INTERNATIONAL MONETARY FUND

Is FinTech Eating the Bank's Lunch?

Sami Ben Naceur, Bertrand Candelon,
Selim Elekdag, Drilona Emrullahu

**2023
NOV**

WORKING PAPER

WP/23/239

IMF Working Paper

Institute for Capacity Development

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Prepared by Sami Ben Naceur, Bertrand Candelon, Selim Elekdag, Drilona Emrullahu[1]

Authorized for distribution by Selim Elekdag
November 2023

ABSTRACT: This paper examines how the growing presence of FinTech firms affects the performance of traditional financial institutions. The findings point to a negative impact on profitability, primarily due to a reduction in interest income and a rise in operational costs. Although established financial institutions have tried to diversify their revenue streams, these efforts have proven inadequate to offset the losses associated with increased competition from FinTech firms. Our study also reveals that various FinTech business models, such as Peer-to-Peer (P2P) lending and Balance Sheet lending, have varying effects on financial institutions. Cooperative banks experience more significant profit deterioration under both models, whereas (larger) commercial banks appear to benefit from partnerships with P2P platforms, as evidenced by an increase in non-interest income. Furthermore, the findings suggest that FinTech presence has a disproportionately larger adverse effect on banks in countries with more competitive, profitable, and developed financial systems. Interestingly, however, traditional financial institutions in countries with stronger regulatory frameworks appear to benefit from the expanding influence of FinTech firms.

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I. Introduction

Digital technologies continue to shape the way financial institutions develop and provide financial services. Recent advances in mobile telecommunications, artificial intelligence, machine learning, cloud services, and distributed ledger technology have resulted in new financial technologies (FinTech) defined as "new business models, applications, processes, or products with an associated material effect on the provision of financial services" (FSB, 2017). Among these, FinTech finance models—which refer to digital lending and digital capital raising activities—have become increasingly important across the global financial landscape. These activities involve the use of digital platforms and technologies to provide lending products and raise funds from investors.

Over the past decade, FinTech finance has seen significant growth globally. Despite the regulatory crackdown in China leading to some reduction, the volume of FinTech finance has consistently shown an upward trend (Figure 1). While the current volumes of FinTech finance remain relatively modest, estimated at around 2 percent of the total credit in major FinTech markets, there is a strong expectation of rapid growth (World Bank, 2022). According to a recent industry analysis by Allied Research (2021), the global FinTech lending industry is projected to soar to $4.9 trillion by 2030. Further, investments in FinTech platforms are likely to remain strong with the total value rising to $217 billion in 2019 from $4 billion in 2012 (Statista, 2022).

Figure 1. FinTech finance volumes (in US$ billions)
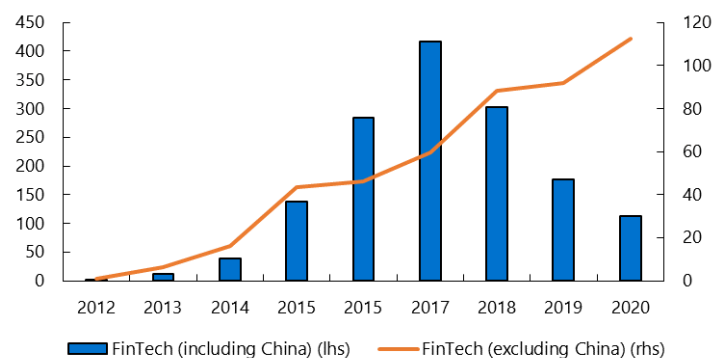
Source: Authors calculations using CCAF (2021) Database.

The emergence of new FinTech financing innovations has delivered significant advantages for both traditional Financial Institutions (FIs) and the wider financial system. Through partnerships with or the development of in-house FinTech solutions, incumbent FIs can enhance their operational efficiency, expand their product offerings, and strengthen customer relationships (Petralia and others, 2019). Notably, incumbent FIs increasingly rely on FinTech firms to provide front-end services such as customer engagement, as well as middle and back-office operations like Know Your Customer (KYC) verification, credit scoring, loan processing, and data storage (Feyen and others, 2021; U.S. Department of Treasury, 2022). This collaborative approach has enabled incumbents to achieve cost efficiency by reducing transaction and monitoring costs, thereby facilitating faster service delivery (FSB, 2017). Moreover, incumbents can effectively maintain their competitiveness in the market. For instance, Chen, Wu, and Yang (2019) demonstrate that financial industry leaders who invest significantly in their own innovation can mitigate much of the negative impact associated with FinTech competition. Recent evidence from China also indicates that the adoption of FinTech solutions by banks not only enhances operational efficiency, but also creates more appealing business models for customers (Wang, Xiuping, and Zhang, 2021).

At the same time, FinTech firms are exerting pressure on the performance of traditional FIs. These new players are disrupting the financial landscape by offering improved user experiences and faster processing times. Buchak and others (2018) emphasize that FinTech lenders provide convenience for borrowers, while Fuster and others (2019) demonstrate that FinTech platforms can process applications 20 percent faster than other lenders in the US mortgage lending sector. Furthermore, as a result of stricter regulatory requirements implemented after the Global Financial Crisis, bank lending has either declined (Cortés and others, 2020), or become more costly for certain borrower categories, leading to a shift in credit intermediation towards unregulated financial institutions (Irani and others, 2020). The increased regulatory burdens heightened supervisory scrutiny, and higher capital requirements have also impacted the range of products and pricing that incumbent FIs can offer (Buchak and others, 2018). Collectively, these factors, according to recent evidence, are lively to have placed downward pressure on the profitability of FIs (IMF, 2022; Bejar and others, 2022).

Within this landscape, an ongoing debate revolves around whether new FinTech firms act as complements or substitutes to traditional FIs. One side of the debate argues that complementarity dominates by noting that FinTechs target underserved and/or less creditworthy borrowers, a strategy known as bottom fishing (Beaumont, Tang and Vansteenberghe, 2022; Jagtiani and Lambie-Hanson, 2021; de Roure, Pelizzon and Thakor, 2021; Jagtiani and Lemieux, 2018). Tang (2019) examines the US consumer credit market and demonstrates that FinTech platforms can complement banks by offering smaller loans due to their lower fixed costs of loan origination. Incumbents can also enhance their efficiency and product offerings through partnerships, acquisitions, or the development of their own financial technologies (Thakor, 2020; Navaretti and others, 2018). On the other side of the debate, evidence suggests that FinTechs can exert a substitution effect—including via greater competition—reducing the market share of incumbents, particularly when facing regulatory shocks such as higher capital requirements (Buchak and others, 2018). More recently, Gopal and Schnabl (2022) provide evidence of the substitution effect: in response to tighter regulatory requirements following the 2008 financial crisis, the void created by reduced bank lending to small and medium-sized enterprises (SMEs) was filled by lending by Fintech firms. Additionally, there is evidence indicating that FinTech competition places downward pressure on the profitability of FIs. In the context of the US home mortgage market, the IMF (2022) demonstrates that FinTechs directly compete with banks, significantly reducing banks' interest income from mortgages. Bejar and others (2022), studying a limited sample of banks in Latin America, reveal that banks in countries with a higher FinTech presence experience a greater reduction in interest income.

Despite the significance of the ongoing debate, there has been a limited number of empirical studies exploring the impact of FinTech presence on the profitability of incumbent financial institutions. Most of the existing research has focused on specific countries, such as China and the United States, and examined a small sample of banks operating in niche segments like consumer lending, SME lending, and the residential mortgage market (IMF, 2022; Lv, Du and Liu, 2022; Lee and others, 2021; Wang, Xiuping and Zhang, 2021; Phan and others, 2020). As a result, the empirical literature in this area remains relatively sparse.

This paper fills this gap in the literature by investigating the impact of FinTech presence on the performance of incumbent FIs. Our study focuses on testing two competing hypotheses: whether the presence of FinTech improves the profitability of FIs (complementarity effects) or has a negative effect on profitability (substitution effects). Moreover, we aim to understand the underlying mechanisms driving this impact by examining key indicators such as Net Interest Margin, Non-Interest Income (fees, commissions), and Cost-to-Income ratios.

To achieve this, we utilize a comprehensive cross-country database that encompasses 10,167 FIs and data on digital finance activities such as digital lending and digital capital raising activities across 57 countries. By leveraging this extensive dataset, we can provide robust insights into the relationship between FinTech and profitability. Additionally, we explore the influence of different FinTech business models on various types of banks. Furthermore, our analysis reveals that the relationship between FinTech and the profitability of incumbent FIs varies depending on country-specific conditions such as the level of financial development and the strength of regulatory framework. By examining these dimensions, our study sheds light on the nuanced dynamics between FinTech and incumbent FIs, providing valuable insights into the diverse effects across markets and bank types.

The main finding of our study is an adverse impact of greater Fintech presence on incumbent FIs' performance. Specifically, the negative impact on FI profitability—which is primarily driven by reduced interest income and increased costs—supports the substitution hypothesis: overall, FinTech firms directly compete with incumbent FIs. Despite efforts by incumbents to diversify their revenue streams, these measures have not been sufficient to counterbalance the losses incurred from the pressures of FinTech competition. Furthermore, our analysis reveals that different FinTech models, such as Peer-to-Peer (P2P) lending and Balance Sheet lending, have varying effects on financial institutions. Cooperative banks tend to experience greater profit deterioration from both models, while (larger, more complex) commercial banks benefit from partnering with P2P platforms as suggested by the positive impact on their non-interest income flows. Moreover, we find that the impact of FinTech presence on incumbents varies depending on the characteristics of the countries they operate in. Countries with more competitive, profitable, and developed financial systems are more susceptible to the negative effects of FinTech competition. However, and importantly, in countries with robust regulatory standards, incumbents benefit from increased FinTech penetration. This finding suggests that well-designed regulations can foster a level playing field, enabling new FinTech firms to thrive while simultaneously protecting incumbent FIs from potentially uneven competitive practices.

The remainder of the article proceeds as follows. Section II presents the conceptual framework. Section III presents the econometric approach. Section IV describes the sample and data sources. Section V discusses the main findings. Section VI describes the robustness checks and section VII provides the conclusions and policy implications.

II. Conceptual Framework

Our conceptual framework builds upon the empirical literature that explores competition within the financial system and its implications for bank performance. Numerous studies have examined the relationship between market concentration and profitability, providing valuable insights into this area. For instance, Mirzaei, Moore, and Liu (2013) conducted a study analyzing the impact of market structure, measured through firm-level market share or the 5-firm concentration ratio at the market level, on bank profitability in both emerging and advanced economies. They assessed profitability indicators such as return on assets and return on equity, finding that higher market power corresponds to increased bank profitability in advanced economies. In the European banking sector, Maudos and de Guevara (2004) demonstrated that reduced market power and concentration lead to declining margins. Their research highlighted the importance of market structure in influencing bank profitability. Moreover, Demirgüç-Kunt and Huizinga (1999) conducted an earlier study investigating the impact of various factors, including bank and macroeconomic conditions, regulatory frameworks, and institutional indicators, on interest margins and bank profitability. Their findings shed light on the multifaceted influences

that can shape bank performance. Additionally, there are studies that explore the effects of regulations and specific structural factors on bank performance, such as those by Barth, Caprio, and Levine (2004) and Demirgüç-Kunt, Laeven, and Levine (2004). These works contribute to our understanding of how regulatory environments and specific structural characteristics can impact the performance of banks.

We build upon this existing body of research by investigating the impact of the entry of FinTech firms on the competitive dynamics within global financial systems. To measure competition, we utilize FinTech transactions as a proxy, which encompasses digital finance activities like digital lending and digital capital raising that have emerged outside of incumbent financial institutions (CCAF, 2021). In our analysis, we not only consider the effects on bank profits but also examine additional components guided by a simple conceptual framework, as illustrated in Figure 2. This framework enables us to present two competing hypotheses: Complementarity and Substitution effects.

