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# CAPITAL ADEQUACY AND BANK PROFITABILITY IN A DIGITALISING FINANCIAL SYSTEM: EVIDENCE FROM VIETNAM

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## ABSTRACT
Capital adequacy can strengthen a bank's resilience while reducing contemporaneous returns to shareholders when additional capital is not matched by higher earnings. This study examines that relationship in a reported panel of 24 Vietnamese commercial banks over 2014–2025, incorporating book capitalization, operating costs, lending intensity, credit-risk provisioning, digitalisation, and common economic conditions. The empirical record contains 288 bank-year observations and estimates from pooled ordinary least squares, fixed effects, random effects, and feasible generalized least squares. The reported capital-adequacy coefficient is negative across all four estimators. In the generalized least squares specification, a one-percentage-point higher capital adequacy ratio is associated with a 0.825-percentage-point lower return on equity, with a nominal 95% confidence interval from −1.044 to −0.606 percentage points. Book equity capitalization and the digitalisation indicator have positive conditional associations. Exploratory subgroup results indicate a larger negative capital coefficient among larger banks, but no formal between-group comparison is available. The analysis distinguishes risk-weighted capital adequacy from book equity funding and a digitalisation indicator from a causal technology effect. Measurement ambiguities, unverified terminal-year data, and limitations in the reported diagnostic sequence mean that these estimates remain provisional. The appropriate managerial inference is not to weaken capital buffers, but to examine whether capital allocation, operating capability, and risk-adjusted earnings develop together. Independent verification and re-estimation are required before submission.

**Keywords:**
capital adequacy, bank profitability, digitalisation, equity capitalization, panel data, Vietnam

## 1. INTRODUCTION
Capital is both a loss-absorbing resource and a constraint on how a bank expands its balance sheet. A bank that increases eligible capital can become more resilient even when its contemporaneous return on equity declines. Conversely, a high accounting return need not indicate strong underlying performance if it is amplified by limited equity. This tension makes the relationship between capital adequacy and shareholder profitability analytically important. The Basel framework focuses on the capacity of capital to support risk exposures, while empirical banking research also evaluates outcomes such as survival and market share (Basel Committee on Banking Supervision, 2017; Berger & Bouwman, 2013). These objectives overlap but are not equivalent to maximizing a one-year ROE.

The question is particularly relevant to the Vietnamese banking setting described by the underlying thesis. Its reported observation window, 2014–2025, spans changes in capital management, the pandemic period, and the adoption of digital banking capabilities. Circular 14/2025/TT-NHNN was issued on 30 June 2025 and became effective on 15 September 2025, providing a recent regulatory context for capital planning (State Bank of Vietnam, 2025). The present study does not identify the effect of that regulation. Its annual observational design cannot separate a specific regulatory change from concurrent bank decisions or common economic developments.

Digitalisation adds an organizational dimension to the capital–profitability relationship. Technology can alter service delivery and the use of information, but its financial benefits depend on changes in processes and capabilities rather than the purchase of technology alone (Vial, 2019; Verhoef et al., 2021). It can also create new operational dependencies and risks (Basel Committee on Banking Supervision, 2024). Consequently, a capital-rich bank need not be profitable unless it can deploy resources effectively, and a digitally active bank need not be resilient unless its operating arrangements support sound risk management. This motivates examining capital, operating efficiency, and digitalisation within a common model without assuming that the model identifies their causal interaction.

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Recent profitability studies show why measurement and context require close attention. Laporšek et al. (2025) analyze 3,076 European banks over 2013–2018 and distinguish conventional from risk-adjusted profitability measures. Importantly, their capital variable is equity divided by total assets, rather than the risk-weighted regulatory CAR used as the focal variable here. Almeida and Sousa (2025), studying 16 Portuguese banks over 2009–2023, also illustrate the relevance of operating conditions and crisis context. Such evidence does not establish a universal sign for the relationship between regulatory capital and ROE, and it should not be cited as though all capital measures were interchangeable.

The article's analytical contribution is to separate three issues often conflated in bank-performance discussions: a larger regulatory capital ratio versus a larger book equity share; improved accounting returns versus greater resilience; and a digitalisation association versus an identified adoption effect. It retains the thesis's substantive research question but sharpens the meaning of its variables and results. The numerical estimates are transcribed, not independently re-estimated. Material questions concerning terminal-year data, variable coding, and diagnostics remain unresolved and are disclosed in the methodology. The manuscript is therefore an author-review draft, not a certification that the empirical record is ready for publication.

## 2. THEORETICAL FRAMEWORK AND HYPOTHESES

### 2.1. Capital adequacy and the shareholder-return trade-off

Regulatory capital can support confidence and the continuity of intermediation by absorbing losses. Research on financial crises indicates that the benefits of capitalization may appear in survival or market-share outcomes rather than only in current profitability (Berger & Bouwman, 2013). On the other hand, raising equity without a commensurate increase in net income reduces ROE arithmetically. A negative relationship between CAR and ROE can therefore coexist with an improvement in the bank's resilience. The relevant empirical question is whether the profit-generating benefits of a stronger capital position outweigh contemporaneous capitalization and portfolio-adjustment effects.

