


# “Digital environment or fee-based business model? Bank competitiveness in Kazakhstan”

## AUTHORS

Gulzhakhan Kassymbekova   
Dina Amangeldi   
Galina Margatskaya   
Gaukhar Kodasheva  
Rakhima Bekbulatova   
Aizhan Zhamiyeva   
Kalamkas Rakhimzhanova 

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Gulzhakhan Kassymbekova, Ph.D., Associate Professor, Department of Finance, Turan University, Kazakhstan. (Corresponding author)

Dina Amangeldi, Master of Economics, Ph.D. Student, Department of Finance and Accounting, Turan University, Kazakhstan.

Galina Margatskaya, Candidate of Economic Sciences, Professor, Department of Finance and Accounting, Turan University, Kazakhstan.

Gaukhar Kodasheva, Ph.D. in Finance, Acting Associate Professor, L.N. Gumilyov Eurasian National University, Kazakhstan.

Rakhima Bekbulatova, Candidate of Economic Sciences, Head teacher, Department of Finance, Higher School of Economics and Tourism, L.N. Gumilyov Eurasian National University, Kazakhstan.

Aizhan Zhamiyeva, Ph.D. in Finance, Acting Associate Professor, L.N. Gumilyov Eurasian National University, Kazakhstan.

Kalamkas Rakhimzhanova, Ph.D., Senior Lecturer of the Department of Finance, L.N. Gumilyov Eurasian National University, Kazakhstan.



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# DIGITAL ENVIRONMENT OR FEE-BASED BUSINESS MODEL? BANK COMPETITIVENESS IN KAZAKHSTAN

## Abstract

Digital transformation of banking is widely expected to reshape competition, but it remains unclear whether it strengthens individual banks' competitive positions, particularly in emerging markets. This study examines how digitalization relates to bank competitiveness, distinguishing the national digital environment from banks' fee-based business models and taking Kazakhstan – a digital frontrunner with an unusually profitable banking sector – as the focal case. A two-layer, two-way fixed-effects design is used: a cross-country panel of up to 147 economies (2004–2025), combining IMF Financial Soundness Indicators with the United Nations E-Government Development Index, and a bank-level panel of Kazakhstan's second-tier banks (2016–2025), in which a fee-oriented business model is proxied by commission income relative to assets. Across countries, the strong negative cross-sectional association between digital maturity and bank profitability – a country-level correlation of  $-0.45$  – disappears once fixed country differences are absorbed, as a standardized coefficient of  $-0.43$  turns to an insignificant  $+0.09$ , revealing a development gradient rather than a competitive effect. No robust within-country effect on profitability, margins, spreads, or cost efficiency survives. Within Kazakhstan, by contrast, a one-standard-deviation increase in commission intensity is associated with a 0.7 percentage-point wider interest spread and a 0.8 percentage-point higher net interest margin (both  $p < 0.05$ ). This bank-level relationship holds when the dominant digital bank is excluded and is stable in magnitude under more conservative inference, though its statistical significance weakens, indicating that the competitive returns associated with a fee-based business model led in this market by digital, platform-based banks are concentrated within markets, across banks, rather than across national aggregates.

## Keywords

digital transformation, bank competitiveness, fee-based business model, interest margin, fee income, Kazakhstan, e-government

## JEL Classification

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## INTRODUCTION

The digital transformation of banking – payments, lending, and customer relationships migrating onto mobile and online platforms – has accelerated worldwide, with the share of adults holding a financial account rising from 51% in 2011 to 79% in 2024 (World Bank, 2025). Its effect on an individual bank's competitive position, however, is theoretically ambiguous: digital models can lower marginal costs, broaden fee-generating services, and retain customers, supporting margins, yet they also lower entry barriers and commoditize core products, intensifying competition. Which force dominates is an empirical question that may differ across markets and across banks within a market.

Evidence is mixed, concentrated in advanced economies and national banking systems, and tends to conflate two distinct phenomena. National digital maturity – an economy’s digital readiness, captured by indicators such as the United Nations E-Government Development Index – is shared by all banks in a country, whereas a digitally transformed business model is a firm-level choice that differentiates banks within a market; the two are rarely separated, and firm-level evidence from emerging markets is scarce. Kazakhstan offers a revealing setting – not a typical emerging market but a critical, theory-testing case in which the hypothesis that digitalization compresses bank margins should be easiest to falsify. It is a digital frontrunner – ranked 24th of 193 economies, with an index of 0.90, in the United Nations E-Government Survey 2024 (United Nations, 2024; Government of Kazakhstan, 2024) – and home to Kaspi.kz, a financial application used by about 70% of the population. Yet its banking sector remains highly profitable, with a sector return on assets of around 5% and historically wide interest spreads (International Monetary Fund, 2024; World Bank, 2024), making it an instructive case for asking whether, and where, digitalization yields a competitive advantage.

This study assesses how digitalization relates to bank competitiveness – distinguishing the national digital environment from banks’ fee-based business models – with Kazakhstan as the focal case, using a two-layer, two-way fixed-effects design. The cross-country panel is not a standalone study but a benchmark: it situates Kazakhstan against global regularities and identifies what is environmental in digitalization, while the firm-level Kazakhstani panel carries the study’s central argument. A cross-country panel of up to 147 economies (2004–2025) asks whether national digital maturity is associated with banking-sector competitiveness – profitability, margins, spreads, and cost efficiency – across and within countries; a bank-level panel of Kazakhstan’s second-tier banks (2016–2025), with the business model proxied by commission income relative to assets, asks whether more fee-oriented banks occupy stronger competitive positions than their peers. The contribution is to separate the environmental and strategic dimensions of digitalization – usually conflated – and to provide firm-level emerging-market evidence on where the competitive payoff to digitalization, if any, is realized.

## 1. LITERATURE REVIEW

Digital technologies are transforming banking from a relationship-based, vertically integrated activity into a data-driven, platform-based one. Artificial intelligence, big data, and digital platforms are reconfiguring financial intermediation and eroding the boundaries of the traditional bank, pressing incumbents to modernize legacy systems and branch networks while fintech entrants offer non-intermediated alternatives in lending and payments (Vives, 2019; Thakor, 2020). At the customer interface, the same technologies enable product personalization, robo-advisory and AI-assisted support (Rysin et al., 2023; Piotrowski & Orzeszko, 2023), with value increasingly co-created through AI and big-data capabilities (Khaddam & Alhanatleh, 2024) and delivered through mobile, smart-technology channels (Kostiushko et al., 2025). Whether banks realize performance gains from these tools, however, remains contested.

Evidence on the performance effects of bank digitalization is strikingly mixed. One strand reports clear gains: for listed Chinese commercial banks, digital transformation raises profitability largely by improving asset-operating efficiency, with a positive effect on return on assets ( $\beta = 0.252$ ) (He et al., 2025). A competing strand documents a productivity paradox, in which heavy upfront investment, organizational friction and a transitional rise in non-performing loans depress short-run profitability and net interest margins ( $\beta = -0.012$ ) (Zhang, 2026). These outcomes diverge largely with organizational readiness, since digital leadership, competence, and employee self-efficacy determine whether new systems translate into higher performance (Annisa et al., 2024; H. Saifi & F. Saifi, 2025). A central reason the effects differ is that digitalization simultaneously reshapes the bank’s revenue model.

