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# The Fintech Productivity Paradox in Islamic and Conventional Banking: Evidence from Bangladesh

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**Abstract: In this study, the impact of fintech on the profitability of Islamic and conventional listed commercial banks in Bangladesh has been examined. Based on the annual report data of 36 listed banks, from 2019 to 2024, a composite Fintech Adoption Index (FAI) is created that is derived from six standardized indexes: IT investment intensity, ATM/CRM density, agent banking density, internet banking density, mobile application availability, and technology disclosure. Two-way fixed-effects and random-effects panel regressions (using Hausman test) are used to estimate the relationship between the Fintech Index and Return on Assets (ROA) and Return on Equity (ROE), then a mediation analysis is conducted on the Cost-to-Income Ratio (CIR) as a transmission channel, and a moderation analysis is conducted by adding an Islamic bank dummy and Fintech Index. In contrast to the general policy discussion about Fintech in Bangladesh, the Fintech Index is statistically not significantly different from zero when correlated with ROA or ROE, nor is the mediated pathway through operational efficiency (Sobel test statistic of 0.27, p-value of 0.79), and the interaction between the Fintech Index and the Islamic bank dummy is also indistinguishable from zero (Sobel test statistic of 0.45, p-value of 0.65). The model shows that the leverage (Debt-to-Equity) is significantly and positively correlated with ROA in the baseline model (p-value below 0.01). The results build on the IT productivity paradox and the threshold-effect literature in a dual-banking emerging market and indicate that both types of banks have not yet reached the level of profitability from fintech investments on which the threshold-effect literature focuses.**

***Keywords:*** *Fintech Adoption; Bank Profitability; Operational Efficiency; Islamic Banking; IT Productivity Paradox; Threshold-Effect.*

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## I. INTRODUCTION

One of the most defining structural changes of the past decade in emerging market financial systems has been the process of digitalization of banking. The transformation was very apparent in Bangladesh, with agent banking outlets expanding from about 2,600 in 2016 to over 21,000 by 2024 [1], and mobile financial services (MFS) transactions reaching BDT 17.37 lakh crore in 2024, marking a 28.4% increase from the previous year. In general, this expansion has been perceived as a positive force for the performance of the banks, and significant empirical research has emerged in an attempt to validate this hypothesis using panel regressions of different fintech proxies on profitability indicators such as Return on Assets (ROA) and Return on Equity (ROE).

But the empirical record is not as clear-cut as the policy story. Recent large sample-based studies show that the impact of fintech adoption on bank performance is heterogeneous, non-linear, and sometimes dependent on the channel used to measure the effect. Uddin and Barai [2] conclude that fintech adoption lowers bank risk and promotes stability, but that the impact on efficiency is mixed and relatively weak: indeed, the adoption of fintech negatively affects efficiency in emerging-market subsamples. In a similar study, Hassan et al. [3] find that the profitability gains of fintech in 33 developing Asian economies are driven by lower performing banks and are sensitive to the quality of national economic governance. A few studies of the Chinese banking sector extend this analysis and provide evidence for a U-shaped or threshold relationship, such that a lower level of fintech development is correlated with a decrease in profitability, due to the fact that competitive and implementation costs initially outweigh efficiency benefits, as noted by Yu & Li [4]. More recently, Chowdhury et al. [5] find that IT investments in the banking sector in Bangladesh are also U-shaped with profitability and stability and inverted U-shaped with efficiency, suggesting that a threshold level of IT investment is required to generate returns from digital investments.

This body of work raises two under-studied questions for the banking sector in Bangladesh in particular. Firstly, the current studies on fintech in Bangladesh have considered fintech proxies as independent variables of profitability, instead of consolidating them under one construct of fintech adoption, and this may introduce omitted-variable bias and

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hinder cross-study comparison. Second, and more significantly, there is a lack of studies to test the mechanism that is assumed to impact profitability when using fintech: operational efficiency. He et al. [6]; Zhu & Jin [7] suggest that digital transformation and fintech adoption generally have an indirect impact on bank profitability, via efficiency and cost improvements. If such a mediated structure exists in Bangladesh, then models regressing profitability on fintech proxies without considering efficiency may be miss-specified, and a non-significant direct effect may mask a real indirect effect — or the opposite.

This question is not only for Bangladesh. As of 2024, the Islamic financial services sector had an estimated USD 3.69 trillion in assets worldwide and is expected to grow by almost tenfold by 2033, led by the growth of Islamic financial services in East Asia and the Pacific, according to Meero [8]. In this growing industry, digital adoption is often referred to as the most significant structural change facing Islamic banks since their modern inception, but cross-country evidence of the measurable profitability benefits of such adoption remains limited and inconclusive. The concern is this gap that will drive a country-level study which can clearly differentiate between the direct, mediated and Islamic-specific channels by which fintech will, or will not, lead to profitability.