Figure 2. Conceptual Framework: How does FinTech affect bank performance? Transmission channels
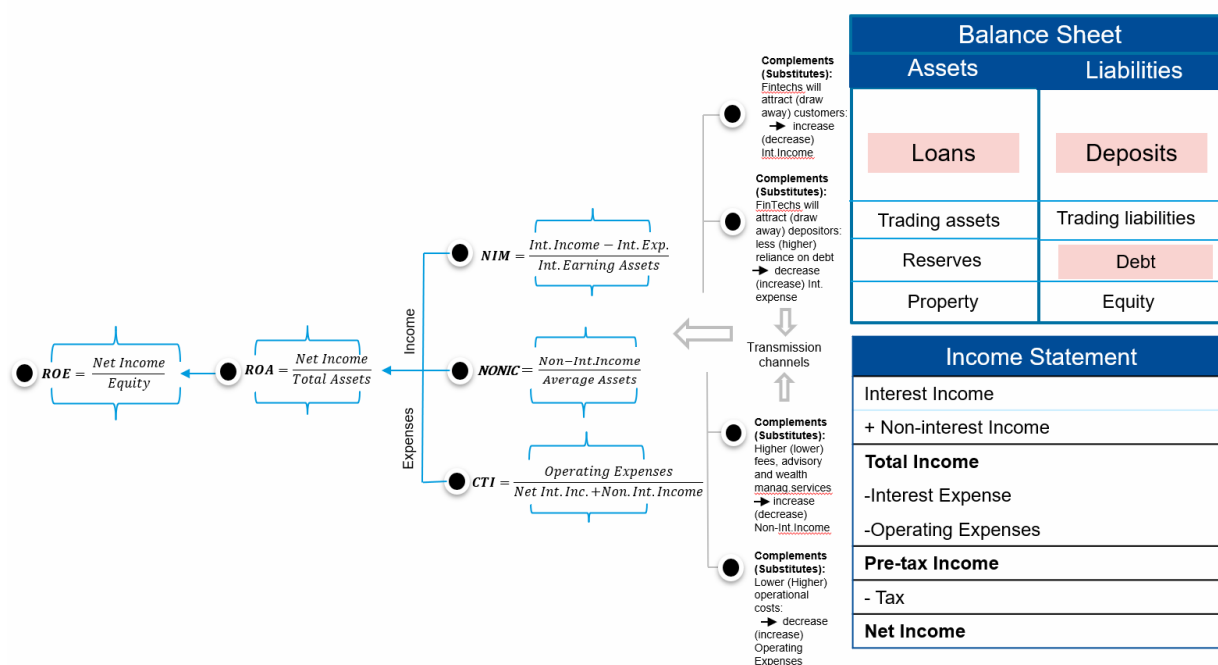
Source: Authors calculations.

The Complementarity Hypothesis: FinTech presence enhances incumbent's performance

Under the complementarity hypothesis, incumbents strategically collaborate with FinTechs or develop in-house FinTech solutions to expand their customer base in previously untapped segments, outside of traditional or established channels. This partnership enables FIs to attract new customers, resulting in an expanded lending portfolio and increased interest income. Additionally, FIs can bolster their deposit accumulation, leading to lower funding costs. Partnerships can take the form of mergers and acquisitions, as well as incumbents outsourcing specific parts of the transaction process, such as customer onboarding, verification, and credit

scoring, while the originating bank handles the loan. A study conducted in the US in 2022 revealed that nearly two-thirds of banks and credit unions had entered into at least one FinTech partnership in the past three years, with 35 percent of them making investments in FinTech (Synctera, 2022). Other partnership models could involve incumbents providing funding to FinTech platforms in exchange for a fee, with the platform facilitating all transaction elements, including loan origination and payment servicing. Consequently, incumbents can generate additional non-interest income. As reported by CCAF (2021), banks and non-bank financial institutions collaborate with FinTechs to fund FinTech platforms, supporting investment strategies or portfolio diversification for themselves or their clients.

Incumbents have also been making substantial investments in information technology to meet customer expectations and adapt to the growing presence of FinTech firms in the market (U.S. Department of the Treasury, 2022; Modi and others, 2022). This strategic approach enables incumbents to reduce operating costs and enhance overall efficiency. Over the past five years, IT spending by banks in North America has steadily risen, reaching $115 billion, with a focus on new investments rather than maintenance (U.S. Department of the Treasury, 2022). The study also revealed that digital banking capabilities are considered the top priority, followed closely by security (U.S. Department of the Treasury, 2022).

In summary, according to the complementarity hypothesis, we expect FinTech platforms to complement the incumbents and improve their performance by increasing their profitability through higher interest income and non-interest income, and lower costs.

The Substitution Hypothesis: FinTech presence reduces incumbent's performance

According to the substitution hypothesis, incumbent financial institutions are likely to experience significant competitive pressures arising from the emergence of FinTech firms, which can have a detrimental effect on their performance. The disruptive business models and innovative technologies introduced by FinTech firms challenge the traditional institutions in the financial industry. Notably, FinTech firms excel in efficient screening of potential borrowers and processing loan applications at a faster pace compared to incumbents (Hau and others, 2021; Berg and others, 2020; Fuster and others, 2019). Moreover, empirical evidence suggests that during periods of regulatory shocks, such as the implementation of higher capital requirements, traditional banks may reduce their lending activities. This reduction in lending can potentially drive customers towards FinTech firms, seeking alternative sources of financing (Gopal and Schnabl, 2021; Tang, 2019; Buchak and others, 2018). It is important to note that FinTech firms, not being subjected to the same level of regulatory scrutiny as incumbent FIs, have more flexibility in terms of the products they can offer and the target customers they can serve. These factors collectively contribute to the competitive advantage enjoyed by FinTech firms, as they can leverage their agility and technological capabilities to provide innovative financial products and services to a broader customer base. This presents a significant challenge for incumbent financial institutions that must navigate through the evolving landscape of the financial industry and find ways to effectively compete with the disruptive forces of FinTech.

Considering the competitive advantages enjoyed by FinTech firms, incumbent financial institutions may face challenges in retaining their existing customers and expanding into new market segments. This could lead to a contraction in their loan portfolio, reducing its diversification and resulting in lower interest income. Furthermore, a decline in deposit collection may necessitate a greater reliance on debt for funding, leading to

increased interest expenses. In addition, the reduced deposit and loan activity would result in a decrease in fee income, including account maintenance fees, transaction fees, credit card fees, and loan processing fees. Consequently, the non-interest income generated by incumbents may decline. Another factor to consider is the potential slow adoption of new digital technologies by incumbent institutions. They may still rely on obsolete legacy systems and maintain large branch networks to meet service standards that new competitors can provide more efficiently (OECD, 2020). Therefore, their operational costs may remain high, and their overall efficiency may be compromised. Taken together, these factors can lead to a decrease in the profitability of incumbent institutions.

In summary, according to the substitution hypothesis, we expect FinTech platforms to substitute the incumbents and negatively affect their performance by decreasing their profitability through lower interest income and non-interest income and higher costs.

The Differential Effect of FinTech Business Models on Incumbent FIs' Performance

We will now examine how the relationship between FinTech firms, and the profitability of incumbent financial institutions varies depending on the specific FinTech business models and the types of financial institutions involved. Among the various FinTech business models, P2P lending and Balance Sheet lending have gained significant traction. P2P lending stands out as the largest business model when considering China in our analysis, as shown in Figure 3. However, when excluding China, we observe that the growth of FinTech transactions is driven by both P2P lending and Balance Sheet lending, as depicted in Figure 4.

Figure 3. FinTech finance volumes by model (including China, in US$ billions)
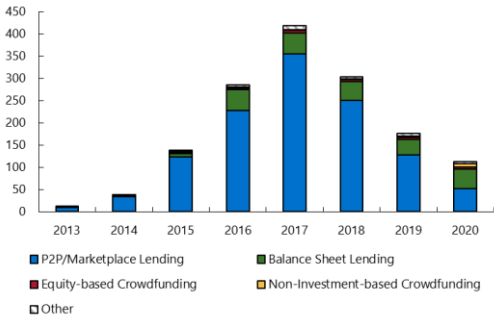
Figure 4. FinTech finance volumes by model (without China, in US$ billions)
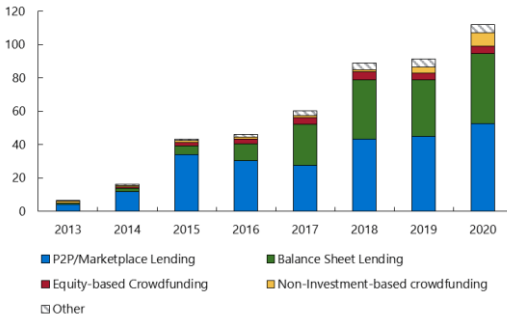
Source: Authors calculations using CCAF (2021) Database.

P2P Lending

In general, P2P lending platform offers a matching service between borrowers and investors. The platform verifies the borrower's information, assigns a credit rating, and refers the completed loan application package to a partner bank that provides the loan to the borrower. This means that the risk of financial loss in case of loan default lies with the partnering bank rather than the platform itself (CCAF, 2021; FSB, 2017; FDIC, 2015).

P2P lending platforms typically generate income by charging fees to both borrowers and investors.[2] To mitigate risk, the platform encourages investors to diversify their investments across multiple loans. These investors can be individuals or institutions such as banks, trusts, brokerage firms, investment dealers, insurance companies, and other non-financial institutions. Assuming a pure P2P lending model, we anticipate stronger complementarity effects, which would enhance the performance of incumbent financial institutions. This would be reflected in increased profits resulting from higher interest income and reduced costs.

Balance Sheet Lending

The Balance Sheet lending platform is the closest model to a traditional non-bank credit intermediary, which can provide loans but is not legally permitted to take deposits (CCAF, 2021). This type of platform facilitates the entire loan transaction process, including collecting borrower applications, assigning credit ratings, advertising loan requests, connecting borrowers with interested investors, originating the loans, and servicing loan payments. As a result, the platform operator bears the risk of financial loss if the loans are not repaid (CCAF, 2021; FSB, 2017; FDIC, 2015).[3] Balance Sheet lending platforms secure financing through debt or equity and include the loans they provide on their own balance sheets (Baba and others, 2020). In the case of Balance Sheet lending, we anticipate stronger substitution effects, which can lead to reduced profits for incumbent financial institutions. This would be reflected in lower interest income and higher costs for incumbents.

There are also FinTech platforms that employ a combination of different business models, rather than exclusively relying on either the P2P or Balance Sheet model. Some platforms initially operate as pure P2P lenders, providing a matching service between borrowers and investors. However, as they grow and establish trust, they may transition to a Balance Sheet model. This means that in addition to referring loan applications to partnering banks, they also originate loans themselves by obtaining funding from institutional investors for a fee (Baba and others, 2020). This can enable incumbent institutions to generate additional non-interest income.

It is worth noting that there are a few platforms, which fall outside the scope of our study, which have taken a further step and obtained a banking license. This allows them to directly access lower-cost deposit funding, eliminating the need for partner banks in their operations.[4]

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[2] An example of such model is *Mintos*, one of the biggest P2P lending platforms in Europe with €8.7 billion invested in loans and €394 million of loans sold on the Secondary Market since its creation in 2015 (Mintos, 2023). In addition to individual investors, *Mintos* partners with 61 lending companies from 33 companies to issue loans. Minto's main source of income is the commission they take from the lending companies when they fund their originated loans through *Mintos*. Investing activities are free, apart from the fees and charges for additional services including forex conversions and selling in the secondary market.

[3] An example of such model is *Credibly*, a leading FinTech platform in lending to SMEs. Since its inception in 2010, *Credibly* has provided over $2 billion in funding to small and medium-sized businesses across the United States (Credibly, 2023). *Credibly* works with borrowers throughout the entire underwriting, funding, and servicing process and relies on funding from venture capital firms and other institutional investors.

[4] Such an example is *Lending Club*, one of the first P2P lending platforms in the U.S., helping more than 4 million members receive over $70 billion in personal loans (Lending Club, 2023). In 2021, *Lending Club* acquired Radius Bank and became the first public U.S. neobank and subsequently closed their P2P side of the business. Their drive to become a bank came from the high funding costs of working with institutional investors. Similarly, *Zopa*, a British-based FinTech company began as the world's first P2P lending platform in 2005. In 2020, *Zopa* gained a full banking license offering deposit and savings accounts in addition to their lending arm and by end of 2021 they closed their P2P lending side of the business (Zopa, 2023).

Types of FIs

We also aim to examine whether the impact of the two prominent FinTech business models, P2P lending and Balance Sheet lending, varies across different types of banks, namely cooperative banks, and commercial banks, which account for 70 percent and 14 percent of our sample, respectively. Our expectations are that cooperative banks may be more susceptible to FinTech competition due to their smaller size, limited product range, and local customer focus (McKillop and others, 2020; Coelho and others, 2019; Al-Muharrami and Hardy, 2013). They face challenges in achieving economies of scale and scope, have restrictions on expanding geographically, and may struggle to meet the demands of a mobile population. Additionally, some cooperative banks may find it difficult to afford the necessary IT investments to meet customer expectations, particularly among younger generations who are more inclined to use digital banking services and may not have strong attachments to community-oriented institutions (Coelho and others, 2019).