Digitalization is shifting banks from interest-based intermediation toward fee- and platform-

based revenue, but the payoff of this shift is disputed. Open banking and application programming interfaces let banks monetize ecosystems even as specialized providers strip away fee-generating services in a horizontal disintegration of the value chain (Boot et al., 2021); for second-tier banks in developing economies, API-driven, fee-based monetization is presented as a route to defend margins and manage problem loans (Rakhimzhanova et al., 2025). Diversification into non-interest income, however, cuts both ways: diversified banks appear to gain most from digitalization, using it to amplify liquidity creation (Huynh, 2025), whereas a larger non-interest-income share has been found to reduce net interest margins and overall performance across Asian economies (Budhathoki et al., 2025). These firm-level revenue dynamics unfold within market structures that digitalization is itself transforming.

At the level of markets and national systems, digital maturity reshapes competition, frequently in non-linear ways. Under imperfect competition, technology-driven production and screening costs set equilibrium loan volumes and interest spreads (Ray, 2026), forcing incumbents to defend local deposit franchises while facing national competition for corporate loans from digital entrants (Berger & Boot, 2024), even as prudential oversight and resilience to failure remain salient (Morin, 2025). At the national level, digital readiness and e-government are treated as determinants of national competitiveness (Jankal & Jankalová, 2025; Tadevosyan, 2023) and of financial transparency, curbing the shadow economy (Bozhenko et al., 2024), and they feature in wider analyses of digital governance and public administration (Oe et al., 2025; Zahorodnia et al., 2026). These macro effects are uneven: persistent cross-country asymmetries in digital readiness constrain convergence (Kolupaieva & Tiesheva, 2023). Such level-dependent dynamics reinforce that digital effects operate differently at the environmental and at the firm level – a distinction that is especially consequential in emerging markets, where these forces interact with firm strategy.

In emerging markets, the promise of digital finance is tempered by uneven access and distributional risk. Digital payments, mobile banking and expanded access points are associated with

financial inclusion, customer satisfaction and growth (Saienko et al., 2025; Raman Thapaliya & Dongol, 2026), with adoption depending on perceived usefulness and self-efficacy among diverse users (Hedau, 2025). Yet inclusion gains are conditional: card-payment inclusion lowers poverty risk only beyond a high adoption threshold, while physical branches remain more consistently effective at reducing income inequality (Laskienė et al., 2026), and, under market disruption, demand for digitalization can amplify financial stratification by pushing asset-light firms into costly credit (Sartamorn et al., 2025). Kazakhstan epitomizes these tensions, with sharp regional and sectoral gaps in digital readiness between leading hubs and lagging regions (Satpayeva et al., 2025). Across this literature, however, two channels of digitalization are rarely disentangled: the national, environmental digital maturity of a country, such as e-government development, and the firm-level digital business model of an individual bank, such as reliance on commission income. Most studies examine one channel in isolation, draw on large state-owned banks in China or on developed-market aggregates, and seldom test how a second-tier bank's fee-income strategy affects its net interest margin and profitability within a fragmented emerging-market environment. The present study addresses this gap with a two-layer design: a cross-country panel relates national digital maturity to banking-sector competitiveness, isolating environmental spillovers, while a bank-level panel of Kazakhstani second-tier banks links commission-income intensity to net interest margin, interest spread, and return on assets, isolating the firm-strategy channel. By distinguishing where digital maturity acts as a national externality from where it reflects a deliberate business-model choice, and by bringing into focus second-tier emerging-market banks largely absent from existing evidence, the analysis clarifies a relationship the literature has so far left entangled.

## 2. DATA AND METHODOLOGY

### 2.1. Data and sample

The analysis combines two panels. The first is a cross-country panel for up to 147 economies over 2004–2025. Banking-sector outcomes come from

the IMF Financial Soundness Indicators – return on assets and equity, the interest-margin-to-gross-income and cost-to-income ratios, the non-performing-loan and liquid-assets ratios, and, where reported, the lending-deposit spread. National digital maturity is the United Nations E-Government Development Index and its telecommunication-infrastructure sub-index, complemented by internet use from the World Bank World Development Indicators (WDI). Controls comprise macroeconomic variables (GDP per capita, GDP growth, inflation, trade openness) from the WDI, six Worldwide Governance Indicators (regulatory quality, rule of law, government effectiveness, control of corruption, political stability, and voice and accountability), and financial-depth measures (bank credit and bank deposits to GDP) from the IMF Financial Access Survey. Because governance indicators bind the panel at 2023, the main sample spans 2004–2023 and 138 economies (1,983 country-year observations). The lending-deposit spread, reported for about a third of country-years, is a secondary outcome only; regulatory capital is too sparse to use.

The second panel is bank-level data for Kazakhstan’s second-tier banks over 2015–2025, from the supervisory statistics of the National Bank of Kazakhstan. Income-statement and balance-sheet items come from the regulator’s monthly statements, and the commission-intensity proxy is commission income (account class 4600) over total assets, from the statement of balances on banks’ accounts. Banks are mapped to consistent identities across mergers and renamings via a hand-built crosswalk (Appendix, Table A2), with merged predecessors aggregated within years to prevent double counting. The 2023 chart-of-accounts redefinition left the proxy unaffected – it uses the commission-income class and total assets, both stable across the change – and year fixed effects absorb any common-year shift. The proxy is available from 2016, giving 216 bank-year observations across 29 banks. All dependent variables are winsorized at the 1st and 99th percentiles, and the cross-country spread is rescaled from basis points to percentage points. The digital regressors (e-government index and internet penetration) are standardized, so coefficients reflect a one-standard-deviation increase; the commission proxy enters as the standardized log of one

plus commission-to-assets, taming its right-skew. Variable definitions and sources are in Appendix, Table A1.

## 2.2. Empirical strategy

The two panels address the research question at two levels. The cross-country panel asks whether national digital maturity is associated with banking-sector competitiveness across and within countries; the Kazakhstani panel asks whether, within a single market, banks with more fee-oriented business models occupy a stronger competitive position. Competitiveness is operationalized at the level of the firm or sector as the capacity to sustain interest margins, spreads, and profitability. For the cross-country layer, we estimate two-way fixed-effects models of the form

$$y_{ct} = \alpha_c + \lambda_t + \beta \cdot EGDI_{ct} + \gamma' X_{ct} + \varepsilon_{ct}, \quad (1)$$

where  $y_{ct}$  is a banking-sector outcome for country  $c$  in year  $t$ ;  $\alpha_c$  and  $\lambda_t$  are country and year fixed effects, respectively;  $EGDI_{ct}$  is the standardized e-government index;  $X_{ct}$  is a vector of macroeconomic and governance controls and  $\gamma$  the corresponding coefficient vector (the prime denotes transposition);  $\varepsilon_{ct}$  is the idiosyncratic error; and  $\beta$  – the coefficient of interest – measures the within-country association between national digital maturity and the outcome. Country fixed effects absorb fixed differences in development and financial structure, so that  $\beta$  is identified from within-country variation, while year fixed effects absorb global shocks, including common trends in digitalization. We re-estimate the model with internet penetration in place of the e-government index and, because the two digital measures are highly collinear, never include them jointly. To probe dynamics, we replace the contemporaneous regressor with its second and third lags, and we assess robustness to country-specific linear trends. Standard errors are clustered by country; with 138 clusters, conventional cluster-robust inference is adequate. For the Kazakhstani layer, we estimate

$$y_{it} = \mu_i + \lambda_t + \beta \cdot Comm_{it} + \delta' Z_{it} + \varepsilon_{it}, \quad (2)$$

where  $y_{it}$  is the interest spread, net interest margin, or return on assets of bank  $i$  in year  $t$ ;  $\mu_i$  and  $\lambda_t$  are bank and year fixed effects, respectively;