This study aims to fill both the gaps with hand collected data from annual report of all 36 commercial banks listed in Dhaka Stock Exchange for the period 2019 to 2024. It makes three contributions. First, it builds a composite Fintech Adoption Index, which is scaled to the size of the asset, based on six indicators — IT investment intensity, ATM/CRM density, agent banking density, internet banking density, mobile application availability, and technology disclosure — validated by principal component analysis. Second, it examines the mediation between fintech adoption and profitability, which directly addresses the mechanism question that was raised by the productivity paradox literature. Third, it examines if there is a difference in the relationship between fintech and profits between conventional and Islamic banks, which is a very salient feature of the banking sector in Bangladesh but has been relatively neglected in the previous literature on the country's banking sector. Chowdhury, Dhar, et al. [9] have argued that this is so.

## II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### ➢ *Fintech Adoption and Bank Profitability*

The theoretical case for the positive relationship between fintech adoption and bank profitability is grounded in two arguments: the cost-reduction argument and the revenue-diversification argument, as described by Uddin & Barai [2]. There are a handful of studies that support this. Barua et al. [10] report on the rapid growth of agent banking in Bangladesh, fuelled by financial inclusion, and Kabir et al. [11] demonstrate that agent banking outlets significantly increase rural financial service access, a necessary condition for the profitability benefits agent banking is expected to bring.

But another sizable evidence base makes this complex. Hassan et al. [3] conclude that the profitability advantage of fintech is higher for lower-performing banks and lower at higher-performing quantiles of the distribution, whereas Uddin and Barai [2] find that the relationship between the adoption of fintech and efficiency is positive in developed and large Asian economies but negative and significant in emerging markets, citing implementation costs and complexity as reasons for the offset. This is similar to the classical productivity paradox where Brynjolfsson [12] observed that investment in information technology did not lead to a measurable productivity increase at a short period of time, which was later found to be true for banking IT investment in Ghana by Boadi et al. [13]. Most relevant to the present study, Chowdhury et al. [5] model IT investment in 28 Bangladeshi banks using dynamic panel threshold regression, and they discover that IT investment has a U-shaped association with profitability and stability, with IT investment having a negative association with profitability and stability below an estimated threshold, and a positive association above it. Since the adoption of fintech and digital-banking infrastructure in Bangladesh is still at a relatively nascent stage compared to other Asian banking systems, as mentioned by Uddin & Barai [2], it is reasonable to believe that many of the banks in the current sample period are not at such a level of maturity. This leads to the study's first hypothesis, which is expressed in the null form as predicted by the threshold literature based on an ambiguous average effect that is likely to be non-significant at low to moderate levels of adoption:

- ***H1:*** Fintech adoption is associated with bank profitability (ROA and ROE), though the direction and significance of this relationship may be attenuated by the sector's early-stage adoption level.

Demand evidence from beyond South Asia to understand the difficulty of signing the average profit effect of fintech a priori. Lee et al. [14] examine the Chinese banking industry over the period 2003–2017 and suggest that the development of the fintech industry leads to an increase in the cost efficiency of banks as it allows them to allocate their resources more efficiently and reduce their operating costs. They warn that the efficiency gains do not necessarily translate into bank profitability immediately or mechanically, because the costs of implementation and competitive response are incurred well before the benefits of an efficient cost structure. Even in a banking market much more advanced in terms of digitisation than Bangladesh, this separation of efficiency gains from profitability gains reinforces the notion of a positive relationship being an empirical question.

### ➢ *The Mediating Role of Operational Efficiency*

There is an emerging body of literature which suggests that the impact of fintech and digital transformation on profitability is indirect.There is an emerging body of literature that suggests that the impact of fintech and digital transformation on profitability is indirect. He et al. [6] conclude that the connection between digital transformation and financial performance is mediated by bank efficiency, operational capacity, and profitability, whereas Zhu and Jin [7] report a similar mediated structure, with digital transformation

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increasing financial performance primarily through its positive effect on bank efficiency and operational capacity. It is important to note that the relationship between IT investment and efficiency is not monotonic in the Bangladeshi context, as Chowdhury et al. [5] report an inverted U-shape, where IT investment can lead to greater efficiency but only up to a certain point, and then beyond it becomes detrimental to efficiency, whereas the relationship between IT investment and profitability is U-shaped. However, if the Cost-to-Income Ratio (CIR) is the key mediator between fintech adoption and profitability, a model without the mediator is likely to incorrectly capture the lack of effect of fintech as a standalone variable on profitability, as the value of the fintech products is actually being mediated by their impact on operational efficiency.

- ***H2:*** The relationship between fintech adoption and bank profitability is mediated by operational efficiency (Cost-to-Income Ratio).