The distinction between regulatory and accounting capital makes the mechanism more complex. CAR may rise because eligible capital increases, because risk-weighted assets decrease, or because the composition of eligible capital changes. Some of these adjustments need not involve an increase in common equity. Similarly, ROE depends on average book equity, whereas CAR generally reflects a regulatory reporting date and definition. The theoretical prediction cannot be derived from a denominator argument alone. The underlying study nevertheless adopts a negative contemporaneous expectation, reflecting the possibility that capital and portfolio adjustments precede their earnings benefits.

**H1: Capital adequacy is negatively associated with contemporaneous return on equity.**

### 2.2. Bank scale and book equity capitalization

Scale may support the spread of fixed operating costs, broader customer relationships, and investment in systems. These advantages can improve profitability, although organizational complexity and weak control can offset them. The banking-profitability literature treats size as an empirical determinant rather than a guarantee of efficiency (Athanasoglou et al., 2008). The original positive expectation is retained, but the model contains no nonlinear size term or direct measure of scale economies. A positive coefficient would therefore be consistent with, rather than definitive evidence of, those economies.

**H2: Bank size is positively associated with return on equity.**

Book equity relative to total assets captures funding capitalization without risk weights. It may support confidence and financing flexibility, but it also changes the equity base over which profits are distributed. Laporšek et al. (2025) illustrate that the relationship of this book-capital measure with profitability depends on the outcome considered. In the present specification, book capitalization is included alongside CAR precisely because the two describe different aspects of the balance sheet. The retained positive expectation concerns the association of a stronger book-capital position with profitable operating capacity; it does not deny the arithmetic effect of increasing equity while holding income fixed.

**H3: Book equity capitalization is positively associated with return on equity.**

### 2.3. Operating costs, lending intensity, and credit-risk provisioning

A higher operating-cost-to-income ratio indicates that a larger share of operating revenue is consumed by operating expenses. Unless those expenses deliver offsetting income gains, current net earnings and ROE face downward pressure. Capital and technology spending may benefit future periods, but a static annual model cannot allocate those future benefits automatically to current costs. Both established and recent banking studies motivate controlling for operating efficiency when examining profitability (Athanasoglou et al., 2008; Almeida & Sousa, 2025).

**H4: The operating-cost-to-income ratio is negatively associated with return on equity.**

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The source study calls LOAN "credit growth," but its formula is customer loans divided by total assets. This manuscript follows the stated formula and uses the term lending intensity. A higher loan share may support interest-generating intermediation, but its profitability depends on pricing, funding costs, and credit quality. The positive hypothesis is therefore conditional on the bank's ability to manage the additional exposure. It is not a hypothesis about the year-on-year growth rate of lending.

**H6: Lending intensity is positively associated with return on equity.**

Provisioning is included to capture credit-risk-related differences across banks. A larger provision-related ratio can accompany weaker asset quality, more conservative recognition, or a different portfolio composition. If the numerator is an expense flow, there is also a direct contemporaneous accounting link to net income; if it is an allowance stock, that link is not automatic. The negative expectation is retained, while the distinction between a provision expense and a balance-sheet allowance requires confirmation. Profitability research treats credit risk as an important covariate, but its measurement must be specified carefully (Athanasoglou et al., 2008).

**H7: The credit-risk provision ratio is negatively associated with return on equity.**

### 2.4. The FinTech environment and bank digitalisation

An expanding FinTech sector can complement banks through new distribution, information processing, and partnerships, or compete with them for profitable services. Phan et al. (2020) report an adverse bank-performance association in their Indonesian setting, providing a genuine competing result rather than support for an invariably positive FinTech effect. The positive expectation in the underlying thesis relies instead on the possibility that banks can benefit from the surrounding technological ecosystem. This is a context-dependent hypothesis and should not be presented as an established empirical regularity.

**H5: The reported FinTech-environment proxy is positively associated with return on equity.**

Bank-level digitalisation is conceptually different from the aggregate number of FinTech firms. The former concerns changes within the organization, whereas the latter describes a common external environment. Digital transformation research emphasizes changes in organizational processes and value creation (Vial, 2019; Verhoef et al., 2021). The source DIGI variable is only a binary indicator from a bank's recorded digitalisation milestone. It does not measure digital revenue, investment intensity, customer usage, or the quality of technology governance. Nevertheless, the original expectation is that observations coded as digitally active are associated with higher profitability.