$Comm_{it}$  is the standardized natural log of commission income to assets;  $Z_{it}$  is a vector of bank-level controls (size, capitalization, and credit risk) and  $\delta$  the corresponding coefficient vector;  $\varepsilon_{it}$  is the idiosyncratic error; and  $\beta$  captures the within-bank association between fee orientation and the outcome. Bank fixed effects absorb time-invariant differences in business model and clientele, so that  $\beta$  is identified from within-bank variation over time. Because the sample contains only twenty-nine banks, we complement conventional cluster-robust standard errors with the cluster-jackknife variance estimator and with the wild cluster bootstrap (Cameron et al., 2008), using Rademacher weights and imposing the null hypothesis. We assess robustness by excluding the dominant digital bank, by using the raw commission-to-assets ratio, and by controlling for lending intensity. All models are estimated in Python with the PyFixest package, and the bootstrap uses a fixed random seed for reproducibility.

Several limitations qualify the analysis. The measures are proxies – the e-government index captures the digitalization of the public sector and the national digital environment, not the digitalization of the banking system, and commission intensity captures one observable, fee-side facet of a bank's business model. The latter is a proxy for fee orientation rather than a direct measure of digital or platform-based banking: commission income can also arise from card and transaction fees, foreign-exchange and cash-management services, acquiring, and insurance or brokerage products, as well as from the composition of the client base. We therefore read it as a fee-based business-model indicator, noting that in this market the most fee-intensive banks are predominantly digital, platform-based institutions (Section 4.1) – consistent with, though not direct evidence of, a digital interpretation. Neither proxy is a direct index of competition such as the Lerner or Boone indicator. The Kazakhstani sample is small, with twenty-nine effective clusters, so firm-level inference is correspondingly cautious. The estimates are associational rather than causal. Direct measures of bank-level digital adoption and of market power, applied to other emerging markets, would test whether the within-market pattern documented here generalizes.

## 3. RESULTS

### 3.1. Descriptive statistics and stylized facts

Table 1 reports descriptive statistics for the two samples. The cross-country sample covers up to 147 economies over 2004–2025 (2,323 country-year observations in the assembled panel; 1,983 enter the main estimation, spanning 138 countries over 2004–2023). Banking-sector return on assets averages 1.69% (SD 1.64), the interest-margin-to-gross-income ratio 60.0%, the cost-to-income ratio 57.6%, and non-performing loans 6.5% of total loans. Digital maturity, measured by the United Nations E-Government Development Index (EGDI), averages 0.58 on a 0–1 scale, while individual internet use averages 55.5% of the population and rises steadily over the period – from 13% in 2004 to 77% in 2024, against an EGDI increase from 0.46 to 0.72.

The Kazakhstan sample comprises up to 37 second-tier banks over 2015–2025, with the commission proxy available from 2016 (216 bank-year observations enter the estimations, spanning 29 banks). Commission income relative to assets – the proxy for a fee-based business model – averages 1.43% (median 0.99%) and is strongly right-skewed, reflecting a small group of fee-intensive banks. The interest spread averages 4.9%, the net interest margin 6.1%, and return on assets 2.1% across banks (equal-weighted); this equal-weighted mean lies below the asset-weighted sector figure in the cross-country data (around 5%), reflecting the weight of a few large, profitable banks. Kaspi stands out sharply, with a commission-to-assets ratio averaging 7.24% – far above the next-highest banks (HomeCredit, 3.90%; ADCB Islamic, 3.53%). This fee-intensive frontier is occupied chiefly by digital, platform-based banks: Kaspi, a mobile super-app, and Home Credit, a digitally oriented consumer lender. For Kaspi, the dominant fee earner, commission and transaction income is generated overwhelmingly by its digital payments and marketplace platforms rather than by conventional tariffs (Kaspi.kz, 2024). Not all fee income is platform-based, however: the next most fee-intensive institutions are Islamic banks (ADCB Islamic; Zaman-Bank), whose commission income reflects the structure of Islamic-finance contracts rather than digital intermediation. Commission intensity is therefore best read as

a fee-based business-model indicator that, in this market, is led by – though not confined to – digital, platform-based banks. It is also a persistent bank characteristic: a bank’s commission intensity in its first and last observed years is positively correlated (Spearman  $\rho = 0.43$ ), consistent with a durable business model rather than transient pricing.

Two stylized facts frame the analysis. First, across countries, digital maturity is negatively associated with bank profitability and pricing: in the pooled data, EGDI and internet penetration correlate  $-0.26$  and  $-0.29$  with sector return on assets, and  $-0.22$  and  $-0.21$  with lending spreads (Appendix, Table A4), and at the country level (period means) the gradient is steeper still ( $-0.45$  for EGDI; Figure 1). This pattern reflects a development gradient rather than a causal relationship – EGDI and internet use are themselves highly correlated ( $0.87$ ) and both rise with income per capita, so digitally mature economies tend to be those with more competitive, lower-margin banking systems. Second, Kazakhstan lies above this cross-country relationship (Figure 1): its banking-sector profitability is higher than its digital maturity would

predict – though, once income and institutions are also accounted for, its conditional profitability is close to the cross-country norm (Appendix A, Table A5). Although its period-average sector return on assets (2.4%) is held down by the banking distress of the mid-2010s, by the end of the period it combined a high e-government index (0.90 in 2024) with a high sector return on assets (around 5%) and wide interest spreads (around 9%). This juxtaposition motivates the empirical strategy – if digital maturity does not compress margins in Kazakhstan as the cross-country gradient would suggest, the competitive effects of digitalization may operate within the market, across banks, rather than at the aggregate level.