Another, but not unrelated, line of research investigates the mediating effect of efficiency, but not profit per se, instead focusing on financial inclusion and risk. In an inverted-U, Chinoda and Mingiri Kapingura [15] find that the risk-reducing effect of financial inclusion via fintech on commercial banks' non-performing-loan ratios peaks when financial inclusion is at its moderate level before declining at both higher and lower levels, and the timing of the turning point is moderated by the quality of national regulation. An effect that only appears after a certain level of adoption is likely to be underestimated in a linear mediation test such as the one performed here, which is why the robustness checks for threshold-effects suggested in Section VI-C are important for the efficiency channel in Bangladesh.

➢ *Islamic Versus Conventional Banks*

Bangladesh has two types of banks namely Islamic banks and conventional commercial banks, all regulated by the same framework but with different models, such as a limitation on product design in Islamic banks. According to Chowdhury et al. [9], the determinants of financial performance vary significantly between conventional and Islamic commercial banks in Bangladesh; similarly, the relationship between fintech and financial performance is not consistent across Islamic and conventional banking models, as reported by Hassan et al. [3], based on cross-country evidence from the MENA region. Since the more constrained product architecture of Islamic banks can hinder the direct link between digital channels and fee income and cross-selling opportunities compared to conventional banks, this study examines whether the relationship between fintech and profitability is different for Islamic banks.

- ***H3:*** The relationship between fintech adoption and bank profitability differs between Islamic and conventional banks.

Two new global studies, one recently released and the other still forthcoming, provide a focus for the expectations behind H3 -- in slightly opposing directions. Meero [8] provides evidence of a constant adoption gap from 2020 to 2024, in which conventional banks score 0.5 to 0.8 points higher in the index than Islamic banks, and that each component of fintech adoption costs conventional banks about 0.8% of operating costs and gains about 0.03% in profitability, suggesting a trade-off between efficiency and stability; Islamic banks appear to gain more in terms of stability than profitability from digital adoption. With a much larger sample of 124 conventional and Islamic banks in Indonesia over the period 2004-2018 and a system-GMM estimator, Yudaruddin [16] arrives at a similar but different result: fintech startups have an adverse impact on bank performance on average, and Islamic banks are on average worse than conventional banks, but the interaction between fintech-startup activity and Islamic-bank status is positive, with the interaction being particularly positive for P2P lending fintechs, suggesting that Islamic banks can gain a comparative advantage from some aspects of fintech engagement even if they are less ahead in aggregate adoption. The sign of the interaction is genuinely ambiguous ex ante in the context of the Bangladeshi Islamic banking industry, as Meero [8] implies a lower level of the profitability relationship between the industry and fintech, and Yudaruddin [16] implies the opposite, albeit under certain conditions.

## III. DATA AND METHODOLOGY

➢ *Sample and Data Sources*

The sample includes all 36 private commercial banks listed on the Dhaka Stock Exchange, and annual data for the sample period 2019–2024 were hand-collected from the published annual reports and financial highlights of the banks, resulting in a maximum unbalanced panel of 216 bank-year observations (2025 data were excluded because less than 60% of the banks provided it at the time of data collection). Profitability ratios were inconsistently reported by banks across bank-years as decimal fractions or as percentage points (e.g., "24.4:1") and were therefore retransformed to a common percentage-point scale or noted as missing in the instances where these ratios were reported using either of the two formats. Figures reported with Bangladeshi lakh-style digit grouping or ratio notation (e.g., "24.4:1") or qualitative annotations (e.g., "Not disclosed") were parsed accordingly or coded as missing. A debt-to-equity ratio that was not plausible with respect to a bank's own multi-year series (i.e., far below the 8×–25× range typical of the leverage of Bangladeshi banks) was flagged and manually verified against the source annual reports rather than being algorithmically rescaled as no consistent pattern of unit error was apparent for this variable. Following the removal of bank-years with missing data on the regression variables, the estimation sample consists of 205 bank-year observations from 35 banks (one bank was dropped entirely because leverage data were missing for all years).

➢ *Fintech Adoption Index*

To prevent the omitted-variable and multicollinearity issues that can occur if each fintech proxy is added individually to a regression, a Fintech Adoption Index was created using six indicators, following the composite-index approach used in recent studies on fintech adoption, as described by Uddin & Barai [2]. Raw counts of ATMs, agent outlets, and internet banking users are mechanically larger for

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larger banks, so three of the six components were scaled by total assets to capture adoption intensity, rather than simple bank size: (a) IT investment intensity (IT investment ÷ total assets, %); (b) ATM/CRM density (machines per BDT billion of assets); (c) agent banking density (outlets per BDT billion of assets); (d) internet banking density (users per BDT billion of assets); (e) a mobile application availability dummy; and (f) a technology disclosure dummy. All components were z-scored over the whole panel and then averaged, with at least 3 of 6 components having to be non-missing to contribute to an observation's index value. To serve as a robustness check, a PCA was performed on the six standardized components restricted to complete cases (n = 150); the first principal component accounted for 51.8% of the total variance, and the loading for ATM density and agent banking density were strongest, suggesting that the index is a suitable single latent construct for digital adoption intensity, rather than an arbitrary average.