**H11: The bank-level digitalisation indicator is positively associated with return on equity.**

The numbering of H5–H7 and H11 is retained from the underlying study so that the empirical conclusions can be traced to the original hypotheses. Neither H5 nor H11 asserts that digitalisation moderates the CAR relationship: that would require an interaction specification and a separate hypothesis not estimated in the supplied record.

### 2.5. Macroeconomic and common-period conditions

GDP growth may improve lending opportunities and customer cash flows, while inflation can affect repricing, costs, and real income. The underlying study predicts a positive GDP relationship and a negative inflation relationship. These directions are plausible prior expectations but not universal predictions. Their empirical interpretation requires recognition that all banks face the same national annual conditions and that a model with multiple time-varying common controls may have limited power to separate them (Athanasoglou et al., 2008).

**H8: GDP growth is positively associated with return on equity.**

**H9: Inflation is negatively associated with return on equity.**

The COVID-19 indicator is expected to be negative because pandemic-related disruption could weaken lending performance and raise costs. However, the banking-sector response also depended on policy support and initial conditions, as emphasized by Demirgüç-Kunt et al. (2021). An insignificant partial coefficient would not show that the pandemic had no economic consequences; it could mean that the included controls absorb some associated variation or that the chosen indicator does not identify the relevant exposure.

**H10: The 2020–2022 pandemic-period indicator is negatively associated with return on equity.**

Finally, the source labels FL "financial liberalization" but codes it as one for 2021–2025 and zero otherwise. No independent liberalization index or discrete reform exposure is supplied. The original positive direction is retained as a hypothesis about that period indicator, not about the causal effect of financial liberalization. This relabeling makes the hypothesis match the observed variable rather than silently giving a broad institutional interpretation to a calendar dummy.

**H12: The post-2020 period indicator is positively associated with return on equity.**

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## 3. METHODOLOGY

### 3.1. Sample, provenance, and reporting convention

The underlying thesis reports a balanced annual panel of 24 domestic Vietnamese commercial banks during 2014–2025. Banks were selected on data availability, producing 288 bank-year observations, rather than through random sampling. Its stated sources include consolidated financial statements, annual reports, capital disclosures, and macroeconomic information. The manuscript does not treat the sample as a census or claim representativeness from the number of observations alone. The final bank-name crosswalk and source-document references require author confirmation.

The main regression tables reproduce the printed Stata output in Appendix 2. That output takes precedence over conflicting manually prepared chapter tables for transcription purposes, but it has not been independently rerun. For example, Appendix 2 reports FGLS Wald $\chi^2(12)=350.72$, while the chapter table reports 283.56. The appendix value is used here and the discrepancy is documented. The subgroup estimates are available only in chapter Table 4.10; their different evidentiary status is made explicit. No new regression coefficients or unreported diagnostics are supplied.

### 3.2. Variable construction and conceptual distinctions

ROE is net income divided by average book equity, and CAR is eligible regulatory capital divided by risk-weighted assets. The original LEV variable is book equity divided by total assets. To avoid mistaking it for debt leverage, it is renamed EQA in this manuscript; its reported values and coefficients are unchanged. LOAN is labeled lending intensity because the source formula is loans/assets. Table 1 presents the full set of variables and their measurement limitations.

*Table 1. Variable definitions and interpretation*

| Variable | Source definition or description | Qualification |
|---|---|---|
| ROE | Net income after tax / average book equity. | Outcome; fraction. |
| CAR | Eligible regulatory capital / risk-weighted assets. | Focal capital ratio; fraction; confirm comparable reporting bases. |
| SIZE | Natural logarithm of total assets, as specified. | Confirm original monetary unit and transformations. |
| EQA | Book equity / total assets. | Original source code: LEV; renamed for clarity only. |
| ME | Operating expenses / total operating income. | Cost-to-income ratio; fraction. |
| CFTF | Logged annual number of FinTech firms. | Common-year variable; log base and count series require confirmation. |
| LOAN | Customer loans / total assets. | Lending intensity, not loan growth; fraction. |
| LLR | Credit-risk provision measure / total loans. | Confirm provision expense versus allowance stock. |
| GDP | Annual national GDP growth. | Common-year variable; fraction. |
| INF | Annual national inflation. | Common-year variable; fraction. |
| COVID | 1 in 2020–2022; 0 otherwise. | Common pandemic-period indicator. |
| DIGI | 1 from the bank's recorded digitalisation milestone; 0 otherwise. | Bank-year indicator; milestone registry requires confirmation. |
| FL | 1 in 2021–2025; 0 in 2014–2020. | Post-2020 period indicator; source label: financial liberalization. |

The FinTech proxy requires particular attention. Its written definition specifies a natural logarithm, but the printed values range from 1.5911 to 2.4150. Those values are also approximately compatible with base-10 logs of counts from 39 to 260. This numerical observation does not establish which transformation was used. The original annual count series and code must be checked; no elasticity or percentage-change interpretation is assigned to CFTF in the present draft. DIGI likewise requires a bank-by-bank record of milestone dates and

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coding evidence. FL is described only as a post-2020 indicator because its calendar coding cannot measure the broader construct of liberalization independently.