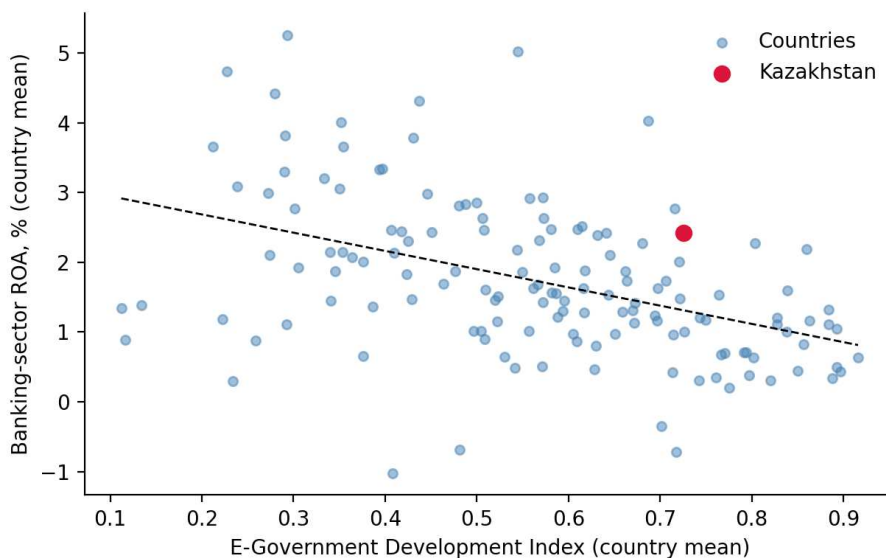
### 3.2. Cross-country evidence

We first ask whether the negative cross-sectional association between digital maturity and bank profitability reflects a within-country relationship. Table 2 reports a sequence of specifications for sector return on assets. In a pooled model, a one-standard-deviation increase in EGDI is associated with 0.43 percentage points lower return on

**Table 1.** Descriptive statistics

Panel A. Cross-country sample (country-year)						
Variable	N	Mean	SD	Min	Median	Max
Return on assets, %	2,293	1.69	1.64	-20.69	1.51	12.16
Interest margin / gross income, %	2,287	60.00	15.77	-294.33	61.52	100.77
Cost-to-income, %	2,285	57.58	16.71	-303.49	56.91	171.89
NPL ratio, %	2,259	6.51	7.63	0.09	3.86	61.12
Liquid assets / total assets, %	2,182	30.04	16.72	4.19	27.32	211.48
EGDI (0–1)	2,273	0.58	0.21	0.00	0.59	0.98
Internet users, %	2,188	55.52	29.33	0.57	61.32	100.00
ln(GDP per capita)	2,212	8.93	1.35	5.58	8.96	11.62
Bank credit / GDP, %	2,180	52.34	42.33	1.22	43.18	390.02
Regulatory quality (index)	2,078	0.19	0.90	-2.15	0.09	2.25
Rule of law (index)	2,084	0.10	0.95	-2.38	-0.08	2.12
Panel B. Kazakhstan sample (bank-year)						
Variable	N	Mean	SD	Min	Median	Max
Interest spread, %	285	4.90	2.82	-2.57	4.53	19.88
Net interest margin, %	285	6.10	3.53	0.46	5.73	26.91
Return on assets, %	287	2.13	4.06	-27.77	2.20	16.92
Commission income / assets, %	253	1.43	1.72	0.00	0.99	9.46
Equity / assets, %	287	19.93	16.76	5.49	13.84	97.50
NPL ratio, %	251	6.67	9.85	0.00	4.74	98.40
Loans / assets, %	287	52.55	22.24	0.07	56.23	100.32
ln(assets)	287	19.96	1.71	15.30	19.98	23.73

*Note:* Cross-country sample: up to 147 economies, 2004–2025. Kazakhstan sample: up to 37 second-tier banks, 2015–2025. All ratios are expressed in percent; ln(assets) is the natural log of total assets (KZT thousand). Source: authors’ calculations based on IMF FSI and FAS, UN EGDI, and World Bank WDI and WGI (cross-country); and National Bank of Kazakhstan supervisory statistics (Kazakhstan).



Note: Each point is a country; Kazakhstan is highlighted; the dashed line is the cross-country OLS fit.

**Figure 1.** Digital maturity and banking-sector return on assets across countries (country means, 2004–2025)

assets ( $p < 0.001$ ); adding year fixed effects leaves this essentially unchanged ( $-0.54$  pp). Once country fixed effects are introduced, however, the coefficient falls to  $+0.10$  and becomes statistically indistinguishable from zero, and it remains so after adding the full set of controls ( $+0.09$ , ns), with the

R-squared rising from 0.09 to 0.68. The negative association is therefore entirely between countries – a reflection of fixed differences in development – and provides no evidence that digital maturity lowers bank profitability within a given country.

**Table 2.** Cross-country development gradient (dependent variable: sector return on assets, %)

Regressor	ROA (1)	ROA (2)	ROA (3)	ROA (4)
EGDI (std.)	-0.428*** (0.083)	-0.542*** (0.092)	0.098 (0.158)	0.086 (0.128)
ln(GDP per capita)				0.811 (0.471)
GDP growth				0.046*** (0.009)
Inflation				0.016* (0.007)
Regulatory quality				0.327 (0.210)
Rule of law				-0.209 (0.210)
Constant	1.722*** (0.082)			
Country FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes
Observations	2,243	2,243	2,243	1,983
R <sup>2</sup>	0.092	0.187	0.644	0.676

Note: EGDI is standardized; the dependent variable is winsorized at the 1st/99th percentiles. Column (1) reports pooled OLS; columns (2) and (3) add year and country fixed effects sequentially; column (4) adds macroeconomic and governance controls. Standard errors clustered by country in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

Table 3 turns to within-country effects, estimating two-way fixed-effects models for five bank outcomes. Neither EGDI nor internet penetration is significantly associated with any of them – sector return on assets (0.09 and 0.03, both ns), the interest margin to gross income (–0.33, ns), the cost-to-income ratio (0.51, ns), or the lending spread (–0.21, ns). Among the controls, GDP growth enters positively for return on assets ( $p < 0.001$ ) and GDP per capita negatively for the lending spread ( $p < 0.05$ ), consistent with expectations. These null within-country associations are unchanged when the governance controls are expanded to the full set of six Worldwide Governance Indicators (Appendix Table A3).

A positive association between digital maturity and profitability emerges only with a delay (Table 4). The EGDI coefficient on return on assets rises monotonically across lags – 0.09, 0.15, 0.30, and 0.33 at lags zero through three – and becomes significant at the two- and three-year horizons ( $p = 0.035$  and  $p = 0.012$ ). The pattern is specific to profitability: at a two-year lag, EGDI is unrelated to margins, cost efficiency, or spreads (all  $p > 0.84$ ). The delayed effect, however, does not survive country-specific linear trends: allowing each

country its own trend reduces the two-year-lag coefficient to 0.24 and renders it insignificant ( $p = 0.22$ ). Because EGDI increases almost monotonically within countries, these trends absorb most of its within-country variation, so the delayed association cannot be separated from each country's broader development trajectory. We therefore treat it as suggestive rather than robustly identified.

**Table 4.** Dynamics and trend robustness (dependent variable: sector return on assets, %)

Specification	Coef.	SE	p
Contemporaneous (lag 0)	0.086	0.128	0.502
Lag 1	0.148	0.127	0.248
Lag 2	0.295	0.139	0.035
Lag 3	0.328	0.128	0.012
Lag 2 + country-specific trends	0.235	0.189	0.217

*Note:* Each row is a separate two-way fixed-effects regression of sector ROA on EGDI (standardized) at the indicated lag, with the controls of Table 3 and standard errors clustered by country. The last row adds country-specific linear trends.

### 3.3. Bank-level evidence from Kazakhstan

We now ask whether, within a single banking market, banks with more fee-oriented business models occupy a stronger competitive position.