In contrast, larger commercial banks, with their sophisticated product offerings, broader geographic reach, and existing investments in digital technology, are better positioned to withstand FinTech competition and are unlikely to experience significant negative effects on their performance.

III. Econometric Approach

Our empirical research is motivated by recent research estimating determinants of bank performance (Elekdag, Malik and Mitra, 2020; Djalilov and Piesse, 2016; Dietrich and Wanzenried, 2011; García-Herrero, Gavilá and Santabárbara, 2009; Athanasoglou, Brissimis and Delis, 2008). These scholars have studied the effect of bank-specific, as well as industry specific and macroeconomic determinants on measures of bank performance.

Guided by our conceptual framework and these empirical studies we initially propose a parsimonious baseline specification:

$$PER_{b,c,t} = \alpha + \beta_1 FinTech_{c,t} + \gamma X_{b,c,t} + \delta W_{c,t} + Other_{b,c,t} \qquad (1)$$

Where $PER_{b,c,t}$ denotes the profitability ratios (ROE and ROA) and relevant income (NIM and NONIC) and cost (CTI) components, winsorized at the 1 percent level to mitigate the impact of outliers, for bank b, in country c, in year t; $FinTech_{c,t}$ the log measure[5] of country-level FinTech transactions in year t; the vectors $X_{b,c,t}$ and $W_{c,t}$ encompass the bank specific, cyclical and structural determinants; $Other_{c,t}$ includes bank fixed effects and a residual term assumed to be not cross-sectionally correlated. The vector $X_{b,c,t}$ controls for size (log (Total Assets)) and capital (Equity to Total Assets ratio). The vector $W_{c,t}$ includes cyclical and structural determinants such as GDP growth, inflation, policy rate and 5-bank asset concentration. For more on the definitions of the variables and their descriptive statistics please refer to Annex I and II.

Our plausible expectations for our baseline specification which were discussed in the conceptual framework would be as follows, the case of profitability (using ROE as an example):

H₁:　$\frac{\partial ROE}{\partial Fintech} > 0$ → Complements: FinTech presence enhances incumbent's profitability.

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[5] For brevity, we use the label "FinTech" in referring to the natural logarithm of the FinTech in the remainder of the paper.

H2: $\frac{\partial ROE}{\partial Fintech} < 0 \rightarrow$ Substitutes: FinTech presence worsens incumbent's profitability

Next, we consider two FinTech models such as P2P lending and Balance Sheet lending in our analysis. Therefore, the specification would be modified as follows:

$$PER_{b,c,t} = \alpha + \beta_1 FinTechBusinessModel_{c,t} + \gamma X_{b,c,t} + \delta W_{c,t} + Other_{b,c,t} \qquad (2)$$

Our expectations for the modified specification:

H1: $\frac{\partial ROE}{\partial P2P} > 0 \rightarrow$ Complements: P2P lending enhances incumbent's profitability.

H2: $\frac{\partial ROE}{\partial BS} < 0 \rightarrow$ Substitutes: Balance Sheet lending reduces incumbent's profitability

Our analysis also considers the role of country and bank-specific characteristics. In this case, the specification would be modified as follows:

$$PER_{b,c,t} = \alpha + \beta_1 FinTech_{c,t} + \beta_2 \omega_{b,c,t} + \beta_3 FinTech_{c,t} * \omega_{b,c,t} + \gamma X_{b,c,t} + \delta W_{c,t} + Other_{b,c,t} \qquad (3)$$

We measure how each of these factors influence the financial institutions performance ratios:

$$\frac{\partial PER}{\partial FinTech} = \beta_1 + \beta_3 * \omega_{b,c,t}$$

Where $\omega_{b,c,t}$ denotes the different *Country-specific characteristics* such as: Stock Market Turnover and Credit Depth (Private Credit to GDP); *Financial System and Industry features* such as: Commercial Bank Profitability (Return on Equity) and Bank concentration; *Institutional characteristics*: Regulatory Quality and Government Effectiveness. For completeness we also look at *Bank-specific characteristics* such as: Solvency (Z-Score); Non-Performing Loans (NPLs) and Total Capital Ratio. These moderator variables are constructed as dummy variables that enable the differentiation of observations based on whether they fall below or above their median value. For instance, in the case of low bank concentration, a value of 1 indicates values below the median, and 0 represents values above the median. Similarly, concerning high stock market turnover, a value of 1 indicates values above the median, and 0 signifies values below the median. By splitting the observations into two groups based on their median, the model can account for potential nonlinearities and differing relationships that exist between FinTech and the performance of FIs. For more on the definitions of the variables and their descriptive statistics please refer to Table 1 below and Annex I and II.

Table 1. Country and Bank-specific characteristics

Variable	Definition
Country	
Stock Market Turnover	Total value of shares traded divided by the average market capitalization.
Credit Depth	The financial resources provided to the private sector by domestic money banks as a share of GDP.
Financial System	
Return on Equity (ROE)	Aggregated commercial bank's after-tax net income to yearly averaged equity.
Industry	
Bank concentration	Assets of five largest banks to total commercial banking assets.
Institutions	
Regulatory quality	How well governments can develop and implement sound policies and regulations that support private sector growth.
Government effectiveness	Quality of public services, quality of the civil service and the degree of its independence from political pressures, quality of policy formulation and implementation.
Bank-specific	
Risk-taking	Measured by the Z-Score which computes the distance from insolvency: (ROA+E/A)/s(ROA), where s(ROA) is the standard deviation of ROA.
Asset Quality	Non-Performing Loans to Gross Loans
Capital	Total Capital Ratio

Source: International Monetary Fund (IMF) WEO, World Bank Governance Indicators, World Development Indicators, Haver, the Global Financial Development Database and Authors calculations.

IV. Sample and Data Sources

To examine the relationship between FinTech competition and profitability of financial institutions, we combine three different datasets for our analysis. First, data on FinTech transactions were collected from the Global Alternative Finance data depository hosted by the Cambridge Center for Alternative Finance (CCAF) for a sample of 57 countries of yearly data over 2012-2020. Our measure of FinTech transactions include country-level digital finance activities such as digital lending and digital capital raising activities that have emerged outside of the incumbent banking systems and traditional capital markets and occur online (CCAF, 2021). Digital lending commonly associated with the P2P lending and Balance Sheet lending activities have by far dominated the alternative finance market. They refer to non-deposit taking platforms that facilitate online credit to individuals, businesses or other entities from individual lenders or institutional investors (CCAF, 2021). Other digital capital raising activities remain small and relate to activities where individuals or institutions invest in unlisted shares or securities issued by a business, typically a startup or provide funding to a project, an

individual or a business without any expectations for a monetary return. For more on these models and stylized facts, please refer to Annex IV and V.

Second, we collect balance sheet and income statement data for 10,167 financial institutions from the Bureau van Dijk Orbis database. This database provides information on banks and non-banks globally, based on publicly available data sources. To capture the domestic effects, we primarily use unconsolidated statements (95 percent of our observations) as they provide a more detailed view of financial activities and performance of individual banks within their respective markets. Unconsolidated statements are preferred as they exclude other activities and sources of income from parent companies or subsidiaries from the analysis (Albertazzi and Gambacorta, 2009; García-Herrero, Gavilá and Santabárbara, 2009; Valverde and Fernandez, 2007). However, in some cases, certain banks only have consolidated statements, while others have only unconsolidated statements. To avoid information loss, we use the consolidated statement when an unconsolidated statement is unavailable (Micco, Panizza, and Yañez, 2007). Our sample of financial institutions consists of two groups: banks and non-banks, representing 90.5 percent and 9.5 percent of the observations, respectively. Banks include commercial banks, cooperative banks, Islamic banks, micro-finance institutions, and savings banks, while non-banks include finance companies, investment and trust corporations, investment banks, real estate and mortgage banks, specialized governmental credit institutions, and other non-banking credit institutions. For further details on the stylized facts, please refer to Annex II - Table 7.

Third, we gather country-level macroeconomic data and various structural indicators from publicly available sources, including the International Monetary Fund (IMF) WEO, World Bank Governance Indicators, World Development Indicators, Haver, and the Global Financial Development Database. These data encompass factors such as GDP growth, policy rate, inflation, bank concentration, financial system Return on Equity (ROE), stock market turnover, credit-to-GDP ratio, regulatory quality, government effectiveness, and internet penetration. Definitions of the variables and their descriptive statistics are provided in Annex I and II for further reference.

V. Results

Baseline estimation results

We now turn our attention to the main results, which are presented in Table 2. The table presents the impact of our primary FinTech variable on profitability measures (ROE and ROA) and the underlying transmission channels: Net Interest Margin (NIM), Non-Interest Income (NONIC), and Cost-to-Income ratio (CTI). The results indicate a significant and negative effect of FinTech on the profitability measures of incumbent financial institutions (ROE and ROA). The estimated coefficients suggest that a 1 percentage point increase in FinTech transaction volumes leads to a reduction of 0.09 percentage points in incumbent FI's ROE and 0.02 percentage points in ROA, respectively. These effects are meaningful considering that the median values of ROE and ROA in our sample are 4.2 percent and 0.5 percent, respectively. Our findings provide support for the substitution hypothesis, which suggests that increased competition from the growing presence of FinTech adversely affects the profitability of incumbent financial institutions. Our results are consistent with the findings of other studies that examine the effect of FinTech competition on the profitability ratios of incumbent banks. Phan and others (2020) find that for every new FinTech firm introduced into the market of Indonesia, ROA and ROE decline by

9.32% and 2.07% respectively. Katsiampa and others (2022) also report that the profitability of traditional Chinese banks is diminished due to the entry of fintech firms into the credit market.

An analysis of the transmission channels reveals a negative and statistically significant impact on NIM. The estimated coefficient suggests that a 1 percentage point increase in FinTech transaction volumes leads to a decrease in incumbent's NIM by 0.03 percentage points. This effect is noteworthy, considering that the average growth rate of FinTech volumes during the period 2012-2020 (excluding China) is 70 percent, indicating a rapidly growing FinTech competition that exerts significant pressure on the income of financial institutions. Our findings align with recent empirical research examining the impact of the increasing presence of FinTech on interest income. Bakker and others (2023) find that FinTech competition is associated with a reduction in net interest margin of banks in EMDEs and Latin America and the Caribbean by 0.2 to 2.7 percentage. The IMF (2022) demonstrates that a higher market share of FinTechs is associated with a decline in interest income. Bejar and others (2022) also show that incumbent banks in countries with a significant FinTech presence have experienced larger reductions in NIMs.

Furthermore, FinTech appears to have an adverse effect on the CTI. The coefficient suggests that a 1 percentage point increase in FinTech transaction volumes leads to a 0.14 percentage point increase in incumbent's CTI. This could be attributed to IT investments necessitated by the pressures from FinTechs, which may be exacerbated by the presence of outdated legacy technology.

Table 2. Effect of FinTech on Bank Performance Measures

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0903***	-0.0246***	-0.0277***	0.0111***	0.136***
	(0.0113)	(0.00233)	(0.00340)	(0.00338)	(0.0292)
Size	3.212***	0.730***	-0.0992	-0.515***	-9.447***
	(0.418)	(0.0883)	(0.128)	(0.151)	(1.220)
Equity-Asset ratio	0.110***	0.0434***	0.0380***	0.0169**	-0.0994*
	(0.0217)	(0.00539)	(0.00955)	(0.00666)	(0.0521)
GDP growth	0.229***	0.0360***	0.0389***	0.0107**	-0.412***
	(0.0155)	(0.00330)	(0.00553)	(0.00468)	(0.0371)
Inflation	-0.186***	-0.0569***	-0.0486**	0.0260	-0.140
	(0.0534)	(0.0117)	(0.0210)	(0.0188)	(0.100)
Policy rate	0.242***	0.102***	0.193***	0.00732	-0.550***
	(0.0426)	(0.0107)	(0.0220)	(0.0151)	(0.0756)
Concentration	-0.00655	-0.00309*	0.00413	0.00966***	0.0768***
	(0.00825)	(0.00183)	(0.00344)	(0.00258)	(0.0188)
N	79523	79701	79438	79666	79384
rho	0.680	0.776	0.910	0.912	0.757

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

In contrast, our analysis reveals that FinTech has a positive effect on NONIC. The estimated coefficient suggests that a 1 percentage point increase in FinTech transaction volumes leads to a 0.01 percentage point increase in incumbent's NONIC. This finding indicates that the intense competition posed by FinTech firms has compelled incumbent financial institutions to explore new revenue streams, with a particular focus on generating income from fees and commissions. However, it is important to note that the impact appears to be relatively small compared to the median value of NONIC in our sample, which is 1.99 percent. This suggests that while incumbent FIs have made efforts to diversify their income sources, the positive effect of FinTech on non-interest income has not been sufficient to fully offset the profitability losses incurred due to the pressures of FinTech competition. Additional strategies and measures may be necessary for traditional financial institutions to effectively navigate the evolving landscape and mitigate the overall impact on their profitability.