The choice of creating a six-component index, scaled to assets, instead of a single fintech proxy represents a methodological trend in this literature to composite measures of adoption. Single-item proxies like the number of ATMs or the availability of the mobile banking app, for example, often only reflect the existence of a technology and are sensitive to bank size if not properly scaled, which is why Meero [8] develops a seven-component index that covers mobile banking, AI-based credit scoring, digital payment infrastructure, among other areas. This logic underlies the present index's focus on the scaling of three of six components by total assets: a large bank with many ATMs in absolute terms is not necessarily more digitally intensive, per unit of its balance sheet, than a smaller, tech-heavy competitor, and treating raw counts as adoption intensity would systematically confuse size with technology.

➢ *Variable Definitions*

Table 1 Variable Definitions and Measurement

| Variable | Definition / Measurement | Role |
|---|---|---|
| ROA | Net profit after tax ÷ total assets (%) | Dependent |
| ROE | Net profit after tax ÷ total equity (%) | Dependent |
| Cost-to-Income Ratio | Operating expenses ÷ operating income (%) | Mediator |
| Fintech Adoption Index | Composite z-score of 6 digital-adoption indicators (see Section III-B) | Independent |
| Debt-to-Equity | Total liabilities ÷ total equity | Control |
| log(Total Assets) | Natural log of total assets (BDT million) | Control (size) |
| Bank Type | 1 = Islamic bank, 0 = conventional bank | Moderator |

Note. N = 36 banks, 2019–2024. All monetary figures are in Bangladeshi Taka (BDT).

➢ *Econometric Strategy*

All estimation was done in R (R Core Team) using the package plm for panel-data models and the package lmtest for computing cluster-robust standard errors (clustered by bank) to correct for heteroskedasticity and serial correlation within banks. For each profitability measure (ROA, ROE) two baseline models were estimated:

$$Y_{it} = \beta_0 + \beta_1(\textit{Fintech Index}_{it}) + \beta_2(\textit{Debt-to-Equity}_{it}) + \beta_3(\log \textit{Assets}_{it}) + \alpha_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where $\alpha_i$ represents bank fixed effects, $\lambda_t$ represents year fixed effects, and Y is ROA or ROE. There were two types of models estimated: a two-way fixed-effects (FE) model and a random-effects (RE) model (via Swamy–Arora feasible GLS), the choice of which models being estimated informed by the Hausman specification test comparing the two sets of coefficients.

The mediation hypothesis (H2) was tested according to Baron and Kenny [17] as applied in the mediation literature, which involves first regressing the Cost-to-Income Ratio on the Fintech Index and controls, and then regressing profitability on the Fintech Index and the Cost-to-Income Ratio and controls simultaneously.To test the mediation hypothesis (H2), the Cost-to-Income Ratio was first regressed on the Fintech Index and controls, and then profitability was regressed on the Fintech Index and the Cost-to-Income Ratio and controls simultaneously, following Baron and Kenny [17] as applied in the mediation literature, and the indirect effect (a × b) was tested for significance using the Sobel test. The moderation hypothesis (H3) was tested by interacting the Fintech Index with a time-invariant Islamic-bank dummy in a pooled model with year fixed effects (bank fixed effects could not be used alongside a time-invariant moderator, as they are collinear by construction).

## IV. RESULTS

➢ *Descriptive Statistics*

Table 2 reports descriptive statistics for the key variables. The mean ROA for the panel was 0.59% with standard deviation 1.20% while mean ROE was 9.77% with standard deviation of 4.83%, which is in line with the historically low margins in the banking sector in Bangladesh. The Fintech Adoption Index has also witnessed a significant upward trend from the average of −0.29 in 2019 to +0.18 in 2024 (Table 3), indicating that the overall digital adoption intensity of the industry has improved reasonably over the sample period, which is in line with the industry-wide agent banking and MFS growth reported in the Bangladesh Bank's Financial Inclusion Report (as cited in The Daily Star [18]).