**Table 3.** Within-country effects of digital maturity on bank outcomes

Regressor	ROA (1)	ROA (2)	Margin (3)	Cost (4)	Spread (5)
EGDI (std.)	0.086 (0.128)		–0.330 (1.276)	0.513 (1.327)	–0.210 (0.481)
Internet users (std.)		0.026 (0.164)			
ln(GDP per capita)	0.811 (0.471)	0.850 (0.488)	3.675 (3.558)	–12.057 (7.128)	–4.005* (1.561)
GDP growth	0.046*** (0.009)	0.048*** (0.009)	–0.179*** (0.050)	0.105 (0.073)	–0.006 (0.011)
Inflation	0.016* (0.007)	0.015* (0.007)	–0.080 (0.046)	–0.071 (0.063)	–0.038 (0.029)
Regulatory quality	0.327 (0.210)	0.331 (0.217)	1.065 (1.908)	–0.153 (2.083)	0.244 (0.561)
Rule of law	–0.209 (0.210)	–0.200 (0.213)	1.338 (1.707)	–2.656 (2.196)	–0.181 (0.648)
Country & Year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,983	1,961	1,976	1,974	650
R <sup>2</sup>	0.676	0.675	0.741	0.707	0.918

*Note:* Two-way (country and year) fixed effects; standard errors clustered by country in parentheses. Digital regressors are standardized; dependent variables are winsorized at the 1st/99th percentiles. Columns (1)–(2) use sector ROA (EGDI in column 1, internet penetration in column 2); (3) interest margin to gross income; (4) cost-to-income; (5) lending spread. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

The explanatory variable is the standardized log of commission income to assets; all specifications include bank and year fixed effects – the latter absorbing the 2023 redefinition of the regulator’s chart of accounts – and standard errors are clustered by bank, with wild cluster bootstrap p-values reported given the small number of clusters (29). Table 5 reports the baseline estimates. A one-standard-deviation increase in commission intensity is associated with a 0.7 percentage-point higher interest spread ( $p = 0.016$ ; wild-bootstrap  $p = 0.085$ ) and a 0.8 percentage-point higher net interest margin ( $p = 0.013$ ; wild-bootstrap  $p = 0.077$ ), while the association with return on assets is positive but imprecise. The equity-to-assets ratio enters positively for the net interest margin and the non-performing-loan ratio negatively for return on assets, as expected. Expressed in raw units, each additional percentage point of commission-to-assets is associated with a 0.39 percentage-point wider spread ( $p = 0.005$ ) – a sizeable gap, given that the median bank earns commission income equal to about 1% of assets while the most fee-intensive bank earns more than seven times that.

**Table 5.** Commission intensity and bank margins, Kazakhstan (baseline fixed-effects estimates)

Regressor	Spread (1)	ROA (2)	NIM (3)
Commission/assets (std., log)	0.007* (0.003)	0.004 (0.008)	0.008* (0.003)
ln(assets)	0.001 (0.007)	0.010 (0.009)	-0.004 (0.005)
Equity/assets	0.037 (0.023)	0.094 (0.054)	0.059** (0.017)
NPL ratio	-0.013 (0.032)	-0.114*** (0.029)	-0.011 (0.026)
Bank & Year FE	Yes	Yes	Yes
Observations	216	216	216
R <sup>2</sup>	0.786	0.543	0.844

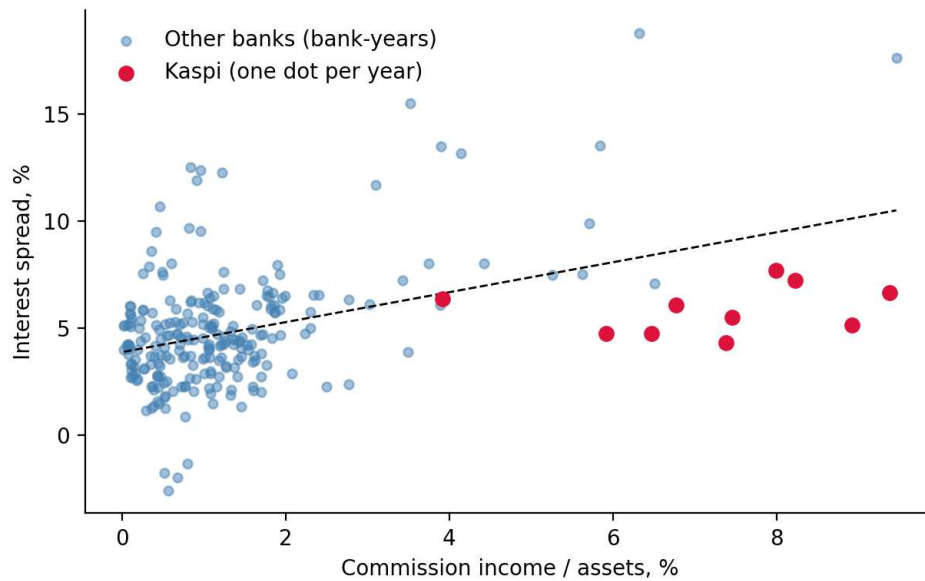
Note: Bank and year fixed effects; standard errors clustered by bank (29 clusters) in parentheses. The commission proxy is the standardized log of commission income to assets. Dependent variables are proportions winsorized at the 1st/99th percentiles (a coefficient of 0.007 corresponds to 0.7 percentage points). Wild cluster bootstrap p-values (999 replications, Rademacher weights): spread 0.085, net interest margin 0.077. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

The point estimates are stable across specifications (Table 6). The point estimates are essentially unchanged when the dominant digital bank, Kaspi, is excluded (spread 0.0074,  $p = 0.015$ ; net interest margin 0.0084,  $p = 0.013$ ), indicating that the result is not driven by a single institution but holds across the fee-oriented segment of the market. Controlling for the loan-to-assets ratio leaves the coefficient unchanged, and the loan ratio itself is insignificant, so the effect does not simply proxy for a bank’s lending intensity. Statistical significance is sensitive to the inference method, as is common with few clusters: the spread and margin effects are significant at the 5% level under conventional cluster-robust standard errors and remain significant at the 10% level under the wild cluster bootstrap (spread  $p = 0.085$ ; net interest margin  $p = 0.077$ ), whereas under the more conservative cluster-jackknife the spread effect is no longer significant at conventional levels ( $p = 0.129$ ). We therefore read the bank-level evidence as moderate: fee-oriented banks earn economically meaningful margins and pricing advantages over their peers, with point estimates that are stable across specifications even as their statistical significance weakens under the most conservative inference, and with the relationship concentrated in margins and spreads rather than in bottom-line profitability. Figure 2 illustrates this relationship, plotting bank-level interest spreads against commission-to-assets with Kaspi highlighted; the positive slope is visible across the sample and does not rest on the single most fee-intensive bank.

