ textual analysis of annual reports, regulatory filings, and audit reports to construct richer measures of disclosure quality rather than relying exclusively on structured disclosure indices. Research could also examine nonlinear relationships, including whether competition becomes particularly destabilizing beyond specific thresholds or whether the risk-reducing effects of regulation diminish once capital and liquidity buffers exceed certain levels. Cross-country comparisons involving Iraq and other oil-dependent or institutionally transitional banking systems would also help determine whether the interaction between regulation, competition, and transparency identified here is country-specific or reflects a broader regional pattern.

From a practical perspective, the findings suggest that banking supervision in Iraq should combine prudential requirements with stronger disclosure standards and more consistent enforcement. Regulators should not rely on capital and liquidity ratios alone but should ensure that banks report asset quality, provisioning, concentration risk, liquidity positions, related-party exposures, and other material risks in a standardized and timely manner. Particular supervisory attention should be directed toward highly competitive segments of the private banking market, where incentives for aggressive lending may be stronger. Banks themselves should strengthen risk governance, internal audit, credit-monitoring systems, and disclosure controls so that competitive objectives do not override prudential limits. Supervisory authorities should also develop early-warning systems capable of integrating non-performing loans, rapid credit growth, exchange-rate

exposure, liquidity indicators, and market concentration. Finally, reforms intended to increase competition should be coordinated with transparency and risk-management requirements, because greater competition without sufficient informational discipline may increase rather than reduce financial vulnerability.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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