In summary, our findings suggest that the lower profitability of incumbent FIs can be attributed to two main factors: lower interest income and higher costs. The increasing presence of FinTech firms has led to a decline in interest income for incumbents, as they face intensified competition in the lending market. Moreover, the costs associated with adapting to new technologies and meeting customer expectations have increased, further impacting their profitability. While incumbent financial institutions have made efforts to diversify their income sources, our analysis indicates that these measures have not fully offset the losses incurred from FinTech competition. The competition from FinTech firms has proven to be significant, and traditional FIs continue to face challenges in maintaining their profitability in this changing landscape.

Effect of FinTech Business Models on Incumbent's Performance

We now examine the impact of FinTech business models[6] on the different types of financial institutions. The results are summarized in Table 3 (for detailed findings, refer to Appendix 5, Table 1- 4). Our estimations indicate that cooperative banks are particularly susceptible to profit deterioration caused by both P2P and Balance Sheet lending business models. Specifically, our coefficients suggest that a 1 percentage point increase in P2P lending transactions leads to a 0.3 percentage point decrease in incumbent cooperative banks' ROE. Similarly, a 1 percentage point increase in Balance Sheet lending transactions results in a 0.2 percentage point decrease in ROE. These impacts are significant, considering that the median ROE for cooperative banks in our sample is 3.8 percent.

Our findings also reveal that the lower profits of cooperative banks can be attributed to reduced NIM and higher CTI. It is possible that FinTech platforms, leveraging new technologies, have achieved economies of scale and expanded their reach to wider geographical areas compared to cooperative banks (Coelho and others, 2019). Additionally, some cooperative Banks may face challenges in affording the necessary IT investments to meet customer expectations, particularly among the younger generation, who are more inclined to use digital banking services and may have weaker attachments to local community-oriented institutions (Coelho and others, 2019; Al-Muharrami and Hardy, 2013). These factors can limit lending opportunities and undermine the overall profitability of cooperative banks, as supported by our results.

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[6] Note that we have also conducted separate estimations to gauge the impact of other FinTech activities, specifically digital capital raising activities, on various types of financial institutions. However, the outcomes of these estimations have not been included in this presentation due to the relatively modest scale of these transactions when contrasted with the P2P and Balance Sheet lending models (see Figure 3 & 4). Likewise, our analysis has considered BigTech as a separate entity in our estimations. However, the findings pertaining to BigTech have not been showcased owing to its more limited global coverage compared to FinTech, and because the data does not include the breakdown of distinct business models.

Furthermore, FinTech platforms may be targeting the same untapped customer segments that cooperative banks aim to serve. Empirical evidence suggests that FinTech lenders tend to penetrate underserved areas. Studies have shown that FinTech borrowers have fewer tangible assets (Beaumont, Tang, and Vansteenberghe, 2022) and that FinTech market share increases in areas with higher loan denial rates and lower consumer credit scores (Jagtiani, Lambie-Hanson, and Lambie-Hanson, 2021).
Overall, our findings highlight the challenges faced by cooperative banks in the face of FinTech competition. To address these challenges, cooperative banks may need to consider strategies to enhance their digital capabilities, improve operational efficiency, and develop innovative products and services that cater to the evolving needs of their target customers.

In contrast to cooperative banks, our analysis indicates that commercial banks are in a better position as the impact of FinTech on profitability measures appears to be insignificant. This can be attributed to several factors. Firstly, commercial banks tend to have a larger size compared to cooperative banks in our sample, which may provide them with certain advantages and resources to withstand the challenges posed by FinTech competition. Secondly, commercial banks typically have a wider geographical reach and offer more sophisticated products, which may help them retain a competitive edge.

Furthermore, our results indicate that the presence of P2P lending has a positive effect on the NONIC of commercial banks. This suggests that commercial banks may benefit from partnering with P2P lending platforms, potentially expanding their revenue streams through collaborative efforts.

However, it is worth noting that commercial banks may face challenges when it comes to the Balance Sheet lending model, as it appears to have a negative impact on their NIM. Although the impact may not be as severe as in the case of cooperative banks, it still poses a potential challenge to the profitability of commercial banks. It is important for commercial banks to closely monitor and adapt to the changing landscape of FinTech and Balance Sheet lending models to mitigate any adverse effects on their NIM.

Overall, the findings suggest that while commercial banks may be better positioned compared to cooperative banks in dealing with FinTech competition, they still need to remain vigilant and proactive in exploring opportunities for collaboration and innovation to maintain their competitive advantage in the evolving financial landscape.

		ROE	ROA	NIM	NONIC	CTI
ALL	**FinTech**	-0.0903***	-0.0246***	-0.0277***	0.0111***	0.136***
Cooperative Banks	**P2P lending**	-0.333***	-0.128***	-0.111***	0.0192	0.676***
	Balance Sheet lending	-0.192***	-0.0910***	-0.142***	0.0177*	-0.0944
Commercial Banks	**P2P lending**	-0.0489	-0.0153	0.00653	0.0611***	0.286**
	Balance Sheet lending	-0.0749	-0.0120	-0.0612***	0.0225	0.449***

Source: Authors calculations
Note: *, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Effect of FinTech based on selected country and bank-specific characteristics

We now assess how the different country and bank-specific characteristics can affect the relationship between FinTech competition and incumbent FIs' profitability. The results, presented in Table 4 (detailed information can be found in Appendix 5, Tables 5-13), indicate that profitability of incumbents is negatively affected in markets with lower bank concentration, higher stock market turnover, higher credit depth, and higher commercial bank profitability at the country level. Lower bank concentration suggests fewer barriers to entry (Beck, Demirgüç-Kunt and Levine, 2006) for new FinTech firms. Likewise, higher stock market turnover and credit depth indicate more competitive and developed financial systems (Beck, De Jonghe and Schepens, 2013; Čihák and others, 2013, Demirgüç-Kunt and Levine, 1996) which implies fewer barriers to entry, more sophisticated investors, and access to highly skilled talent. These factors are crucial for the success of FinTech firms, while posing a threat to the profits of incumbent institutions. Additionally, a profitable banking sector can suggest greater market power (Lloyd-Williams, Molyneux, and Thornton 1994; Berger and Hannan 1989; Gilbert 1984) while at the same time a greater demand for financial services overall, creating opportunities for FinTech companies to enter the market and expand their customer base, thereby threatening the profits of incumbents. Overall, these findings suggest that FinTech firms are attracted to more competitive, profitable, and developed financial systems.

At the same time, financial institutions with relatively stronger regulatory standards seem to benefit from increased penetration of FinTech. Our findings demonstrate that the profitability of incumbents in countries with high regulatory quality and government effectiveness is positively impacted by FinTech competition. This implies that well-designed regulations can establish a level playing field (Kaufmann, Kraay and Mastruzzi, 2010), enabling new FinTech companies to thrive while protecting incumbents from uneven competition practices.

At the institutional level, incumbents with a lower risk profile, including lower non-performing loans (NPLs), a lower probability of insolvency, and higher capital, are more susceptible to the adverse profitability implications associated with the presence of FinTech. These findings support our expectations that incumbent institutions with these characteristics would be more risk-averse and less inclined to lend (Corbae and D'Erasmo, 2014; Dietrich and Wanzenreid, 2011; Goddard, Molyneux and Wilson, 2004). FinTech firms can capitalize on this situation by serving as substitutes for traditional bank lending (Gopal and Schnabl, 2021; Tang, 2019; Buchak and others, 2018).

Table 4. Summary: Effect of FinTech based on selected country and bank-specific characteristics

		ROE	ROA
Country	FinTech*Low Concentration	-0.0704***	-0.0021
	Net Effect	-0.1041	-0.0258
	FinTech*High Stock Market Turnover	-0.0418*	-0.00646
	Net Effect	-0.1215	-0.03096
	FinTech*High Credit depth	-0.14***	-0.0196***
	Net Effect	-0.2079	-0.0428
	FinTech*High ROE	-0.0592***	-0.0164***
	Net Effect	-0.1274	-0.0378
	FinTech*High Regulatory quality	0.316**	0.0878*
	Net Effect	0.2235	0.0629
	FinTech*High Government effectiveness	1.513***	0.144***
	Net Effect	1.4175	0.1188
Bank	FinTech*Low NPL	-0.157***	-0.057***
	Net Effect	-0.2386	-0.0784
	FinTech*High Risk-taking	-0.0636***	-0.035***
	Net Effect	-0.1634	-0.0584
	FinTech*High Capital	-0.119**	-0.0314***
	Net Effect	-0.0815	-0.0212

Source: Authors calculations
Note: *, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.
In this table we report coefficients of interaction terms and the Net effect. Interaction terms are formed by multiplying the dummy variable representing the moderator variables (i.e., low concentration; high stock market turnover etc.) with the independent variable which in our case is the log transformed variables of FinTech. The Net Effect, also known as the Total Effect, is calculated by summing the coefficient of the independent variable and the coefficient of the interaction term. Mathematically, Net Effect = Coefficient of Independent Variable + Coefficient of Interaction Term.

VI. Robustness Checks

To validate the previous findings and ensure their reliability, we conducted several robustness checks which are presented in Table 5 (detailed information can be found in Appendix 5, Tables 14-27). First, we examined the impact of FinTech transactions relative to the overall economy and financial system. The results indicate that when scaling the new FinTech explanatory variables to GDP and to total assets of the incumbents in our sample, the findings remain broadly consistent with the baseline estimation. Second, we expanded our analysis to include the larger ecosystem of alternative finance transactions, specifically incorporating the BigTech credit transactions compiled by Cornelli and others (2022). The results presented in Table 5 demonstrate that our combined FinBigTech explanatory variable continues to have a significant negative effect on the profitability

measures of our incumbents, leading to lower income and lower costs, while exhibiting a positive effect on non-interest income.

We acknowledge the potential emergence of endogeneity issues, including scenarios such as reverse causality, omitted variable bias, and simultaneity. To illustrate, consider the case of reverse causality, wherein the entry of FinTech into a country might be influenced by the level of competition in the local market, thus directly impacting the observed profitability. To address these potential endogeneity concerns, we employed a Two-Stage Least Squares (2SLS) approach, which involved using valid instrumental variables. Our instrument set included measures such as internet penetration, along with two novel exogenous measures: $FinTech_{-c,t}$ which represents the sum of all FinTech transactions in our sample leaving out Country c and $RegInstFund_{-c,t}$ which represents the sum of regional Institutional Funding leaving out Country c.

By incorporating internet penetration as a control variable, we effectively accounted for variations in internet accessibility across different countries. Our underlying assumption was that a higher proportion of the population with internet access would likely correlate with increased FinTech transactions, and conversely. The results from these regressions closely align with our baseline model. Moreover, the inclusion of $FinTech_{-c,t}$ as an instrument allowed us to isolate and thoroughly examine the impact of FinTech transactions occurring beyond a specific country's borders. This approach helped mitigate potential biases that might arise from factors like mergers, acquisitions, or partnerships between FinTech entities and established institutions within the country. Additionally, our control for institutional investor funding was imperative, considering that FinTech platforms often rely on financial support from institutional investors. Our results from the two respective regressions remain broadly robust relative to the baseline estimation.

To tackle the challenges posed by endogeneity and the presence of unobserved differences among banks, we adopted a two-step Generalized Method of Moments (GMM) approach, drawing from the methodologies outlined by Arellano and Bover (1995) as well as Blundell and Bond (1998). This method effectively addressed potential biases originating from dissimilar corporate governance structures, latent variables, and the unique characteristics of our dataset—comprising a limited number of time periods but a substantial number of individual institutions. The outcomes yielded through this methodology retained their significance and robustness in comparison to the baseline estimates. Additionally, we revisited our model with a balanced sample, a move aimed at controlling for the influence of mergers and acquisitions. This entailed retaining institutions that held complete information for all five performance ratios (ROE, ROA, NIM, NONIC, CTI) throughout the 2012-2020 timeframe. The results exhibited considerable consistency and robustness when juxtaposed with the baseline estimation.

Similarly, we explored the incorporation of lagged explanatory variables to address potential autoregressive effects, drawing inspiration from the work of Pesaran and Shin (1999). These modifications produced outcomes that closely aligned with the baseline estimates. To account for temporal dynamics, we introduced a dummy variable to capture the impact of Covid-19 and introduced time fixed effects in separate estimations. These adjustments yielded outcomes that maintained their consistency across various performance metrics.