**Table 6.** Robustness of the commission-intensity effect (dependent variable: interest spread)

Specification	Coef.	SE	p
Baseline (CRV1)	0.0073	0.0029	0.017
Cluster jackknife (CRV3)	0.0073	0.0047	0.129
Excluding Kaspi	0.0074	0.0029	0.015
Adding loans/assets	0.0073	0.0028	0.016
Raw commission/assets (per pp)	0.0039	0.0013	0.005

Note: Coefficient on the commission proxy under alternative inference and specifications; standard errors clustered by bank. CRV1 = conventional cluster-robust; CRV3 = cluster jackknife. The final row uses the raw commission-to-assets ratio (effect per percentage point). Wild cluster bootstrap p for the baseline = 0.085 (999 replications).



Note: Each point is a bank-year; Kaspi is highlighted; the dashed line is the OLS fit.

**Figure 2.** Interest spread and commission income relative to assets, Kazakhstani banks (2016–2025)

### 3.4. Synthesis

Taken together, the two layers show that the relationship between digitalization and bank competitiveness is largely invisible at the level of national aggregates but evident at the level of individual banks within a market. Across countries, national digital maturity is entangled with economic development: the strong negative cross-sectional association between digital maturity and bank profitability disappears once fixed country differences are absorbed, and no robust within-country effect on bank competitiveness survives. Within Kazakhstan, by contrast, banks with more fee-oriented business models earn higher interest margins and spreads than their peers. This pattern holds across the fee-intensive segment rather than through a single firm, and the point estimates are stable across specifications, although their statistical significance is sensitive to the inference method.

These findings are complementary rather than contradictory, because they capture different margins of variation. National digital maturity – proxied by e-government and internet-penetration indices – is a feature of the operating environment that all banks in a country share, and it co-moves with development and competition in ways

that leave aggregate margins broadly unchanged. Digital transformation of the business model, by contrast, is a firm-level strategy, and the associated competitive advantage appears where banks differ from one another: in the cross-section of margins within a single market. Kazakhstan illustrates the point. It is a highly digital economy – its e-government index reached 0.90 by 2024 – yet its banking sector is highly profitable in levels, sitting above the global digital-maturity gradient; once income and institutions are accounted for, however, this profitability is close to the cross-country norm (Appendix, Table A5), and what distinguishes Kazakhstan's banks is visible only within the market, where the digital and fee-oriented banks, led by Kaspi, command the widest margins. The competitive returns to digitalization, in short, are concentrated within markets, across banks, rather than across national aggregates.

## 4. DISCUSSION

Our cross-country layer indicates that national digital maturity relates to banking-sector competitiveness as a between-country, development-linked factor rather than a within-country driver. The strong negative cross-sectional gradient between e-government development and bank

profitability collapses to zero once country fixed effects are introduced, and no within-country effect on profitability, margins, cost efficiency, or spreads survives. This is consistent with the classic account of Demirgüç-Kunt and Huizinga (1999), in which cross-country differences in bank margins and profitability stem from time-invariant legal, institutional, and macroeconomic structures that country fixed effects absorb. The result stands in apparent tension with studies reporting within-country effects of macro digitalization (Huynh, 2025); the contrast is instructive, because in our data a positive profitability effect emerges only at a two- to three-year lag and does not survive country-specific trends, indicating that the within-country bite of digital maturity is delayed and hard to separate from a country's development trajectory.

Our bank-level layer addresses the more contested, firm-level question of business-model differentiation. Within a single market, banks with more fee-oriented business models sustain wider interest margins and spreads than their peers, and the pattern is robust to excluding the dominant digital bank, so it reflects the fee-oriented segment rather than a single institution. What the estimates identify is fee orientation, not digital intermediation as such; in this market, the two coincide at the fee-intensive frontier (Section 4.1), but the

evidence speaks directly to a fee-based business model. These results support the view that second-tier banks in developing economies can defend margins through API-driven, fee-based monetization (Rakhimzhanova et al., 2025) and that diversified banks translate digitalization into stronger outcomes (Huynh, 2025); they run contrary to evidence that a larger non-interest-income share erodes margins and performance (Budhathoki et al., 2025) and that digital transformation compresses net interest margins during costly transitions (Zhang, 2026). Under imperfect competition, bank-specific technology and cost structures set equilibrium spreads, so the margin effect of a fee-oriented model is contingent on competitive position (Ray, 2026). That the effect concentrates in margins and spreads rather than in bottom-line profitability is itself consistent with a pricing-power rather than a pure-efficiency interpretation.

Read together, the two layers help reconcile part of the literature's disagreement by locating it in a missing distinction. The environmental channel – national digital maturity – behaves as a cross-country-level factor that does not, on its own, raise within-country profitability or compress margins, whereas the firm-strategy channel – a bank's commission-income orientation – carries an economically meaningful margin effect in the cross-section of banks within a market.

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## CONCLUSION

This study set out to assess how the digital transformation of banks' business models relates to their competitiveness, with Kazakhstan as the focal case. The design combines a cross-country panel of up to 147 economies (2004–2025) with a bank-level panel of Kazakhstan's second-tier banks (2016–2025). The two layers yield a consistent message. At the national level, digital maturity is not robustly associated with banking-sector competitiveness: the strong negative cross-sectional gradient between e-government development and bank profitability – a standardized coefficient of  $-0.43$  – turns to an insignificant  $+0.09$  once fixed country differences are absorbed, and the only within-country signal, a delayed rise in profitability, does not survive country-specific trends. Within Kazakhstan, by contrast, a one-standard-deviation increase in commission intensity is associated with a 0.7 percentage-point wider interest spread and a 0.8 percentage-point higher net interest margin (both  $p < 0.05$ ); this relationship holds across the fee-intensive segment rather than resting on a single institution, though it is concentrated in margins rather than in bottom-line profitability.

The principal contribution is to separate two dimensions of digitalization that are usually conflated: national digital maturity, a feature of the environment that all banks in a country share, and the digital transformation of the business model, a firm-level strategy whose competitive correlate appears in the cross-section of banks within a market. Kazakhstan illustrates the distinction: a highly

digital economy with an unusually profitable banking sector, in which the most digital and fee-oriented banks command the widest margins.

For practice, the findings suggest that the competitive returns associated with digitalization appear in banks with more fee-based business models, rather than in banks that merely operate in digitally advanced environments. Because the analysis is associational and does not observe banks' digital investments, their costs, or specific managerial choices, it cannot establish that changing the business model causes competitive gains; with that caveat, the pattern indicates that a bank's own business model may matter more for its competitive position than the digital sophistication of its environment.

For Kazakhstan specifically, the persistence of wide margins alongside rapid digital adoption indicates that digitalization has so far coincided with, rather than eroded, the pricing power of leading banks – a pattern that merits the continued attention of competition authorities.

## AUTHOR CONTRIBUTIONS

Conceptualization: Gulzhakhan Kassymbekova, Dina Amangeldi, Galina Margatskaya, Gaukhar Kodasheva, Rakhima Bekbulatova, Aizhan Zhamiyeva, Kalamkas Rakhimzhanova.

Data curation: Rakhima Bekbulatova.

Formal analysis: Galina Margatskaya, Gaukhar Kodasheva.

Investigation: Dina Amangeldi, Rakhima Bekbulatova.

Methodology: Dina Amangeldi, Kalamkas Rakhimzhanova.

Project administration: Kalamkas Rakhimzhanova.

Resources: Gulzhakhan Kassymbekova.