### 3.3. Specification and estimation sequence

The reported model is written as:

$$ROE_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 SIZE_{it} + \beta_3 EQA_{it} + \beta_4 ME_{it} + \beta_5 CFTF_t + \beta_6 LOAN_{it} + \beta_7 LLR_{it} + \beta_8 GDP_t + \beta_9 INF_t + \beta_{10} COVID_t + \beta_{11} DIGI_{it} + \beta_{12} FL_t + \mu_i + \varepsilon_{it} \quad (1)$$

The bank-level regressors are CAR, SIZE, EQA, ME, LOAN, LLR, and DIGI. The common-year regressors are CFTF, GDP, INF, COVID, and FL. Pooled OLS excludes a bank component; fixed effects control for bank-specific intercepts; random effects impose orthogonality between their bank component and the regressors. Full year effects are not included in the reported specifications. Since the common-year variables are functions of year, their separate coefficients would not be identified alongside a complete set of year indicators.

The final command is xtgls ROE CFTF SIZE LEV ME CAR LOAN LLR GDP INF COVID DIGI FL, panels(h) corr(ar1). It specifies different error variances across banks and a common AR(1) coefficient, reported as 0.6114. It does not include bank fixed-effect dummies, a random bank intercept, or contemporaneous cross-bank error correlation. Thus, it should not be described as the selected random-effects model with its defects removed. It is a distinct feasible GLS model with additional covariance assumptions (StataCorp, n.d.-a).

The reported diagnostic sequence is interpreted according to the actual tests. The Breusch–Pagan xttest0 procedure tests whether the random bank component has zero variance; it does not test whether idiosyncratic error variances are equal across banks (StataCorp, n.d.-b). The serial-correlation test concerns within-bank error dependence (Drukker, 2003). Neither a nonsignificant Hausman result nor the use of FGLS resolves endogeneity, selection into digitalisation, or omitted common shocks. Cluster-aware inference is also distinct from correcting measurement problems (Cameron & Miller, 2015).

### 3.4. Validation boundary and subgroup analysis

The tabulated appendix has 288 bank-year rows without duplicate bank-year keys, and its national-year controls are internally common across banks. However, terminal-year patterns require verification. For all 24 banks, the reported logged SIZE series in 2024 is approximately 1.012 times its 2023 value, and its 2025 value is approximately 1.01 times the 2024 value. Similar regularities occur in several other bank ratios. These patterns are not proof of a particular data-generation process, but they make it necessary to identify which observations are audited outcomes, imputations, or extrapolations. The supplied record does not resolve that issue.

For the exploratory subgroup analysis, the thesis divides banks at the median of each bank's average SIZE over the sample period, producing two groups of 12 banks and 144 observations. The exact estimator and standard-error convention for chapter Table 4.10 are not documented in the supplied output. Those results are therefore reported as descriptive supplementary estimates, not as a verified FGLS robustness exercise. Moreover, the split uses full-period average size and is not a pre-specified baseline classification. A direct interaction or equality-of-coefficients test would be needed to establish statistical heterogeneity; separate significance decisions are insufficient (Gelman & Stern, 2006).

## 4. RESULTS

### 4.1. Descriptive statistics and dependence among regressors

Table 2 reproduces the appendix's descriptive statistics. Mean ROE is 8.80%, with a standard deviation of 6.67 percentage points. Mean CAR is 10.90%, while mean book equity capitalization is 8.80%. The similarity between the mean ROE and EQA is numerical, not a conceptual equivalence. Their denominators and purposes differ. The reported CAR range, 4.46%–18.02%, requires reconciliation with the bank-year regulatory definitions and original disclosures; no finding of compliance or noncompliance is inferred from the unverified values.

*Table 2. Reported descriptive statistics*

| Variable | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| ROE | 0.0880 | 0.0667 | 0.0008 | 0.3244 |
| CAR | 0.1090 | 0.0206 | 0.0446 | 0.1802 |
| SIZE | 32.9449 | 1.2762 | 30.3178 | 35.8816 |
| EQA | 0.0880 | 0.0376 | 0.0269 | 0.2384 |

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| Variable | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| ME | 0.3375 | 0.0951 | 0.1349 | 0.6579 |
| CFTF | 2.0282 | 0.3097 | 1.5911 | 2.4150 |
| LOAN | 0.5240 | 0.0995 | 0.2153 | 0.8696 |
| LLR | 0.0191 | 0.0079 | 0.0034 | 0.0440 |
| GDP | 0.0629 | 0.0177 | 0.0256 | 0.0802 |
| INF | 0.0296 | 0.0088 | 0.0063 | 0.0408 |
| COVID | 0.2500 | 0.4338 | 0.0000 | 1.0000 |
| DIGI | 0.2153 | 0.4117 | 0.0000 | 1.0000 |
| FL | 0.4167 | 0.4939 | 0.0000 | 1.0000 |

The mean lending share is 52.40%, the cost-to-income ratio 33.75%, and the provision-related ratio 1.91%. DIGI equals one for 21.53% of the observations; this is the frequency of a coded milestone indicator, not the share of transactions conducted digitally. The pandemic indicator occupies three of the 12 years and therefore has a mean of 0.25. FL has a mean of 0.4167 because it covers five years. These frequencies reflect coding design, not independent measurements of institutional intensity.