Furthermore, given the substantial contribution of China, the U.S., and the UK to the overall FinTech transaction volumes within our sample, we performed separate regression analyses by excluding each of these countries individually. Remarkably, the results from these analyses continued to exhibit significance and robustness in relation to the baseline estimates.

Table 5. Robustness Checks

	ROE	ROA	NIM	NONIC	CTI
Baseline					
FinTech	-0.0903***	-0.0246***	-0.0277***	0.0111***	0.136***
FinTech_assets	-0.321**	-0.177***	-0.300***	0.172***	0.482
FinTech_gdp	-0.144	-0.221***	-0.353***	0.210***	0.340
FinBigTech	-0.0898***	-0.0245***	-0.0259***	0.0110***	0.130***
Two-Stage least squares (2SLS)					
FinTech=IP	-0.119***	-0.0624***	-0.0560***	0.0376***	0.00174
FinTech=FT	-0.136***	-0.0308***	-0.0227***	0.00622***	0.0719***
FinTech=IF	-0.550***	-0.212***	-0.194***	0.0272	0.0561
Two-Step Generalized Methods of Moments (GMM)					
FinTech	-0.274***	-0.0631***	-0.0623**	0.0228*	0.190**
Balanced Panel					
FinTech	-0.0674***	-0.00705***	-0.0143***	0.00106	0.114***
Lagged Explanatory Variable					
FinTech (-1)	-0.0471***	-0.0212***	-0.0163***	0.00879***	-0.0425
Adding a Covid dummy (1= Year 2020; 0=Year 2012-2019)					
FinTech	-0.0900***	-0.0230***	-0.0242***	0.00825***	0.114***
Adding Time Fixed Effects and no macro controls					
FinTech	-0.0108	-0.0442***	-0.147***	0.0342***	0.592***
Excluding China, US, and UK from the sample					
FinTech_exclCHN	-0.0946***	-0.0254***	-0.0278***	0.0111***	0.138***
FinTech_exclCHNUS	-0.101**	-0.0562***	-0.0708***	0.0615***	0.649***
FinTech_exclCHNUSUK	-0.0984**	-0.0550***	-0.0732***	0.0608***	0.648***

Source: Authors calculations
Note: Standard errors in parentheses*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Instrumental Variables:
IP = Internet Penetration
FT= All other countries FinTech
IF= Regional Institutional Funding

VII. Conclusions and Policy Implications

This paper aims to provide insights into the impact of emerging FinTech firms on the performance of established financial institutions. Our findings reveal a negative influence of FinTech presence on profitability, primarily driven by lower income and increased costs. Despite efforts by incumbents to diversify their revenue streams, these measures have been insufficient to offset the overall decline in profits. When analyzing the effects of different FinTech models, namely P2P lending, and Balance Sheet lending, on various types of financial institutions, our results indicate that cooperative banks are particularly susceptible to profit deterioration from both models, whereas (larger, more complex) commercial banks seem to be better positioned as indicated by higher non-interest income flows. This suggests that commercial banks may benefit more from partnering with P2P platforms.

Furthermore, we highlight the evolving relationship between FinTech presence and the profitability of incumbent financial institutions, contingent on diverse country and institutional characteristics. At the country level, we demonstrate that FinTech activity is attracted to more competitive, profitable, and developed financial systems. At the same time, incumbents in countries with stronger regulatory standards reap the advantages of increased FinTech penetration. This indicates that well-designed regulations can foster a level playing field, enabling new FinTech firms to thrive while simultaneously protecting incumbent FIs from potentially uneven competitive practices.

These findings underscore the need for continuous monitoring of FinTech development and its impact on all segments of the financial system. While the entry of new FinTech platforms has brought about benefits such as improved efficiency in financial service delivery, increased competition, and enhanced access to finance, it can also pose challenges to incumbent institutions by eroding their market share and limiting profit margins. Consequently, banks may face difficulties in building capital buffers necessary to absorb losses and maintain solvency. Moreover, incumbents may engage in riskier lending and investment activities to preserve their market share and boost profits. Striking the right balance between promoting financial innovation and mitigating systemic risks becomes crucial for regulators.

To achieve this balance, specific recommendations could be considered to broaden the regulatory scope and create a level playing field. These include reviewing and redesigning licensing regimes to encompass new types of service providers within the regulatory framework where appropriate, implementing more robust capital, liquidity, and operational risk management requirements that match the risks posed by different FinTech business models, and strengthening the regulatory framework and supervision for smaller, less technologically advanced incumbents who may be more vulnerable to FinTech competition. In addition, incumbents can take measures to adjust their business models by enhancing cost efficiency, diversifying income sources, consolidating operations, improving internal governance, and addressing problem loans.

Annex I. Variable Names, Definition and Sources

Variable	Description	Source
Dependent variables		
ROE	Return on Equity (%) = Net Income/Equity	Bureau van Dijk Orbis
ROA	Return on Assets (%) = Net Income/Assets	Bureau van Dijk Orbis
NIM	Net Interest Margin (%) = Interest Income-Interest Exp/Interest-earning assets	Bureau van Dijk Orbis
NONIC	Non-Interest Income to Average Assets (%) =Non-Interest Income/Average Assets	Bureau van Dijk Orbis
CTI	Cost to Income ratio (%) = Operating Exp./Operating Income-Non-Operating Income	Bureau van Dijk Orbis
Explanatory variables		
FinTech	Log (Total volume of digital lending and capital raising activities in US$)	Cambridge Center for Alternative Finance
P2P Lending	Log (Total volume of P2P lending activities in US$)	Cambridge Center for Alternative Finance
Balance Sheet Lending	Log (Total volume of Balance Sheet lending activities in US$)	Cambridge Center for Alternative Finance
Other control variables		
Size	Log (Total Assets)	Bureau van Dijk Orbis
Equity-Assets ratio	Equity to Total Assets (%)	Bureau van Dijk Orbis
GDP growth	GDP, at constant prices, percent change (%)	IMF WEO Database
Inflation	Annual percentage of average consumer prices (%)	IMF WEO Database
Policy rate	Central Bank Policy rate (%)	Haver Database
Bank concentration	Assets of five largest banks to total bank assets	Global Financial Development Database
NPL	Non-Performing Loans to Gross Loans (%)	Bureau van Dijk Orbis
Total Capital Ratio	Total Capital Ratio (%)	Bureau van Dijk Orbis
Risk-taking Z-Score	Distance from insolvency: (ROA+E/A)/s(ROA), where s(ROA) is the standard deviation of ROA.	Authors calculations using Bureau van Dijk Orbis data
Stock Market Turnover Ratio	Total value of shares traded during the period divided by the average market capitalization for the period. (%)	Global Financial Development Database
Private credit by deposit money banks to GDP (%)	The financial resources provided to the private sector by domestic money banks as a share of GDP.	Global Financial Development Database
Bank return on equity (%, after tax)	Commercial banks' after-tax net income to yearly averaged equity.	Global Financial Development Database
Regulatory quality	Ability of government to implement sound policies that promote private sector development -Percentile rank (0-100)	World Governance Indicator
Government effectiveness	Quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies- Percentile rank (0-100)	World Governance Indicator
Internet penetration	Individuals using the Internet (% of population)	World Governance Indicator
Institutional funding for FinTech platforms	The funding of FinTech platforms by institutional investors to support investment strategies or portfolio diversification for themselves or their clients.	Cambridge Center for Alternative Finance

Annex II. Descriptive statistics, correlations, and stylized facts

Table 1: Descriptive statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
LFintech	87384	20.896	22.205	4.089	7.24	26.6
ROE	84311	4.901	4.249	9.217	-47.664	50.971
ROA	84565	.812	0.488	2.145	-9.532	14.261
NIM	84274	4.972	3.131	7.117	-1.656	59.484
NONIC	84530	1.966	0.989	5.175	-.607	55.061
CTI	84220	76.844	78.399	25.177	5.157	216.483
lTotalAssets	84897	11.563	11.395	2.653	-.983	22.106
Equity to Total Assets	84831	16.143	11.569	17.071	-971.677	101.308
NonPerfLoansGrossLoans	27543	8.953	3.495	24.63	0	984.481
Z-Score	74277	1.364e+13	64.685	3.717e+15	-42.781	1.013e+18
Total Capital Ratio	21628	141.725	18.230	16120.203	-5240.14	2369797
Stock Turnover	78449	106.341	108.513	57.622	.27	480.287
Private credit to GDP	90171	140.598	175.676	58.484	10.247	258.45
ROE	91503	8.554	9.736	7.48	-194.894	41.092
Regulatory Quality	91503	80.214	87.678	18.269	13.942	100
Government Effectiveness	91503	81.015	90.521	18.571	10.577	100
GDP Growth	91503	1.469	2.161	2.673	-11.115	25.305
Inflation	91335	2.36	1.812	3.003	-2.074	53.548
Policy Rate	88663	2.258	0.630	4.256	-.75	59.25
Bank Concentration	90992	59.318	47.614	18.117	31.855	100

Table 2: Correlations

Variables	FinTech	ROE	ROA	NIM	NONIC	CTI
lfintech	1.000					
ROE	-0.080*	1.000				
	(0.000)					
ROA	-0.102*	0.705*	1.000			
	(0.000)	(0.000)				
NIM	-0.158*	0.174*	0.346*	1.000		
	(0.000)	(0.000)	(0.000)			
NONIC	-0.087*	0.193*	0.335*	0.090*	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)		
CTI	0.152*	-0.532*	-0.477*	-0.141*	-0.025*	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
NPL	-0.078*	-0.101*	-0.060*	0.182*	0.084*	0.048*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Z-Score	-0.001	-0.002	-0.001	-0.003	-0.001	0.003
	(0.701)	(0.641)	(0.707)	(0.483)	(0.741)	(0.397)
Total Capital Ratio	0.002	0.007	0.007	0.008	-0.002	0.000
	(0.758)	(0.284)	(0.292)	(0.247)	(0.783)	(0.997)
Stock Market Turnover	0.259*	-0.083*	-0.110*	-0.213*	-0.128*	0.135*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Private Credit to GDP	0.552*	-0.140*	-0.224*	-0.383*	-0.184*	0.263*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROE	0.061*	0.099*	0.092*	0.121*	-0.010*	-0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.324)
Regulatory Quality	0.296*	-0.180*	-0.277*	-0.480*	-0.150*	0.233*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Government Effectiveness	0.312*	-0.171*	-0.288*	-0.546*	-0.149*	0.207*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bank Concentration	-0.394*	0.122*	0.186*	0.244*	0.137*	-0.264*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 3: Stylized facts

Financial Institution	# of institutions	Total Assets(th) median	ROE median	ROA median	NIM median	NONIC median	CTI median
Banks							
Commercial Bank	1409	985,502	7.094	.8	3.358858	1.105514	59.90551
Cooperative Bank	7151	481,23.16	3.818	.436	3.178233	.9632227	81.47331
Islamic Bank	33	2,485,177	6.555	.6215	1.894553	1.860511	63.95508
Micro-financing Institution	37	186,531	10.5225	2.294	14.79198	2.270579	67.11605
Savings Bank	568	576,127.8	3.72	.4065	2.102961	.9446083	73.67054
Non-Banks							
Finance Company	516	427,016.2	7.301	1.0655	4.159253	1.865802	60.68638
Investment Bank	176	1,136,596	5.783	.7455	1.129579	2.373146	68.23625
Investment and Trust Corporation	62	1230536	6.2945	.816	.7153499	7.212011	55.10713
Real Estate and Mortgage Bank	117	2418287	5.1785	.331	1.256582	.0639484	45.77802
Specialized Government Credit Institution	70	7,956,728	4.73	.3505	.9904929	.4957385	41.58323