Software: Galina Margatskaya, Gaukhar Kodasheva, Aizhan Zhamiyeva.

Validation: Gulzhakhan Kassymbekova.

Writing – original draft: Gulzhakhan Kassymbekova, Dina Amangeldi, Galina Margatskaya, Gaukhar Kodasheva, Rakhima Bekbulatova, Aizhan Zhamiyeva, Kalamkas Rakhimzhanova.

Writing – reviewing & editing: Gulzhakhan Kassymbekova, Dina Amangeldi, Galina Margatskaya, Gaukhar Kodasheva, Rakhima Bekbulatova, Aizhan Zhamiyeva, Kalamkas Rakhimzhanova.

## DATA AVAILABILITY STATEMENT

The data are publicly available from the IMF Financial Access Survey (IMF, n.d.-a) and Financial Soundness Indicators (IMF, n.d.-b), the UN E-Government Development Index (United Nations, n.d.), the World Bank World Development Indicators (World Bank, n.d.-a) and Worldwide Governance Indicators (World Bank, n.d.-b), and the National Bank of Kazakhstan's supervisory statistics (National Bank of Kazakhstan, n.d.), all accessed in [month, year].

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## APPENDIX A

**Table A1.** Variable definitions and sources

Cross-country panel		
Variable	Definition	Source
Sector ROA	Banking-sector return on assets, %	IMF FSI
Interest margin / gross income	Net interest income as a share of gross income, %	IMF FSI
Cost-to-income	Operating costs to gross income, %	IMF FSI
Lending spread	Lending rate minus deposit rate, percentage points (secondary outcome)	IMF FSI
NPL ratio	Non-performing loans to total loans, %	IMF FSI
Liquid-assets ratio	Liquid assets to total assets, %	IMF FSI
EGDI	UN E-Government Development Index, 0–1 (standardized in estimation)	UN
Internet users	Individuals using the internet, % of population (standardized)	World Bank WDI
ln(GDP per capita)	Natural log of real GDP per capita	World Bank WDI
GDP growth; Inflation	Real GDP growth and consumer price inflation, %	World Bank WDI
Bank credit / GDP	Bank credit to the private sector, % of GDP	IMF FAS
Governance indicators	Regulatory quality, rule of law, government effectiveness, control of corruption, political stability, voice and accountability (standardized indices)	World Bank WGI
Kazakhstan panel		
Variable	Definition	Source
Interest spread	Interest income on earning assets minus interest cost of funding (proportion)	NBK
Net interest margin	Net interest income to earning assets (proportion)	NBK
Return on assets	Net income to total assets (proportion)	NBK
Commission / assets	Commission income (account class 4600) to total assets, % (standardized log in estimation)	NBK
ln(assets)	Natural log of total assets	NBK
Equity / assets	Total equity to total assets (proportion)	NBK
NPL ratio	Loans more than 90 days overdue to total loans (proportion)	NBK
Loans / assets	Gross loans to total assets (proportion)	NBK

Note: FSI = IMF Financial Soundness Indicators; FAS = IMF Financial Access Survey; WDI = World Bank World Development Indicators; WGI = World Bank Worldwide Governance Indicators; UN = United Nations E-Government Survey; NBK = National Bank of Kazakhstan.

**Table A2.** Kazakhstan's second-tier banks in the sample

Bank	Status (2025)	Entry	Exit
Alatau City Bank (ex-Tsesnabank/Jusan)	Active	2016	
Altyn Bank	Active	2016	
AsiaCredit Bank	License revoked	2016	2021
Bank CenterCredit	Active	2016	
Bank RBK	Active	2016	
Bereke Bank (ex-Sberbank)	Active	2016	
Capital Bank Kazakhstan	License revoked	2016	2021
Delta Bank	License revoked	2016	2017
ForteBank	Active	2016	
Freedom Bank (ex-Kassa Nova)	Active	2016	
Halyk Bank	Active	2016	
Home Credit Bank	Active	2016	
ICBC (Kazakhstan)	Active	2016	
KMF Bank	New	2025	
Kaspi Bank	Active	2016	
Qazaq Banki	License revoked	2016	2018
RBS (Kazakhstan)	Exited	2016	2016
Tengri Bank (ex-Bank Pozitiv)	License revoked	2016	2020
ATFBank	Merged	2016	2021
Bank Astana	License revoked	2016	2018
VTB Bank (Kazakhstan)	Active	2016	

**Table A2 (cont.).** Kazakhstan's second-tier banks in the sample

Bank	Status (2025)	Entry	Exit
Bank of China (Kazakhstan)	Active	2016	
ExpoCredit Bank	License revoked	2017	2018
Alfa-Bank (Kazakhstan)	Merged	2016	2022
Eurasian Bank	Active	2016	
ADCB Islamic Bank (ex-Al Hilal)	Active	2016	
Zaman-Bank (Islamic)	Active	2016	
Kazakhstan-Ziraat Int. Bank	Active	2016	
Kazinvestbank	License revoked	2016	2016
Kazkommertsbank	Merged	2016	2018
BNK Commercial Bank	New	2025	
National Bank of Pakistan (Kazakhstan)	Exited	2016	2021
Nurbank	Active	2016	
Otbasy Bank (ex-Zhilstroysberbank)	Active	2016	
Citibank Kazakhstan	Active	2016	
Shinhan Bank Kazakhstan	Active	2016	
Eximbank Kazakhstan	License revoked	2016	2018

*Note:* Status as of end-2025. Banks are identified consistently across renamings and mergers; predecessors of a merged institution are aggregated within years. Names in parentheses indicate former names. The estimation sample uses 29 banks with non-missing covariates over 2016–2025.

**Table A3.** Within-country effects of digital maturity, extended governance controls

Regressor	ROA (1)	ROA (2)	Margin (3)	Cost (4)	Spread (5)
EGDI (std.)	0.077		-0.124	0.199	-0.258
	(0.128)		(1.304)	(1.383)	(0.409)
Internet users (std.)		0.019			
		(0.168)			
ln(GDP per capita)	0.862	0.900	3.051	-13.148	-4.550**
	(0.504)	(0.521)	(3.727)	(7.545)	(1.511)
GDP growth	0.047***	0.049***	-0.193***	0.110	-0.003
	(0.009)	(0.009)	(0.051)	(0.075)	(0.012)
Inflation	0.016*	0.015*	-0.071	-0.066	-0.033
	(0.008)	(0.008)	(0.047)	(0.065)	(0.032)
Regulatory quality	0.273	0.277	1.195	-0.324	0.074
	(0.203)	(0.211)	(1.992)	(2.305)	(0.644)
Rule of law	-0.230	-0.217	-0.392	-2.856	-0.337
	(0.240)	(0.248)	(1.977)	(2.542)	(0.878)
Government effectiveness	0.185	0.171	-0.746	-0.237	0.780
	(0.205)	(0.216)	(1.797)	(2.168)	(0.716)
Control of corruption	0.002	0.016	-0.597	2.822	0.218
	(0.253)	(0.257)	(1.726)	(2.279)	(0.558)
Political stability	-0.185	-0.191	3.078*	0.811	0.417
	(0.153)	(0.154)	(1.251)	(1.051)	(0.391)
Voice & accountability	0.052	0.050	2.118	-3.433	-1.697
	(0.236)	(0.235)	(1.910)	(2.435)	(1.075)
Country & Year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,984	1,962	1,977	1,975	655