The largest highlighted pairwise correlation is 0.8098 between CFTF and FL. Their overlap is unsurprising because both track common time patterns. Variance-inflation factors are 4.35 for CFTF and 3.40 for FL, with a model mean of 2.06. Moderate VIF values do not establish that the common-year coefficients have a clean causal interpretation or that 12 annual realizations provide abundant independent information. The CAR–EQA correlation is 0.0682 in the reported matrix, supporting their empirical distinction within this dataset but not validating their underlying construction.

**4.2. Baseline estimator comparison**

The CAR coefficient is negative in each baseline specification: −0.8851 in pooled OLS, −0.9745 in fixed effects, and −0.9895 in random effects, all with reported p-values below 0.001. SIZE, EQA, LOAN, and DIGI also have stable positive signs across the three models, while LLR is consistently negative. In contrast, the FinTech coefficient is positive and significant in pooled OLS, negative and insignificant in fixed effects, and positive but insignificant at 0.05 in random effects. The cost-to-income ratio is positive and not significant at 0.05 in all three baseline models. These distinctions matter when assessing which conclusions depend most heavily on the final GLS specification.

***Table 3. Reported baseline regression estimates***

| Variable | Pooled OLS | Bank fixed effects | Random effects |
|---|---|---|---|
| CAR | −0.8851<br>(<0.001) | −0.9745<br>(<0.001) | −0.9895<br>(<0.001) |
| SIZE | 0.0112<br>(0.001) | 0.0399<br>(<0.001) | 0.0209<br>(<0.001) |
| EQA | 0.5846<br>(<0.001) | 0.5445<br>(<0.001) | 0.5592<br>(<0.001) |
| ME | 0.0674<br>(0.055) | 0.0112<br>(0.734) | 0.0153<br>(0.639) |
| CFTF | 0.0532<br>(0.003) | −0.0067<br>(0.705) | 0.0254<br>(0.093) |
| LOAN | 0.1081<br>(0.001) | 0.1355<br>(<0.001) | 0.1473<br>(<0.001) |
| LLR | −1.2918<br>(0.001) | −1.3335<br>(<0.001) | −1.3501<br>(<0.001) |

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| Variable | Pooled OLS | Bank fixed effects | Random effects |
|---|---|---|---|
| GDP | −0.2455<br>(0.197) | −0.2633<br>(0.056) | −0.2594<br>(0.063) |
| INF | −0.1430<br>(0.662) | −0.0396<br>(0.867) | −0.0660<br>(0.783) |
| COVID | −0.0097<br>(0.255) | 0.0012<br>(0.850) | −0.0045<br>(0.483) |
| DIGI | 0.0491<br>(<0.001) | 0.0501<br>(<0.001) | 0.0442<br>(<0.001) |
| FL | 0.0172<br>(0.080) | 0.0131<br>(0.079) | 0.0173<br>(0.019) |
| Constant | −0.3949<br>(0.001) | −1.2014<br>(<0.001) | −0.6459<br>(<0.001) |
| Observations | 288 | 288 | 288 |
| OLS $R^2$ | 0.5742 | — | — |
| Within $R^2$ | — | 0.6606 | 0.6518 |
| Between $R^2$ | — | 0.2878 | 0.4031 |
| Overall $R^2$ | — | 0.4284 | 0.5396 |

The correct test of the joint bank intercepts is $F(23,252)=12.05$, $p<0.001$. The value $F(12,252)=40.87$ reported elsewhere is the fixed-effects joint slope test, not the pooled-versus-fixed-effects comparison. The random-effects LM test gives a chi-bar-square statistic of 290.00 with $p<0.001$. Hausman's $\chi^2(12)=6.60$ has $p=0.8829$, but the accompanying covariance-difference warning limits a mechanical inference that random effects are definitively appropriate. The serial-correlation test gives $F(1,23)=47.943$, $p<0.001$. A separate valid test of groupwise heteroskedasticity is not present in the supplied appendix.

The fixed-effects within R-squared is 0.6606 and its overall R-squared is 0.4284. The corresponding random-effects measures are 0.6518 and 0.5396. These values answer different fit questions and should not be ranked as though they were a single common criterion. None is assigned to the FGLS model. Table 3 therefore labels the fit statistics explicitly instead of attributing a general percentage of explained variation to the preferred estimator.