Annex III. List of Countries included in the Sample

#	Country	Total Alternative Finance Volume 2012-2020 (in billions of US$)	Total Alternative Finance Volume (% of GDP)
1.	China	1,018.0	6.9
2.	United States	315.7	1.5
3.	United Kingdom	58.0	2.2
4.	Brazil	7.7	0.5
5.	Netherlands	6.1	0.7
6.	France	5.8	0.2
7.	Germany	5.8	0.2
8.	Australia	5.7	0.4
9.	India	5.6	0.2
10.	Korea, Rep.	5.2	0.3
11.	Indonesia	4.5	0.4
12.	Italy	4.4	0.2
13.	Japan	4.1	0.1
14.	Canada	3.1	0.2
15.	Israel	2.6	0.6
16.	Singapore	2.4	0.7
17.	Spain	2.2	0.2
18.	Chile	1.9	0.8
19.	Finland	1.7	0.6
20.	Mexico	1.6	0.1
21.	New Zealand	1.6	0.8
22.	Sweden	1.5	0.3
23.	Poland	1.5	0.2
24.	Ghana	1.1	1.7
25.	Colombia	1.1	0.4
26.	Latvia	1.0	3.0
27.	Ukraine	1.0	0.6
28.	Hong Kong	0.8	0.2
29.	Armenia	0.8	6.4
30.	Estonia	0.7	2.4
31.	Russian Federation	0.7	0.0
32.	Georgia	0.6	3.7
33.	Kazakhstan	0.5	0.3
34.	Denmark	0.5	0.2
35.	Zambia	0.5	2.8
36.	Ireland	0.4	0.1
37.	Belgium	0.4	0.1
38.	Switzerland	0.4	0.1
39.	Peru	0.4	0.2
40.	Czech Republic	0.3	0.1
41.	Philippines	0.3	0.1

42.	Moldova	0.3	2.9
43.	Malaysia	0.3	0.1
44.	Argentina	0.3	0.1
45.	United Arab Emirates	0.3	0.1
46.	Kenya	0.3	0.3
47.	Slovenia	0.3	0.5
48.	Uganda	0.2	0.6
49.	Norway	0.2	0.1
50.	Tanzania	0.2	0.3
51.	Austria	0.2	0.0
52.	Vietnam	0.2	0.1
53.	Bulgaria	0.2	0.3
54.	Albania	0.2	1.1
55.	South Africa	0.1	0.0
56.	Romania	0.1	0.0
57.	Nigeria	0.1	0.0

Annex IV. Digital lending and capital raising activities

Digital lending activities

P2P/Marketplace Lending	Individuals or institutional funders provide a loan to a consumer borrower, business borrower, or secured against a property, commonly ascribed to off-balance sheet lending.
Balance Sheet Lending	The platform entity provides a loan directly to the consumer borrower, business borrower, or secured against a property, ascribed to on-balance sheet nonbank lending.
Invoice Trading	Individuals or institutional funders purchase invoices or receivables from a business at a discount.
Securities	Debt-based: Individuals or institutional funders purchase debt-based securities, typically a bond or debenture, at a fixed interest rate. Mini-bonds: Individuals or institutions purchase securities from companies in the form of an unsecured bond which is 'mini' because the issue size is much smaller than the minimum issue amount needed for a bond issued in institutional capital markets.
Consumer Purchase Finance/BNPL	A buy now/pay later payment facilitator or Store Credit solution.

Digital capital raising activities

Equity-based	Individuals or institutional funders purchase equity issued by a company; provide equity or subordinated debt financing for real estate; purchase securities from a company, such as shares or bonds, and share in the profits or royalties of the business.
Non-Investment based	Backers provide funding to individuals, projects or companies in exchange for non-monetary rewards or products. Donors provide funding to individuals, projects or companies based on philanthropic or civic motivations with no expectation of monetary or material. Interests and/or other profits are re-invested (forgoing the interest by donating) or provides microcredit at lower rates.

Source: Cambridge Center for Alternative Finance (2021)

Annex V. Emergence of Fintech Transactions Worldwide: Key Stylized Facts

Figure 5-7 show the key trends of the global online alternative finance market (FinTech). FinTech volumes grew up significantly until 2017. They have declined since driven largely by the decrease in volume from China. However, market developments in China and the rest of the world have followed different trajectories. Local market developments and regulatory changes in China have led to a considerable decline in volumes and its global market share. US and Canada followed by the UK appear to have taken over and became the largest regional alternative market in 2020. P2P lending stands out as the largest business model when considering China in our analysis. When excluding China, total alternative finance volumes show gradual growth driven by both P2P/Marketplace Lending and Balance Sheet Lending.

Figure 5. FinTech finance volumes
(Including China (left) and excluding China (right); in US$ billions)
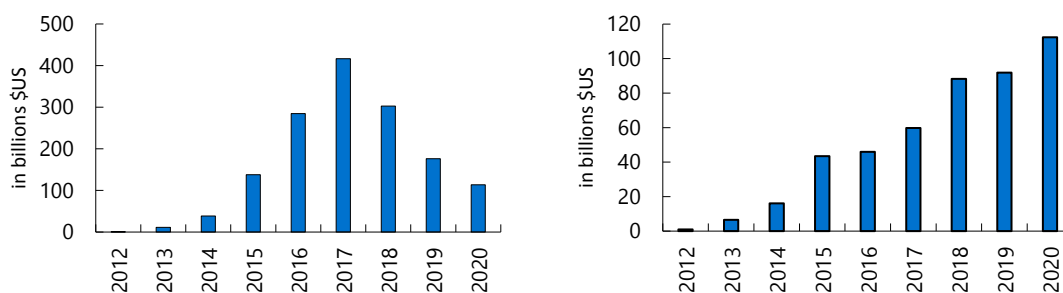
Figure 6. Market share
(Including China (left) and excluding China (right); in US$ billions)
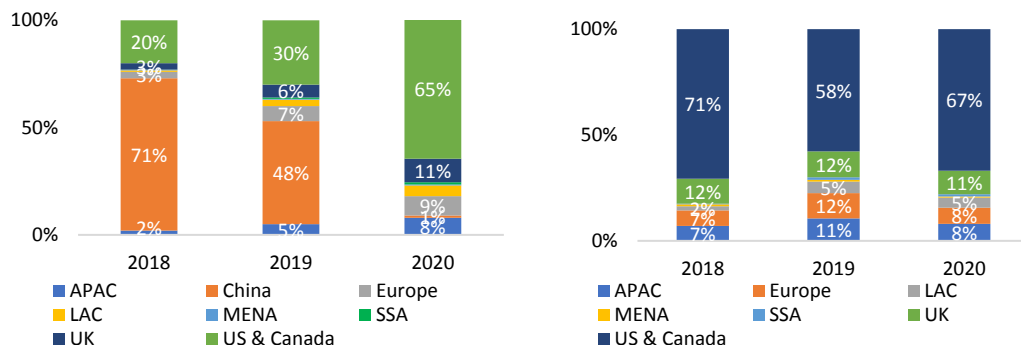
Figure 7. FinTech finance volumes by model
(Including China (left) and excluding China (right); in US$ billions)
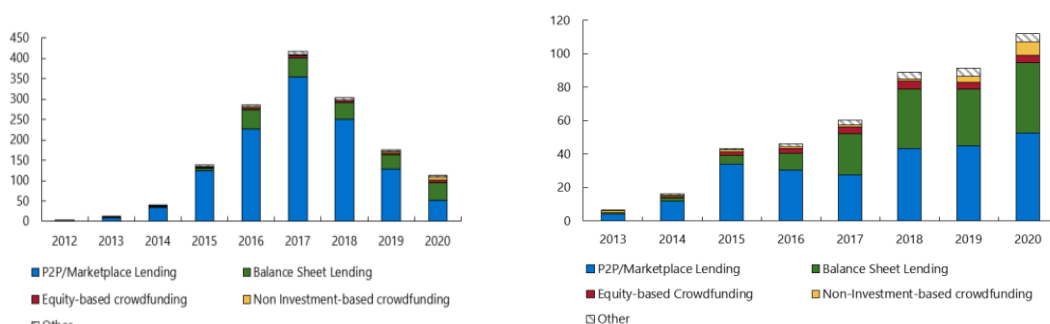
Source: Authors calculations using CCAF (2021) Database.

Annex VI. Detailed Regression Output Tables

I. Effect of FinTech Business Models on Cooperative Banks

Table 1: Effect of P2P lending on performance measures of Cooperative Banks

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
P2P lending	-0.333***	-0.128***	-0.111***	0.0192	0.676***
	(0.0477)	(0.0103)	(0.0216)	(0.0141)	(0.128)
Size	4.905***	1.161***	0.207	-0.254	-12.84***
	(0.419)	(0.0870)	(0.178)	(0.165)	(1.086)
Equity-Assets ratio	0.381***	0.0820***	0.0813***	-0.00163	-0.602***
	(0.0478)	(0.0121)	(0.0159)	(0.0107)	(0.108)
GDP growth	0.158***	0.0187***	0.0170***	0.0112***	-0.478***
	(0.0141)	(0.00287)	(0.00591)	(0.00416)	(0.0364)
Inflation	-0.0913*	-0.115***	-0.309***	-0.0168	0.282**
	(0.0515)	(0.0118)	(0.0247)	(0.0155)	(0.112)
Policy rate	0.287***	0.180***	0.404***	0.0109	-1.150***
	(0.0403)	(0.0126)	(0.0291)	(0.0211)	(0.0905)
Concentration	0.0225*	0.0156***	0.0125*	-0.00164	0.189***
	(0.0124)	(0.00167)	(0.00656)	(0.00453)	(0.0262)
Constant	-48.39***	-11.04***	2.924*	3.639**	204.7***
	(4.308)	(0.837)	(1.650)	(1.605)	(9.983)
N	52026	52035	52030	52039	52015
rho	0.770	0.881	0.936	0.891	0.817

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 2: Effect of Balance Sheet Lending on performance measures of Cooperative Banks

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
Balance Sheet lending	-0.192***	-0.0910***	-0.142***	0.0177*	-0.0944
	(0.0323)	(0.00761)	(0.0125)	(0.00939)	(0.0851)
Size	5.400***	1.248***	0.351*	-0.296*	-11.21***
	(0.453)	(0.0929)	(0.188)	(0.176)	(1.286)
Equity-Assets ratio	0.461***	0.0924***	0.0802***	-0.00222	-0.630***
	(0.0544)	(0.0139)	(0.0156)	(0.0106)	(0.122)
GDP growth	0.173***	0.0168***	-0.0102	0.00733	-0.515***
	(0.0160)	(0.00332)	(0.00748)	(0.00515)	(0.0437)
Inflation	0.0973*	-0.0512***	-0.254***	-0.0221	-0.259***
	(0.0574)	(0.0111)	(0.0202)	(0.0259)	(0.0862)
Policy rate	0.117***	0.132***	0.436***	0.0288	-0.775***
	(0.0444)	(0.0121)	(0.0338)	(0.0243)	(0.0813)
Concentration	0.0275	0.00724***	0.00734**	0.00289	0.241***
	(0.0208)	(0.00222)	(0.00332)	(0.00412)	(0.0373)
Constant	-57.69***	-12.40***	2.286	3.845**	202.6***
	(4.818)	(0.892)	(1.814)	(1.739)	(12.30)
N	48047	48056	48053	48060	48038
rho	0.793	0.892	0.948	0.912	0.780

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

II. Effect of FinTech Business Models on Commercial Banks

Table 3: Effect of P2P lending on performance measures of Commercial Banks

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
P2P lending	-0.0489	-0.0153	0.00653	0.0611***	0.286**
	(0.0467)	(0.0105)	(0.0239)	(0.0165)	(0.119)
Size	2.151***	0.647***	-0.122	-0.257	-7.790***
	(0.703)	(0.140)	(0.131)	(0.268)	(2.240)
Equity-Assets ratio	-0.00515	0.0168**	0.0354**	0.0132	0.206**
	(0.0311)	(0.00836)	(0.0140)	(0.0121)	(0.0913)
GDP growth	0.485***	0.0828***	0.0752***	-0.0103	-0.412***
	(0.0483)	(0.0108)	(0.0172)	(0.0161)	(0.116)
Inflation	-0.180*	-0.0483*	0.130*	0.118**	-0.429**
	(0.0975)	(0.0281)	(0.0759)	(0.0544)	(0.201)
Policy rate	0.128*	0.0433**	0.0416	0.0457	0.0140
	(0.0759)	(0.0195)	(0.0417)	(0.0400)	(0.150)
Concentration	0.0819***	0.0131***	-0.0272***	0.00686	0.0826
	(0.0228)	(0.00435)	(0.00948)	(0.00631)	(0.0656)
Constant	-28.43***	-9.154***	7.164***	3.937	162.1***
	(10.25)	(2.088)	(2.200)	(3.873)	(32.41)
N	7762	7855	7809	7842	7786
rho	0.659	0.682	0.788	0.846	0.673

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 4: Effect of Balance Sheet lending on performance measures of Commercial Banks