*Note:* Two-way (country and year) fixed-effects estimates that extend the within-country specification of Table 3 with the full set of six Worldwide Governance Indicators. Digital regressors are standardized; dependent variables are winsorized at the 1st and 99th percentiles. Columns (1)-(2) use sector ROA (EGDI in column 1, internet penetration in column 2); column (3), interest margin to gross income; column (4), cost-to-income; column (5), lending spread. Standard errors clustered by country in parentheses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table A4.** Pairwise correlations

Panel A. Cross-country variables								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ROA	1.00							
(2) Margin/GI	0.06	1.00						
(3) Cost/income	-0.21	0.02	1.00					
(4) Spread	0.27	-0.18	-0.01	1.00				
(5) EGDI	-0.26	-0.01	-0.09	-0.22	1.00			
(6) Internet	-0.29	-0.03	-0.06	-0.21	0.87	1.00		
(7) ln GDP pc	-0.37	-0.08	-0.07	-0.26	0.81	0.79	1.00	
(8) Reg. quality	-0.29	-0.01	-0.06	-0.28	0.78	0.67	0.82	1.00

Panel B. Kazakhstan variables								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Spread	1.00							
(2) NIM	0.94	1.00						
(3) ROA	0.27	0.30	1.00					
(4) Comm/assets	0.43	0.42	0.24	1.00				
(5) Equity/assets	0.25	0.25	0.01	0.01	1.00			
(6) NPL ratio	-0.03	0.02	-0.36	-0.01	0.26	1.00		
(7) Loans/assets	0.30	0.37	-0.18	0.21	0.14	0.16	1.00	
(8) ln(assets)	-0.22	-0.15	0.15	0.05	-0.74	-0.22	0.01	1.00

Note: Pooled Pearson correlations over the respective samples. EGDI, internet use, GDP per capita, and governance are strongly collinear across countries, which is why the digital measures are never entered jointly.

**Table A5.** Estimated country effects (main sector-ROA specification)

Rank	Country	Effect (pp)	Rank	Country	Effect (pp)	Rank	Country	Effect (pp)
1	Malawi	+5.48	47	Bolivia	+0.71	93	Chile	-1.06
2	Madagascar	+4.31	48	Georgia	+0.69	94	Estonia	-1.10
3	Papua New Guinea	+4.04	49	Colombia	+0.69	95	Antigua and Barbuda	-1.12
4	Uganda	+3.94	50	Armenia	+0.68	96	St. Vincent and the Grenadines	-1.13
5	Lesotho	+3.89	51	Vanuatu	+0.65	97	Croatia	-1.13
6	Solomon Islands	+3.86	52	Jordan	+0.56	98	Dominica	-1.19
7	Mozambique	+3.71	53	Morocco	+0.54	99	Romania	-1.29
8	Guinea	+3.59	54	Belarus	+0.53	100	Latvia	-1.31
9	Ghana	+3.54	55	Seychelles	+0.51	101	Barbados	-1.32
10	Gambia, The	+3.46	56	Guatemala	+0.51	102	Brunei Darussalam	-1.32
11	Rwanda	+3.28	57	Ecuador	+0.47	103	Iceland	-1.32
12	Kenya	+3.25	58	Philippines	+0.45	104	Algeria	-1.37
13	Maldives	+3.07	59	Dominican Republic	+0.44	105	Montenegro	-1.41
14	Tanzania	+3.05	60	Comoros	+0.41	106	Slovak Republic	-1.43
15	Ethiopia	+2.96	61	El Salvador	+0.40	107	Poland	-1.46
16	Zambia	+2.78	62	India	+0.39	108	Kuwait	-1.47
17	Eswatini	+2.66	63	Trinidad and Tobago	+0.37	109	Hungary	-1.48
18	Central African Republic	+2.45	64	Djibouti	+0.36	110	St. Kitts and Nevis	-1.62
19	Kyrgyz Republic	+2.11	65	Kazakhstan	+0.15	111	United Arab Emirates	-1.72
20	Tonga	+2.03	66	Vietnam	+0.10	112	Malta	-1.88
21	Nepal	+2.01	67	South Africa	+0.03	113	Slovenia	-2.11
22	Nicaragua	+1.83	68	Tajikistan	+0.01	114	Spain	-2.17

**Table A5 (cont.).** Estimated country effects (main sector-ROA specification)

Rank	Country	Effect (pp)	Rank	Country	Effect (pp)	Rank	Country	Effect (pp)
23	Congo, Rep.	+1.74	69	Turkiye	-0.03	115	United States	-2.18
24	Cameroon	+1.70	70	Brazil	-0.09	116	Israel	-2.22
25	Chad	+1.69	71	Ukraine	-0.13	117	Portugal	-2.24
26	Pakistan	+1.65	72	Iraq	-0.14	118	Korea, Rep.	-2.38
27	Fiji	+1.60	73	Mexico	-0.14	119	Canada	-2.43
28	Cambodia	+1.57	74	Equatorial Guinea	-0.15	120	Singapore	-2.48
29	Bhutan	+1.48	75	Russian Federation	-0.19	121	Norway	-2.52
30	Nigeria	+1.46	76	Thailand	-0.22	122	Sweden	-2.55
31	Samoa	+1.34	77	Albania	-0.22	123	Australia	-2.60
32	Argentina	+1.29	78	North Macedonia	-0.24	124	France	-2.61
33	Indonesia	+1.22	79	Uruguay	-0.38	125	Finland	-2.61
34	Bangladesh	+1.20	80	Bosnia and Herzegovina	-0.48	126	Belgium	-2.65
35	Honduras	+1.08	81	Mauritius	-0.49	127	Austria	-2.70
36	Gabon	+1.04	82	Lebanon	-0.49	128	Greece	-2.81
37	Angola	+1.03	83	Costa Rica	-0.62	129	Italy	-2.82
38	Paraguay	+1.03	84	Saudi Arabia	-0.67	130	Netherlands	-2.96
39	Sri Lanka	+1.01	85	Bulgaria	-0.67	131	Germany	-3.04
40	Belize	+1.00	86	Grenada	-0.69	132	Denmark	-3.09
41	Uzbekistan	+0.95	87	Malaysia	-0.73	133	Cyprus	-3.10
42	Botswana	+0.94	88	Lithuania	-0.80	134	United Kingdom	-3.12
43	Azerbaijan	+0.93	89	Panama	-0.86	135	Luxembourg	-3.36
44	Micronesia, Fed. Sts.	+0.83	90	St. Lucia	-0.86	136	Switzerland	-3.55
45	Peru	+0.75	91	China	-0.94	137	Ireland	-3.72
46	Moldova	+0.74	92	Czechia	-0.95	138	San Marino	-3.92

*Note:* Country fixed effects recovered from the two-way fixed-effects model for sector ROA (controls: GDP per capita, GDP growth, inflation, regulatory quality, rule of law), centered on the cross-country mean and ranked from highest to lowest conditional ROA (138 economies); Kazakhstan is shown in bold.