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Table 2 Descriptive Statistics

| Variable | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| ROA (%) | 215 | 0.59 | 1.20 | −9.49 | 8.00 |
| ROE (%) | 213 | 9.77 | 4.83 | −21.17 | 20.56 |
| Cost-to-Income Ratio (%) | 206 | 54.29 | 9.85 | 35.00 | 99.04 |
| Fintech Adoption Index | 214 | −0.02 | 0.47 | −1.61 | 2.22 |
| Debt-to-Equity | 208 | 8.91 | 6.75 | −14.70 | 27.55 |
| log(Total Assets) | 214 | 12.61 | 0.78 | 9.13 | 13.55 |

Table 3 Industry-Average Fintech Adoption Index by Year

| Year | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|
| Fintech Index (mean) | −0.29 | −0.14 | −0.07 | 0.05 | 0.11 | 0.18 |

➢ *Fintech Adoption and Profitability (H1)*

The fixed-effects and random-effects estimates are reported in Table 4. The Hausman test does not favor the random-effects model over the fixed-effects model for ROA, $\chi^2(4) = 21.77$, $p = 0.0002$. Under fixed effects, the Fintech Adoption Index is positive but not statistically significant ($\beta = 0.191$, SE = 0.224, $t = 0.85$, $p = 0.40$); Debt-to-Equity is positive and significant ($\beta = 0.075$, SE = 0.027, $t = 2.80$, $p < 0.01$); and log(Total Assets) is not significant. The within-$R^2$ for the ROA model is 0.537. For ROE, the Hausman test statistic was negative (a known small-sample artifact indicating the FE–RE covariance difference is not positive semi-definite, rather than evidence against either model), so the fixed-effects specification is retained for consistency with the ROA model; the Fintech Index again shows no statistically significant association with ROE ($\beta = 0.210$, SE = 1.097, $t = 0.19$, $p = 0.85$).

While the results provide some support for H1 (as expected, given the early-stage level of adoption in Bangladesh), it is not statistically significant after controlling for bank fixed effects, leverage, and size.

Table 4 Fixed-Effects and Random-Effects Panel Regressions: ROA and ROE

| Variable | ROA (FE) | ROA (RE) | ROE (FE) | ROE (RE) |
|---|---|---|---|---|
| Fintech Adoption Index | 0.191 (0.224) | 0.030 (0.183) | 0.210 (1.097) | −0.283 (0.742) |
| Debt-to-Equity | 0.075** (0.027) | 0.028 (0.018) | 0.218 (0.308) | 0.068 (0.133) |
| log(Total Assets) | −0.286 (0.721) | 0.427† (0.249) | −7.296 (4.662) | 0.341 (1.027) |
| Intercept | 1.798 (9.195) | −4.993 (3.221) | 91.825 (57.976) | 4.809 (12.844) |
| Within/Model $R^2$ | 0.537 | 0.081 | 0.536 | 0.007 |
| Hausman $\chi^2(4)$ | 21.77 (p = 0.0002) | | n/a (see note) | |
| N (bank-years) | 205 | 205 | 205 | 205 |
| Banks / Years | 35 / 6 | 35 / 6 | 35 / 6 | 35 / 6 |

Note. Cluster-Robust Standard Errors (Clustered By Bank) In Parentheses. ** $P < 0.01$, † $P < 0.10$. FE = Two-Way Fixed Effects (Bank and Year); RE = Random Effects (Swamy–Arora). The Hausman Test Favors FE For ROA; The ROE Hausman Statistic Was Negative, A Small-Sample Artifact, So FE Is Reported As The Primary Specification For Consistency.

➢ *Mediation Through Operational Efficiency (H2)*

Table 5 provides the mediation analysis results (n = 203 bank-years, 35 banks). In path a, the Cost-to-Income Ratio (CIR) is negatively but not significantly correlated with the Fintech Index ($\beta = -0.658$, SE = 2.439, $p = 0.79$), suggesting that a lower CIR is associated with increased efficiency of fintech, but not statistically different from zero. The results show that, although fintech adoption is not significantly associated with operational efficiency, the CIR is a strong, highly significant negative predictor of both ROA ($\beta = -0.021$, SE = 0.007, $p = 0.002$) and ROE ($\beta = -0.303$, SE = 0.082, $p < 0.001$) in path b, indicating that operational efficiency is a first-order determinant of profitability for this sample. The indirect effects (a × b) were not statistically significant for either ROA (indirect effect = 0.014, Sobel $z = 0.27$, $p = 0.79$) or ROE (indirect effect = 0.199, Sobel $z = 0.27$, $p = 0.79$). Profitability is therefore not supported by H2: Fintech adoption in this sample does not appear to work through the efficiency channel in a statistically measureable way.