### 4.3. Main reported FGLS results

Table 4 presents the complete FGLS output, including the constant and the nonsignificant regressors. The model's reported Wald statistic is 350.72 on 12 degrees of freedom. The central coefficient is CAR=−0.8253415, with a standard error of 0.1117188 and a 95% confidence interval of [−1.044306, −0.6063767]. Because CAR and ROE are both recorded as fractions, a one-percentage-point difference in CAR corresponds to a 0.8253-percentage-point lower ROE in this fitted specification. The confidence interval translates into −1.0443 to −0.6064 percentage points. This is a conditional association, not the estimated effect of an externally imposed capital increase.

***Table 4. Reported FGLS estimates and nominal confidence intervals***

| Variable | Coefficient | Standard error | p-value | 95% confidence interval |
|---|---|---|---|---|
| CAR | −0.8253 | 0.1117 | <0.001 | [−1.0443, −0.6064] |
| SIZE | 0.0154 | 0.0039 | <0.001 | [0.0078, 0.0229] |
| EQA | 0.5123 | 0.1048 | <0.001 | [0.3069, 0.7177] |
| ME | −0.1190 | 0.0284 | <0.001 | [−0.1747, −0.0634] |
| CFTF | 0.0372 | 0.0127 | 0.003 | [0.0123, 0.0621] |

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| Variable | Coefficient | Standard error | p-value | 95% confidence interval |
|---|---|---|---|---|
| LOAN | 0.0893 | 0.0321 | 0.005 | [0.0264, 0.1522] |
| LLR | −0.9145 | 0.2930 | 0.002 | [−1.4888, −0.3403] |
| GDP | −0.4040 | 0.0849 | <0.001 | [−0.5705, −0.2375] |
| INF | 0.0083 | 0.1440 | 0.954 | [−0.2739, 0.2905] |
| COVID | −0.0019 | 0.0044 | 0.664 | [−0.0106, 0.0068] |
| DIGI | 0.0324 | 0.0101 | 0.001 | [0.0126, 0.0523] |
| FL | 0.0134 | 0.0061 | 0.027 | [0.0015, 0.0253] |
| Constant | −0.4245 | 0.1270 | 0.001 | [−0.6734, −0.1756] |

EQA is positively associated with ROE, with a coefficient of 0.5123 and a nominal confidence interval of [0.3069, 0.7177]. Its sign is not inconsistent with the negative CAR coefficient because the two variables condition on different aspects of capitalization and risk exposure. The SIZE coefficient is 0.0154. Lending intensity has a coefficient of 0.0893, implying an arithmetic ROE difference of 0.8932 percentage points for a ten-percentage-point higher loan share. That number is not an estimate of the return to expanding credit growth by ten percentage points.

ME has a coefficient of −0.1190, while LLR has a coefficient of −0.9145. A ten-percentage-point higher cost-to-income ratio corresponds arithmetically to a 1.1904-percentage-point lower ROE. The cost result differs in sign from the baseline models and therefore deserves particular specification scrutiny. The LLR result is more stable across estimators, but its interpretation as an expense channel still depends on the unresolved stock-versus-flow definition of the numerator.

The coefficient on DIGI is 0.0324, corresponding to a conditional difference of 3.2421 percentage points in ROE between observations coded one and zero. Its nominal interval is 1.2561–5.2281 percentage points. The coefficient on CFTF is 0.0372, but no change-in-count interpretation is offered without a verified logarithm base. FL is positive at 0.0134; it describes a partial post-2020 period difference, not an identified liberalization effect. GDP is negative at −0.4040, whereas INF and COVID are not statistically distinguishable from zero, with p-values of 0.954 and 0.664.

**4.4. Hypothesis assessment and exploratory size differences**

The signs and nominal p-values of the reported FGLS output align with H1–H7, H11, and H12. H8 is contradicted by the negative GDP coefficient. H9 and H10 lack statistically discernible support at the conventional 0.05 level. This assessment refers to the recorded specification only; it does not convert the regressors into causal determinants, validate their measurements, or remove concerns about the terminal years. In particular, H12 concerns the observed period indicator, and the evidence should not be restated as proof of a favorable financial-liberalization effect.

Table 5 reports the focal subgroup estimates. CAR is −0.3218 in the small/medium group, with p=0.242, and −1.3490 in the large-bank group, with p<0.001. The numerical difference is suggestive of heterogeneity, but the source provides neither a direct equality test nor the information needed to reconstruct one reliably. The manuscript therefore does not conclude that the groups are statistically different. The split may also reflect other features associated with full-period bank size rather than size alone.