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
Balance Sheet lending	-0.0749	-0.0120	-0.0612***	0.0225	0.449***
	(0.0756)	(0.0145)	(0.0228)	(0.0320)	(0.149)
Size	4.080***	0.846***	-0.733*	0.467	-8.370**
	(0.853)	(0.201)	(0.410)	(0.662)	(3.542)
Equity-Assets ratio	0.0824*	0.0234	0.0188	0.0232	0.0174
	(0.0431)	(0.0154)	(0.0261)	(0.0285)	(0.188)
GDP growth	0.609***	0.0970***	0.0617***	0.0236	-0.577***
	(0.0643)	(0.0143)	(0.0178)	(0.0238)	(0.142)
Inflation	-0.425***	-0.0727*	0.327***	0.185**	-0.123
	(0.129)	(0.0379)	(0.121)	(0.0895)	(0.218)
Policy rate	0.252***	0.0745***	0.0190	0.0307	-0.0530
	(0.0902)	(0.0258)	(0.0469)	(0.0504)	(0.181)
Concentration	0.0849**	0.0172**	-0.00368	-0.00459	0.197
	(0.0379)	(0.00862)	(0.0112)	(0.0104)	(0.181)
Constant	-59.22***	-13.03***	15.84**	-5.413	166.0***
	(13.24)	(3.210)	(6.431)	(10.06)	(54.49)
N	4153	4220	4191	4215	4179
rho	0.806	0.782	0.801	0.889	0.744

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

III. Effect of FinTech depending on selected country and bank-specific characteristics

Table 5: Effect of FinTech and its interaction with lower bank concentration

	(1) ROE	(2) ROA
FinTech	-0.0337	-0.0237***
	(0.0242)	(0.00507)
Low concentration	1.415***	0.0198
	(0.471)	(0.0979)
FinTech*Low concentration	-0.0704***	-0.00210
	(0.0204)	(0.00418)
Size	3.221***	0.733***
	(0.419)	(0.0889)
Equity-Assets ratio	0.112***	0.0439***
	(0.0215)	(0.00534)
GDP growth	0.225***	0.0362***
	(0.0157)	(0.00334)
Inflation	-0.187***	-0.0574***
	(0.0531)	(0.0117)
Policy rate	0.254***	0.103***
	(0.0428)	(0.0107)
Constant	-33.52***	-7.904***
	(4.741)	(1.007)
N	79949	80129
rho	0.679	0.776

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 6: Effect of FinTech and its interaction with higher Stock Turnover Ratio

	(1) ROE	(2) ROA
FinTech	-0.0797***	-0.0245***
	(0.0124)	(0.00258)
High Stock turnover	0.709	0.159
	(0.476)	(0.103)
FinTech*High Stock turnover	-0.0418*	-0.00646
	(0.0218)	(0.00467)
Size	3.126***	0.734***
	(0.428)	(0.0916)
Equity-Assets ratio	0.108***	0.0435***
	(0.0218)	(0.00543)
GDP growth	0.237***	0.0361***
	(0.0154)	(0.00334)
Inflation	-0.188***	-0.0573***
	(0.0537)	(0.0118)
Policy rate	0.226***	0.103***
	(0.0438)	(0.0111)
Concentration	-0.00302	-0.00323*
	(0.00823)	(0.00183)
Constant	-31.10***	-7.719***
	(4.969)	(1.065)
N	79523	79701
rho	0.675	0.777

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 7: Effect of FinTech and its interaction with higher private credit to GDP

	(1) ROE	(2) ROA
FinTech	-0.0679***	-0.0232***
	(0.0120)	(0.00250)
High credit to GDP	2.875***	0.456***
	(0.399)	(0.0834)
FinTech*High Credit to GDP	-0.140***	-0.0196***
	(0.0178)	(0.00364)
Size	3.163***	0.737***
	(0.421)	(0.0901)
Equity-Assets ratio	0.108***	0.0436***
	(0.0217)	(0.00541)
GDP growth	0.242***	0.0359***
	(0.0153)	(0.00329)
Inflation	-0.211***	-0.0599***
	(0.0536)	(0.0118)
Policy rate	0.259***	0.106***
	(0.0423)	(0.0106)
Concentration	-0.00318	-0.00293
	(0.00825)	(0.00184)
Constant	-31.80***	-7.799***
	(4.913)	(1.052)
N	79523	79701
rho	0.679	0.779

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 8: Effect of FinTech and its interaction with higher Commercial Bank's ROE

	(1) ROE	(2) ROA
FinTech	-0.0682***	-0.0214***
	(0.0119)	(0.00244)
High ROE	0.880**	0.333***
	(0.436)	(0.0938)
FinTech*High ROE	-0.0592***	-0.0164***
	(0.0195)	(0.00410)
Equity-Assets ratio	0.106***	0.0430***
	(0.0217)	(0.00540)
Size	3.091***	0.720***
	(0.417)	(0.0892)
GDP growth	0.248***	0.0375***
	(0.0151)	(0.00329)
Inflation	-0.196***	-0.0590***
	(0.0538)	(0.0118)
Policy rate	0.235***	0.102***
	(0.0425)	(0.0107)
Concentration	-0.00455	-0.00246
	(0.00808)	(0.00178)
Constant	-30.74***	-7.635***
	(4.870)	(1.043)
N	79523	79701
rho	0.672	0.774

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 9: Effect of FinTech and its interaction with higher regulatory quality

	(1) ROE	(2) ROA
FinTech	-0.0925***	-0.0249***
	(0.0111)	(0.00228)
High Regulatory Quality	-6.936***	-1.088
	(2.068)	(0.718)
FinTech*High Regulatory Quality	0.316**	0.0878*
	(0.144)	(0.0532)
Size	3.222***	0.730***
	(0.409)	(0.0877)
Equity-Assets ratio	0.112***	0.0435***
	(0.0214)	(0.00536)
GDP growth	0.228***	0.0360***
	(0.0154)	(0.00330)
Inflation	-0.189***	-0.0574***
	(0.0535)	(0.0117)
Policy rate	0.245***	0.103***
	(0.0426)	(0.0107)
Concentration	-0.00568	-0.00321*
	(0.00825)	(0.00184)
Constant	-31.94***	-7.654***
	(4.782)	(1.027)
N	79523	79701
rho	0.681	0.776

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 10: Effect of FinTech and its interaction with higher government effectiveness

	(1) ROE	(2) ROA
FinTech	-0.0955***	-0.0252***
	(0.0108)	(0.00225)
High Government Effectiveness	-21.14***	-2.036***
	(2.986)	(0.556)
FinTech*High Government Effectiveness	1.513***	0.144***
	(0.207)	(0.0368)
Size	3.246***	0.734***
	(0.397)	(0.0862)
Equity-Assets ratio	0.115***	0.0440***
	(0.0211)	(0.00537)
GDP growth	0.227***	0.0359***
	(0.0154)	(0.00330)
Inflation	-0.191***	-0.0573***
	(0.0535)	(0.0117)
Policy rate	0.246***	0.103***
	(0.0426)	(0.0107)
Concentration	-0.00903	-0.00334*
	(0.00828)	(0.00183)
Constant	-32.02***	-7.703***
	(4.655)	(1.009)
N	79523	79701
rho	0.683	0.777

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 11: Effect of FinTech and its interaction with lower NPLs of incumbents

	(1) ROE	(2) ROA
FinTech	-0.0816***	-0.0214***
	(0.0112)	(0.00227)
Low NPLs	4.512***	1.416***
	(0.739)	(0.164)
FinTech*Low NPLs	-0.157***	-0.0570***
	(0.0365)	(0.00811)
Size	3.212***	0.736***
	(0.420)	(0.0893)
Equity-Assets ratio	0.112***	0.0440***
	(0.0217)	(0.00540)
GDP growth	0.227***	0.0359***
	(0.0155)	(0.00330)
Inflation	-0.183***	-0.0559***
	(0.0534)	(0.0117)
Policy rate	0.226***	0.0961***
	(0.0433)	(0.0107)
Concentration	-0.00412	-0.00223
	(0.00820)	(0.00181)
Constant	-32.36***	-7.909***
	(4.936)	(1.049)
N	79523	79701
rho	0.685	0.780

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 12: Effect of FinTech and its interaction with lower solvency of incumbents

	(1) ROE	(2) ROA
FinTech	-0.0998***	-0.0234***
	(0.0119)	(0.00230)
High Z-Score	2.054***	0.921***
	(0.486)	(0.115)
FinTech*High Z-Score	-0.0636***	-0.0350***
	(0.0210)	(0.00482)
Size	3.260***	0.749***
	(0.425)	(0.0905)
Equity-Assets ratio	0.106***	0.0424***
	(0.0218)	(0.00541)
GDP growth	0.226***	0.0351***
	(0.0154)	(0.00328)
Inflation	-0.183***	-0.0559***
	(0.0532)	(0.0116)
Policy rate	0.232***	0.0983***
	(0.0425)	(0.0105)
Concentration	0.000566	-0.000494
	(0.00803)	(0.00173)
Constant	-32.81***	-8.115***
	(4.998)	(1.067)
N	79523	79701
rho	0.688	0.784

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 13: Effect of FinTech and its interaction with higher capital of incumbents

	(1) ROE	(2) ROA
FinTech	0.0375	0.0102
	(0.0552)	(0.00842)
High capital	2.988***	0.745***
	(1.122)	(0.176)
FinTech*High capital	-0.119**	-0.0314***
	(0.0543)	(0.00823)
Size	2.501***	0.469***
	(0.335)	(0.0647)
GDP growth	0.220***	0.0327***
	(0.0148)	(0.00313)
Inflation	-0.194***	-0.0610***
	(0.0533)	(0.0118)
Policy rate	0.256***	0.108***
	(0.0427)	(0.0109)
Concentration	-0.0101	-0.00468**
	(0.00822)	(0.00182)
Constant	-24.78***	-4.695***
	(3.857)	(0.736)
N	79523	79754
rho	0.633	0.739

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

IV. Robustness Checks

Table 14: Effect of FinTech-Assets on the performance of incumbents

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech-Assets	-0.321**	-0.177***	-0.300***	0.172***	0.482
	(0.153)	(0.0365)	(0.0595)	(0.0418)	(0.382)
Size	2.974***	0.686***	-0.132	-0.511***	-9.094***
	(0.388)	(0.0820)	(0.125)	(0.147)	(1.146)
Equity-Assets ratio	0.103***	0.0422***	0.0370***	0.0171**	-0.0924*
	(0.0212)	(0.00528)	(0.00950)	(0.00666)	(0.0511)
GDP growth	0.241***	0.0383***	0.0401***	0.0109**	-0.430***
	(0.0156)	(0.00331)	(0.00547)	(0.00481)	(0.0381)
Inflation	-0.144***	-0.0490***	-0.0440**	0.0263	-0.203**
	(0.0523)	(0.0114)	(0.0204)	(0.0182)	(0.0980)
Policy rate	0.202***	0.0907***	0.179***	0.0130	-0.488***
	(0.0413)	(0.0102)	(0.0212)	(0.0145)	(0.0730)
Concentration	-0.00935	-0.00355**	0.00396	0.00956***	0.0810***
	(0.00817)	(0.00181)	(0.00338)	(0.00255)	(0.0186)
Constant	-30.69***	-7.599***	5.467***	6.780***	180.2***
	(4.657)	(0.987)	(1.548)	(1.687)	(13.52)
N	79523	79701	79438	79666	79384
rho	0.660	0.763	0.911	0.911	0.749

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 15: Effect of FinTech-GDP on the performance of incumbents

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech-GDP	-0.144	-0.221***	-0.353***	0.210***	0.340
	(0.160)	(0.0381)	(0.0515)	(0.0486)	(0.428)
Size	2.929***	0.676***	-0.151	-0.501***	-9.038***
	(0.384)	(0.0812)	(0.126)	(0.146)	(1.138)
Equity-Assets	0.103***	0.0422***	0.0369***	0.0172***	-0.0919*
	(0.0211)	(0.00527)	(0.00950)	(0.00665)	(0.0510)
GDP growth	0.243***	0.0382***	0.0403***	0.0109**	-0.433***
	(0.0156)	(0.00334)	(0.00557)	(0.00481)	(0.0375)
Inflation	-0.133**	-0.0456***	-0.0378*	0.0229	-0.217**
	(0.0522)	(0.0113)	(0.0202)	(0.0183)	(0.0990)
Policy rate	0.205***	0.0942***	0.185***	0.00973	-0.495***
	(0.0417)	(0.0104)	(0.0215)	(0.0147)	(0.0735)
Concentration	-0.0107	-0.00456**	0.00229	0.0105***	0.0832***
	(0.00825)	(0.00184)	(0.00347)	(0.00261)	(0.0187)
Constant	-30.16***	-7.447***	5.753***	6.627***	179.5***
	(4.603)	(0.976)	(1.557)	(1.677)	(13.39)
N	79523	79701	79438	79666	79384
rho	0.656	0.759	0.910	0.911	0.748