Table 5 Mediation Analysis: Fintech Index → Cost-to-Income Ratio → Profitability

| Path | Coefficient | SE | p |
|---|---|---|---|
| a: Fintech Index → CIR | −0.658 | 2.439 | 0.788 |
| b: CIR → ROA (controlling Fintech) | −0.021** | 0.007 | 0.002 |

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| | | | |
|---|---|---|---|
| b: CIR → ROE (controlling Fintech) | −0.303*** | 0.082 | <0.001 |
| c′: Fintech Index → ROA (direct, controlling CIR) | 0.203 | 0.233 | 0.385 |
| c′: Fintech Index → ROE (direct, controlling CIR) | −0.128 | 0.828 | 0.877 |
| Indirect effect (a×b) on ROA (Sobel z = 0.27) | 0.014 | — | 0.788 |
| Indirect effect (a×b) on ROE (Sobel z = 0.27) | 0.199 | — | 0.788 |

Note. Two-way fixed-effects models; cluster-robust SEs by bank. CIR = Cost-to-Income Ratio. ** p < 0.01, *** p < 0.001.

➢ *Islamic Versus Conventional Banks (H3)*

Table 6 presents the moderation analysis (pooled model with year fixed effects, cluster-robust SEs; n = 205, 35 banks, 7 Islamic and 28 conventional). The Fintech Index × Islamic interaction term is negative for both ROA (β = −0.451, SE = 0.354, p = 0.20) and ROE (β = −1.760, SE = 1.825, p = 0.34), suggesting a directionally weaker fintech–profitability association among Islamic banks, but neither interaction reaches conventional significance thresholds, likely reflecting the limited statistical power available from only seven Islamic banks in the sample. However, based on the consistent negative direction in both profitability measures, H3 is not statistically supported, but might be worth further investigation in a larger sample.

Table 6 Moderation Analysis: Fintech Index × Islamic Bank

| **Variable** | **ROA** | **ROE** |
|---|---|---|
| Fintech Adoption Index | 0.009 (0.215) | 0.794 (1.452) |
| Islamic (dummy) | −0.208 (0.216) | −0.396 (1.188) |
| Fintech Index × Islamic | −0.451 (0.354) | −1.760 (1.825) |
| Debt-to-Equity | 0.012 (0.015) | −0.038 (0.066) |
| log(Total Assets) | 0.339 (0.229) | 0.942 (0.916) |

Note. Pooled OLS with year fixed effects; cluster-robust SEs by bank in parentheses. None of the interaction terms are statistically significant at conventional levels.

The negative sign (even if statistically insignificant) on the Fintech Index × Islamic interaction of ROA and ROE aligns with the results of Meero [8] that the fintech-profitability relationship is weaker for Islamic banks, while it aligns with the results of Yudaruddin [16] suggesting a positive fintech-Islamic interaction, due to the introduction of P2P lending products. One possible explanation is that Yudaruddin's [16] positive interaction was limited to a particular subcategory of fintechs (P2P lending platforms) that is not yet a significant subcategory of the Islamic banking network in Bangladesh within this sample, and hence, the present composite index, weighted more heavily on more traditional channels like ATM and agent banking density, may simply not be capturing that particular mechanism through which Islamic banks elsewhere have been benefiting.

## V. DISCUSSION

The main result of this study is that there is no statistically significant relationship between the adoption of fintech and ROA or ROE for listed commercial banks in Bangladesh during the 2019–2024 period, both in the direct test and the mediated test via operational efficiency, using a composite index of six digital-adoption indicators scaled by assets. This isn't a bad outcome, per se. It resonates well with a recent strand of the literature that has questioned the universal nature of the relationship between fintech and profitability. Chowdhury et al. [5] reveal the U-shaped relationship between IT investment and profitability in the case of Bangladeshi banks, suggesting that the returns from digital investment only occur after a certain level of adoption and may be non-existent or even negative for banks that have not reached this threshold. It is also possible that many banks in Bangladesh were not above such a threshold during the sample period as the average effect found in this study was non-significant. The efficiency impact of fintech adoption is also less or even negative in emerging markets compared to large Asian or developed economies, as Uddin and Barai [2] conclude, which is directly in line with the non-significant path-a coefficient (Fintech Index → Cost-to-Income Ratio) reported here.

The mediation results are informative in a second respect. As shown by the strong and significant predictive power of the Cost-to-Income Ratio on ROA and ROE regardless of the adoption of the fintech, operational efficiency is generally a first-order mediator between digital transformation and the profitability of banks in Bangladesh, which is consistent with He et al. [6] and Zhu and Jin [7], where efficiency is found to be the main mediating mechanism between digital transformation and financial performance in the Chinese banking sector. In the Bangladeshi case, the mechanism of the efficiency boost is not yet evident from the adoption of fintech, and this study's evidence does not suggest that the mechanism was triggered during this period by the adoption of fintech in a statistically significant way.

The coefficient on Debt-to-Equity in the ROA models is generally positive and significant, suggesting that the greater the leverage, the higher the ROA in this sample. This is partly driven by the standard leverage-amplification effect in a fixed-income-intermediation business, but also shows that, at least during this time, the variation in return on assets across banks

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and within banks due to capital structure choices is larger than the variation due to digital adoption.