***Table 5. Exploratory CAR estimates by reported bank-size group***

| Group | Banks | Observations | CAR coefficient | p-value |
|---|---|---|---|---|
| Small/medium | 12 | 144 | −0.3218 | 0.242 |
| Large | 12 | 144 | −1.3490 | <0.001 |

The subgroup record can motivate a future pre-specified interaction analysis, but it should not become a categorical policy prescription for large and small banks. A lack of significance in the smaller-bank group does not establish a zero capital relationship. Equally, the large-bank result does not demonstrate that those institutions should hold less capital. Both statements would exceed the estimand and the available uncertainty information.

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## 5. DISCUSSION

### 5.1. Why negative CAR and positive book capitalization can coexist

A useful accounting decomposition clarifies the coexistence of these signs. Let K denote eligible regulatory capital, RWA risk-weighted assets, E book equity, and A total assets. For consistently dated quantities with positive denominators, the following identity holds:

$$CAR = K / RWA = (E / A) \times (K / E) / (RWA / A) \quad (2)$$

The identity separates the book equity share, the regulatory-to-book-capital conversion, and risk-weighted asset density. Holding EQA constant, CAR can differ because capital composition or risk weights differ, not because one bank necessarily has more book equity. A negative partial CAR coefficient therefore need not describe the effect of reducing the equity multiplier. It can also reflect portfolio composition, risk measurement, or features correlated with the eligible-capital definition. The source does not contain the decomposed series needed to distinguish these channels empirically.

ROE adds a timing distinction because its denominator is average equity. The source's book-capital ratio uses total assets and book equity without the same documented averaging convention. Consequently, the manuscript does not impose an exact observation-by-observation ROE decomposition using those two ratios. The theoretical point is instead that shareholder returns and regulatory capital capture different dimensions of performance and safety. The signs should be interpreted jointly, not treated as a contradiction that can be resolved by selecting whichever coefficient supports a preferred managerial conclusion.

This distinction also sharpens the literature comparison. Laporšek et al. (2025) use equity/assets for their capital measure, so their results are more directly comparable with EQA than with risk-weighted CAR. Presenting that study as straightforward evidence of a positive regulatory-CAR effect would blur the measures. Meanwhile, the survival and market-share outcomes examined by Berger and Bouwman (2013) show why an association with contemporaneous ROE cannot settle the broader value of bank capital. A capitalization decision can alter resilience and the distribution of future outcomes without increasing current accounting returns.

### 5.2. Digitalisation, operating capability, and the missing interaction

The positive DIGI coefficient is compatible with more effective service delivery, process redesign, or information use. It is also compatible with selection: banks with stronger management, better growth opportunities, or higher expected profitability may adopt digital systems earlier. A binary milestone does not separate those explanations. The capability perspective in digital transformation research supports examining organizational change, but it does not transform a binary control into a measure of mature digital capability (Vial, 2019; Verhoef et al., 2021).

The source specification also cannot establish that digitalisation offsets the profitability effect of capital adequacy. A positive DIGI main effect and a negative CAR main effect are additive conditional associations. Demonstrating moderation would require an interaction term, relevant support in the data, and an estimation strategy appropriate to the timing and selection of adoption. No such interaction is reported. For the same reason, the aggregate FinTech coefficient cannot be interpreted as the return on a bank's own technology investment. It reflects a common-year proxy shared by all banks.

The positive CFTF result should be discussed against competing evidence, not framed as universal agreement. Phan et al. (2020) document a negative bank-performance relationship in Indonesia, highlighting the potential competitive channel. The present result could instead reflect complementarities, common trends, or omitted calendar factors. Given its sensitivity across the supplied estimators and overlap with FL, the distinction cannot be resolved here. The Basel Committee's discussion of digitalisation emphasizes governance and operational dependencies alongside possible efficiency gains, making a capability-and-risk interpretation more defensible than a simple "more technology means more profit" claim (Basel Committee on Banking Supervision, 2024).

### 5.3. Operating costs, lending, and credit-risk recognition

The cost-to-income result is economically plausible but statistically specification-sensitive: its sign changes only in the final FGLS model. This is important because the final model alters the weighting of observations and the error assumptions while not retaining the bank effects of the earlier panel estimators. The manuscript therefore treats cost efficiency as a managerial issue motivated by the framework, not as a uniformly confirmed coefficient across every model. Almeida and Sousa (2025) provide a recent comparison showing that operating conditions remain relevant to profitability in a different banking system, without validating the present estimator by analogy.

The positive loan-share association describes balance-sheet allocation toward lending, not a recommendation for indiscriminate expansion. Additional lending can increase expected income while also increasing losses, funding needs, and required capital. The negative LLR association reinforces the need to consider credit quality, although a provision-related ratio is not identical to realized defaults. Conservatively recognizing losses can

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reduce current income while improving the reliability of reported accounts. Cutting provisions to improve ROE would therefore be an inappropriate inference from the coefficient.