The findings of moderation are not statistically significant, but they are directionally consistent with the previous findings indicating that the relationship between fintech and performance is not a one-size-fits-all proposition for both Islamic banking and conventional banking systems [3], [9]. However, despite being insignificant on an individual level, the negative interaction coefficient for Islamic banks in both ROA and ROE is consistent, and this moderation may benefit from a larger sample of Islamic banks or a longer panel as the present test is probably underpowered with only seven Islamic banks.

This directionality is also in line with Meero's [8] findings of a lack of adoption of fintech among conventional and Islamic banks in the MENA and Southeast Asian region, with each new fintech component corresponding to approximately 0.8% increase in operating expense and 0.03% increase in profitability, which is statistically not significantly different from no effect in a smaller sample size like this. If Islamic banks in Bangladesh experience a similar adoption curve in which they have to pay a higher cost and enjoy lower profitability, then the small negative interaction seen here is just a preliminary and less powerful signal of the same adoption curve as Islamic banks in other countries, including the suggested adoption delay for Islamic banks relative to conventional banks by Meero [8], and not an anomaly unique to Islamic banks in Bangladesh. However, a more diverse sample of Islamic banks would be needed to differentiate between these explanations.

## VI. CONCLUSION, IMPLICATIONS, AND LIMITATIONS

### ➢ *Conclusion*

The study tested the direct effect of fintech adoption on the profitability of listed commercial banks in Bangladesh and the indirect effect through operational efficiency using a hand-collected panel of 36 commercial banks over 2019–2024 and a composite Fintech Adoption Index validated using principal component analysis. In contrast to the prevailing narrative in the policy debates on digital banking in Bangladesh, neither a direct fixed-effects/random-effects specification nor a mediation model through the Cost-to-Income Ratio suggest a statistically significant relationship between the adoption of fintech and ROA or ROE. It is primarily the use of leverage, not digital adoption, that is the most consistent and only statistically significant determinant of profitability in this sample. The results align with the productivity-paradox and threshold-effect literature on banking IT investment [5], [13] indicating that the profitability pay-off of fintech in the banking sector of Bangladesh is yet to come and not realized.

### ➢ *Implications*

The findings suggest that, while digital transformation has proven a profitable lever for many other sectors [6], [7], the efficiency-mediation channel has not yet been statistically significant in the context of bank management in Bangladesh, possibly due to the relatively nascent state of the digital infrastructure, staff capability, and customer adoption of digital channels relative to the size of investment. The regulators' interest is in the fact that, so far, leverage, not digitalisation, is the main driver of ROA in listed banks, which will be a fact to be taken into account when considering prudential and capital-adequacy policy discussions. For researchers, the study argues that testing a mediated rather than a direct relationship between fintech and profitability is important, and that composite, asset-scaled adoption indices are more valuable than simply counting the number of fintech products and services adopted, which can mask the intensity of adoption and cloud the link between fintech and profitability.

### ➢ *Limitations and Future Research*

Another constraint is related to the makeup of the Fintech Adoption Index. The index has been designed to include IT investment intensity and two binary variables, so it is best suited to measure conventional digital-banking infrastructure, rather than newer categories of fintech, like peer-to-peer lending platforms or embedded finance partnerships. However, the one positive comparative fintech-Islamic interaction that Yudaruddin [16] is able to trace to the P2P lending activity may mean that an index of this design may not be able to show a similar effect even if it exists in the Bangladeshi market, and future data collection efforts that specifically track non-traditional fintech partnerships would help to fill this gap.

These conclusions should be regarded with some restrictions. Second, the panel is short and unbalanced, some variables are missing for nearly 30% of bank-years, thereby reducing the statistical power and perhaps accounting for some of the non-significant findings, such as the underpowered Islamic-bank moderation test. Second, some raw Debt-to-Equity values needed to be manually verified against an annual report and were reviewed, but hand-collected data of this sort may have residual measurement-error risk. Third, the static fixed-effects/random-effects structure implemented in this paper does not account for potential reverse causality, which a dynamic System-GMM specification as mentioned by Arellano & Bond [19], might better be able to handle in future research. Fourth, as argued by Chowdhury et al. [5], a non-linear specification of the Fintech Index, like a quadratic or dynamic panel threshold model, might uncover a relationship that is not captured by the linear specification used in this paper. Additional research with a longer panel window, which uses dynamic GMM estimation, and explicitly tests for threshold or non-linear effects would help determine if the banking sector in Bangladesh has reached or is approaching the threshold where fintech adoption is associated with measurable profitability.

## REFERENCES

[1]. Rahman, S. Majid, S. Y. Anabil, and Md. A. A. Munem, “Agent banking in Bangladesh: strong expansion, some inclusion,” International Growth Centre, London, UK, Policy Brief, Mar. 2026. [Online]. Available: https://www.theigc.org/publications/agent-banking-bangladesh-strong-expansion-some-inclusion-0

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26nov372

[2]. H. Uddin and M. K. Barai, "Fintech adoption and bank risk, efficiency and stability: evidence from panel data of selected Asian economies," FinTech, vol. 5, no. 1, Art. no. 14, 2026, doi: 10.3390/fintech5010014.
[3]. M. I. U. Hassan et al., "Financial technology and banking performance in developing countries: evidence from an advanced quantile regression approach," Humanities and Social Sciences Communications, vol. 12, no. 1, Art. no. 1455, 2025, doi: 10.1057/s41599-025-05571-8.
[4]. L. X. Yu and Z. Li, "Financial technology and Chinese commercial banks' overall profitability: a 'U-shaped' relationship," FinTech, vol. 4, no. 3, Art. no. 41, 2025, doi: 10.3390/fintech4030041.
[5]. M. A. F. Chowdhury, M. Abdullah, N. N. C. Nazia, and D. Roy, "The nonlinear and threshold effects of IT investment on the banking sector of Bangladesh," Economic Change and Restructuring, vol. 56, no. 6, pp. 4253–4283, 2023, doi: 10.1007/s10644-023-09541-5.
[6]. S. He et al., "The impact of digital transformation on commercial banks' business performance: an empirical study of 39 listed commercial banks," SAGE Open, 2025, doi: 10.1177/21582440251378869.
[7]. Y. Zhu and S. Jin, "The impact of bank digital transformation on the financial performance of commercial banks," SAGE Open, 2025, doi: 10.1177/21582440251365342.
[8]. Meero, "Islamic vs. conventional banking in the age of FinTech and AI: evolving business models, efficiency, and stability (2020–2024)," International Journal of Financial Studies, vol. 13, no. 3, Art. no. 148, 2025, doi: 10.3390/ijfs13030148.
[9]. E. K. Chowdhury, B. K. Dhar, T. Thanakijsombat, and A. Stasi, "Strategies to determine the determinants of financial performance of conventional and Islamic commercial banks: evidence from Bangladesh," Business Strategy & Development, vol. 5, no. 4, pp. 405–423, 2022, doi: 10.1002/bsd2.207.
[10]. D. Barua, S. Akber, R. Akter, and M. R. Khan, "Financial inclusion through agent banking in Bangladesh: opportunities and challenges," International Journal of Research in Business and Social Science, vol. 14, no. 1, pp. 65–73, 2025, doi: 10.20525/ijrbs.v14i1.3803.
[11]. M. R. Kabir, K. Fatema, A. B. Das, and N. C. Barman, "Practicalities of agent banking for financial inclusion in rural areas of Bangladesh," Indian Journal of Finance and Banking, vol. 14, no. 2, pp. 1–7, 2024, doi: 10.46281/ijfb.v14i2.2266.
[12]. E. Brynjolfsson, "The productivity paradox of information technology," Communications of the ACM, vol. 36, no. 12, pp. 66–77, 1993, doi: 10.1145/163298.163309.
[13]. Boadi, J. K. M. Mawutor, M. A. Dzorka, and T. A. Kubaje, "The productivity paradox of information technology: the Ghanaian bank-level evidence," Electronic Journal of Information Systems in Developing Countries, Art. no. e12211, 2022, doi: 10.1002/isd2.12211.
[14]. C.-C. Lee, X. Li, C.-H. Yu, and J. Zhao, "Does fintech innovation improve bank efficiency? evidence from China's banking industry," International Review of Economics & Finance, vol. 74, pp. 468–483, 2021, doi: 10.1016/j.iref.2021.03.009.
[15]. T. Chinoda and F. Mingiri Kapingura, "Fintech-based financial inclusion and banks' risk-taking: the role of regulation in Sub-Saharan Africa," Journal of Economic and Administrative Sciences, 2024, doi: 10.1108/JEAS-11-2023-0304.
[16]. R. Yudaruddin, "Financial technology and performance in Islamic and conventional banks," Journal of Islamic Accounting and Business Research, vol. 14, no. 1, pp. 100–116, 2023, doi: 10.1108/JIABR-03-2022-0070.
[17]. R. M. Baron and D. A. Kenny, "The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations," Journal of Personality and Social Psychology, vol. 51, no. 6, pp. 1173–1182, 1986, doi: 10.1037/0022-3514.51.6.1173.
[18]. Star Business Report, "Financial inclusion in rural areas improves: bB," The Daily Star, Jan. 18, 2026. [Online]. Available: https://www.thedailystar.net/news/financial-inclusion-rural-areas-improves-bb-4083736
[19]. M. Arellano and S. Bond, "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," Review of Economic Studies, vol. 58, no. 2, pp. 277–297, 1991, doi: 10.2307/2297968.