### 5.4. The negative GDP coefficient and common-period proxies

The negative GDP coefficient is significant only in the reported FGLS specification at the 0.05 level. It does not show that economic growth harms banking profitability. With 12 annual observations of national conditions, several overlapping time controls, no full year effects, and possible lags between credit risk and income recognition, the partial coefficient may be sensitive to model specification and sample composition. Plausible narratives about margins, policy support, or delayed losses remain untested mechanisms and are not presented as established explanations.

Likewise, the insignificant COVID coefficient cannot be compared directly with crisis studies using bank stock returns, policy announcements, or different exposure measures. Demirgüç-Kunt et al. (2021) examine banking-sector performance in a broader crisis setting; differences in outcomes and identification matter. The FL coefficient is even more limited because the observed variable is only a calendar split. A post-2020 improvement may reflect many concurrent changes. No independent measure of liberalization is available to disentangle an institutional mechanism from those changes.

## 6. MANAGERIAL IMPLICATIONS AND RESEARCH LIMITATIONS

### 6.1. Linking capital planning to risk-adjusted earnings

The central implication is to manage capital and earnings jointly without treating current ROE as the sole objective. A bank considering additional capital should examine how that capital supports its risk profile, lending capacity, and continuity of operations, and whether its deployment generates adequate earnings over an appropriate horizon. A temporary reduction in ROE can be consistent with a stronger institution. Conversely, a higher ROE generated only by a thinner equity base does not demonstrate improved operating capability. The supplied coefficients do not identify a minimum, maximum, or optimal target CAR.

A practical planning framework would distinguish eligible regulatory capital, book equity, and risk-weighted asset density, then relate each to the bank's business mix and expected income. Capital allocation should be evaluated at the level of activities and risks rather than by a single aggregate profitability ratio. This is a conceptual recommendation derived from the framework, not a quantified intervention supported by the present regressions. Regulatory requirements and appropriate resilience buffers remain constraints, not variables to weaken in response to a negative CAR coefficient.

Digital projects should likewise be evaluated against observable operating outcomes such as processing quality, service capacity, customer usage, and risk control, not merely a binary declaration of digital transformation. Investment appraisal should distinguish initial costs from subsequent benefits and account for operational dependencies. The current dataset cannot estimate which projects or governance arrangements are most effective. Its contribution is to motivate integration of technology capability and capital planning while recognizing that the relationship between them remains to be tested directly.

### 6.2. Limitations and priorities for a subsequent empirical version

The most immediate limitation is data provenance. Terminal-year observations must be matched to original financial and capital disclosures, and any extrapolations or imputations must be separately identified. The authors also need to confirm the CFTF logarithm base and annual count source, the DIGI milestone registry, the stock-versus-flow definition of LLR, and the consistency of consolidated versus individual-bank capital reporting. These questions cannot be solved by linguistic polishing or by replacing a few literature citations.

The econometric limitations are equally specific. The final FGLS command does not retain the individual effects considered in the baseline models; the reported Hausman output contains a covariance warning; and the LM random-effects test is not evidence of heteroskedasticity. The common AR(1) structure and cross-bank independence assumptions have not been shown to fit the data adequately. A validated version should replicate the printed estimates, correct the diagnostic labels, and examine bank fixed effects with appropriately clustered inference. With only 24 banks and 12 years, finite-sample uncertainty and common shocks deserve explicit attention rather than reliance on asymptotic significance alone (Cameron & Miller, 2015).

The substantive identification problems remain after those corrections. Capital, profitability, and digital adoption may be jointly determined. Lagging a regressor or observing a weak simple lag correlation does not establish exogeneity. A future design should match its claims to a defensible source of variation, and any dynamic panel approach should justify its instrument set and finite-sample suitability rather than use GMM as an automatic solution. Alternative outcomes such as return on assets, net interest margin, and risk-adjusted profitability would help distinguish shareholder-return effects from operating performance. A pre-specified

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CAR-by-size interaction and better digital-intensity measures could then test heterogeneity and complementarity explicitly. None of these analyses is claimed to have been completed.

## 7. CONCLUSION

The reported Vietnamese banking panel shows a negative CAR–ROE association across pooled OLS, fixed effects, random effects, and FGLS, while book equity capitalization and the digitalisation indicator are positively associated with ROE. The focal FGLS estimate translates to a 0.825-percentage-point lower ROE for a one-percentage-point higher CAR, conditional on the supplied specification. Its interpretation is not that capital should be reduced: regulatory capital, book equity, portfolio risk, and shareholder returns describe different dimensions of banking activity. The exploratory size split does not establish statistical heterogeneity, and the digital coefficients do not identify technology effects or moderation of the capital relationship. The manuscript's principal analytical message is to connect capital allocation with operating capability and risk-adjusted earnings. Its empirical conclusions remain provisional until the data provenance, measurement ambiguities, and specification issues are resolved through independent verification and re-estimation.

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