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 16: Effect of combined FinBigTech on the performance of incumbents

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinBigTech	-0.0898***	-0.0245***	-0.0259***	0.0110***	0.130***
	(0.0113)	(0.00234)	(0.00338)	(0.00342)	(0.0293)
Size	3.304***	0.747***	-0.0863	-0.492***	-9.633***
	(0.420)	(0.0884)	(0.130)	(0.152)	(1.205)
Equity-Assets ratio	0.101***	0.0417***	0.0385***	0.0132**	-0.0811
	(0.0209)	(0.00525)	(0.00939)	(0.00647)	(0.0521)
GDP growth	0.236***	0.0377***	0.0406***	0.0112**	-0.422***
	(0.0154)	(0.00327)	(0.00541)	(0.00467)	(0.0367)
Inflation	-0.173***	-0.0515***	-0.0329	0.0259	-0.145
	(0.0515)	(0.0113)	(0.0203)	(0.0184)	(0.0970)
Policy rate	0.235***	0.0967***	0.169***	0.00821	-0.565***
	(0.0393)	(0.00983)	(0.0196)	(0.0142)	(0.0707)
Concentration	-0.00743	-0.00352*	0.00299	0.00960***	0.0770***
	(0.00819)	(0.00182)	(0.00339)	(0.00257)	(0.0187)
Constant	-32.67***	-7.818***	5.469***	6.447***	183.8***
	(4.906)	(1.033)	(1.571)	(1.701)	(13.85)
N	79948	80126	79861	80089	79805
rho	0.684	0.776	0.909	0.903	0.759

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 17: 2SLS Regressions using Internet Penetration as an Instrumental Variable

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.119***	-0.0624***	-0.0560***	0.0376***	0.00174
	(0.0156)	(0.00310)	(0.00508)	(0.00385)	(0.0331)
Size	3.305***	0.843***	-0.0122	-0.593***	-9.011***
	(0.115)	(0.0219)	(0.0364)	(0.0270)	(0.244)
Equity-Assets	0.113***	0.0459***	0.0396***	0.0154***	-0.0916***
	(0.00666)	(0.00122)	(0.00197)	(0.00148)	(0.0131)
GDP growth	0.224***	0.0292***	0.0338***	0.0156***	-0.437***
	(0.0113)	(0.00227)	(0.00372)	(0.00283)	(0.0241)
Inflation	-0.204***	-0.0804***	-0.0662***	0.0424***	-0.222***
	(0.0214)	(0.00428)	(0.00701)	(0.00533)	(0.0454)
Policy rate	0.255***	0.119***	0.205***	-0.00411	-0.490***
	(0.0184)	(0.00370)	(0.00605)	(0.00461)	(0.0392)
Concentration	-0.00533	-0.00147	0.00535***	0.00850***	0.0829***
	(0.00590)	(0.00118)	(0.00194)	(0.00147)	(0.0126)
Constant	-32.35***	-8.263***	5.113***	7.033***	179.3***
	(1.313)	(0.251)	(0.415)	(0.309)	(2.774)
N	79496	79674	79411	79639	79357
rho	0.688	0.805	0.910	0.914	0.747

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 18: 2SLS Regressions using all other countries FinTech as an Instrumental Variable

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.136*** (0.00909)	-0.0308*** (0.00181)	-0.0227*** (0.00297)	0.00622*** (0.00226)	0.0719*** (0.0193)
Size	3.361*** (0.107)	0.748*** (0.0204)	-0.114*** (0.0341)	-0.501*** (0.0253)	-9.238*** (0.228)
Equity-Assets ratio	0.114*** (0.00657)	0.0438*** (0.00120)	0.0377*** (0.00195)	0.0172*** (0.00147)	-0.0957*** (0.0130)
GDP percent	0.221*** (0.0111)	0.0349*** (0.00221)	0.0398*** (0.00364)	0.00982*** (0.00276)	-0.423*** (0.0236)
Inflation	-0.214*** (0.0199)	-0.0607*** (0.00397)	-0.0456*** (0.00652)	0.0229*** (0.00496)	-0.179*** (0.0423)
Policy rate	0.262*** (0.0176)	0.105*** (0.00352)	0.191*** (0.00577)	0.00943** (0.00439)	-0.522*** (0.0374)
Concentration	-0.00462 (0.00588)	-0.00282** (0.00117)	0.00392** (0.00193)	0.00987*** (0.00147)	0.0796*** (0.0125)
Constant	-32.69*** (1.290)	-7.764*** (0.247)	5.664*** (0.409)	6.559*** (0.305)	180.6*** (2.727)
N	79523	79701	79438	79666	79384
rho	0.693	0.781	0.910	0.911	0.752

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 19: 2SLS Regressions using Regional Institutional Funding as an Instrumental Variable

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.550***	-0.212***	-0.194***	0.0272	0.0561
	(0.0734)	(0.0152)	(0.0248)	(0.0183)	(0.150)
Size	4.606***	1.071***	0.121**	-0.389***	-8.862***
	(0.155)	(0.0304)	(0.0484)	(0.0354)	(0.302)
Equity-Assets ratio	0.140***	0.0507***	0.0427***	0.0119***	-0.0933***
	(0.00826)	(0.00159)	(0.00254)	(0.00185)	(0.0159)
GDP growth	0.228***	0.0314***	0.0337***	0.0180***	-0.417***
	(0.0115)	(0.00241)	(0.00396)	(0.00291)	(0.0239)
Inflation	-0.179***	-0.0559***	-0.0618***	0.0190***	-0.205***
	(0.0206)	(0.00433)	(0.00709)	(0.00522)	(0.0428)
Policy rate	0.177***	0.0794***	0.208***	-0.00197	-0.586***
	(0.0249)	(0.00522)	(0.00854)	(0.00630)	(0.0516)
Concentration	0.0222**	0.0126***	0.0117***	0.000715	0.175***
	(0.0112)	(0.00235)	(0.00385)	(0.00283)	(0.0233)
Constant	-39.81***	-8.445***	6.480***	5.573***	170.9***
	(1.842)	(0.379)	(0.615)	(0.451)	(3.765)
N	56880	57016	56826	56992	56786
rho	0.800	0.859	0.905	0.910	0.767

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 20: Two-Step GMM Results

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.274***	-0.0631***	-0.0623**	0.0228*	0.190**
	(0.0467)	(0.0132)	(0.0254)	(0.0129)	(0.0924)
Size	-1.148***	-0.334***	-0.502**	0.640***	-5.309***
	(0.365)	(0.0945)	(0.196)	(0.104)	(0.665)
Equity-Assets ratio	0.527***	0.186***	0.590***	0.0606***	-1.156***
	(0.0727)	(0.0203)	(0.0472)	(0.0211)	(0.123)
GDP growth	0.140***	-0.00351	-0.0261***	0.0250***	-0.294***
	(0.0213)	(0.00568)	(0.00901)	(0.00525)	(0.0391)
Inflation	-0.267***	-0.101***	-0.0604***	0.0588**	-0.0560
	(0.0764)	(0.0222)	(0.0204)	(0.0247)	(0.136)
Policy rate	0.228***	0.101***	0.139***	-0.00777	-0.488***
	(0.0508)	(0.0153)	(0.0247)	(0.0156)	(0.0863)
Concentration	0.00210	0.000456	0.0198***	0.00993***	0.0475**
	(0.00887)	(0.00262)	(0.00481)	(0.00252)	(0.0195)
Year	0.183***	0.0193*	-0.0346*	-0.0380***	0.0226
	(0.0409)	(0.0107)	(0.0207)	(0.0111)	(0.0883)
Constant	-354.6***	-36.00*	71.07*	69.01***	106.0
	(79.36)	(20.66)	(40.05)	(21.47)	(171.8)
N	79523	79701	79438	79666	79384
rho					

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 21: Balanced Panel

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0674***	-0.00705***	-0.0143***	0.00106	0.114***
	(0.0112)	(0.00218)	(0.00337)	(0.00273)	(0.0228)
Size	2.585***	0.379***	-0.336***	-0.562***	-9.004***
	(0.413)	(0.0691)	(0.118)	(0.162)	(0.902)
Equity-Assets ratio	0.281***	0.0642***	0.0435***	0.0337*	-0.273**
	(0.0492)	(0.00922)	(0.00854)	(0.0192)	(0.107)
GDP growth	0.195***	0.0264***	0.00436	-0.00787	-0.492***
	(0.0233)	(0.00475)	(0.00973)	(0.00606)	(0.0619)
Inflation	0.0806	0.00826	-0.00209	-0.0205	-0.407***
	(0.0680)	(0.0134)	(0.0208)	(0.0165)	(0.122)
Policy rate	0.172**	0.0163	0.119***	0.0267**	-1.028***
	(0.0844)	(0.0212)	(0.0433)	(0.0134)	(0.203)
Concentration	-0.0105	0.000222	-0.00842	-0.00602	0.104*
	(0.0198)	(0.00352)	(0.00907)	(0.00437)	(0.0534)
Constant	-27.26***	-4.538***	7.313***	7.467***	180.8***
	(5.194)	(0.852)	(1.358)	(1.948)	(10.97)
N	54371	54371	54371	54371	54371
rho	0.606	0.659	0.900	0.947	0.747

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 22: Lagged FinTech variable

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
L.FinTech	-0.0471***	-0.0212***	-0.0163***	0.00879***	-0.0425
	(0.0114)	(0.00239)	(0.00317)	(0.00322)	(0.0303)
Size	3.449***	0.810***	-0.0540	-0.480***	-9.387***
	(0.493)	(0.108)	(0.137)	(0.159)	(1.397)
Equity-Assets	0.112***	0.0451***	0.0353***	0.0146**	-0.130**
	(0.0237)	(0.00593)	(0.00998)	(0.00698)	(0.0565)
GDP growth	0.227***	0.0351***	0.0393***	0.0140***	-0.427***
	(0.0161)	(0.00345)	(0.00564)	(0.00461)	(0.0382)
Inflation	-0.189***	-0.0608***	0.00901	0.0344	-0.191**
	(0.0514)	(0.0119)	(0.0355)	(0.0285)	(0.0909)
Policy rate	0.309***	0.129***	0.199***	-0.0185	-0.652***
	(0.0390)	(0.0106)	(0.0233)	(0.0163)	(0.0712)
Concentration	-0.0144*	-0.00260	0.0100***	0.00523**	0.106***
	(0.00791)	(0.00176)	(0.00290)	(0.00211)	(0.0182)
Constant	-35.19***	-8.775***	4.452***	6.629***	183.9***
	(5.737)	(1.258)	(1.608)	(1.790)	(16.01)
N	71881	72040	71800	72008	71751
rho	0.711	0.799	0.909	0.919	0.767

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 23: Adding a COVID-19 dummy (1= Year 2020; 0=Year 2012-2019)

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0900***	-0.0230***	-0.0242***	0.00825***	0.114***
	(0.0110)	(0.00227)	(0.00313)	(0.00317)	(0.0280)
Size	3.216***	0.748***	-0.0577	-0.548***	-9.736***
	(0.427)	(0.0912)	(0.130)	(0.154)	(1.270)
Equity-Assets ratio	0.110***	0.0437***	0.0385***	0.0165**	-0.102*
	(0.0218)	(0.00542)	(0.00957)	(0.00667)	(0.0526)
GDP growth	0.223***	0.00613	-0.0259	0.0643***	0.00588
	(0.0403)	(0.00907)	(0.0183)	(0.0121)	(0.0776)
Inflation	-0.187***	-0.0625***	-0.0607***	0.0360*	-0.0619
	(0.0530)	(0.0117)	(0.0225)	(0.0193)	(0.0997)
Policy rate	0.241***	0.0957***	0.179***	0.0189	-0.459***
	(0.0459)	(0.0111)	(0.0228)	(0.0159)	(0.0787)
Concentration	-0.00650	-0.00282	0.00471	0.00919***	0.0732***
	(0.00819)	(0.00181)	(0.00334)	(0.00253)	(0.0186)
Covid	-0.0438	-0.240***	-0.521***	0.430***	3.361***
	(0.302)	(0.0672)	(0.138)	(0.0970)	(0.624)
Constant	-31.84***	-7.835***	5.200***	6.932***	184.5***
	(4.973)	(1.063)	(1.560)	(1.723)	(14.53)
N	79523	79701	79438	79666	79384
rho	0.681	0.780	0.911	0.912	0.763

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 24: Adding Time Fixed Effects with no macro controls

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0108	-0.0442***	-0.147***	0.0342***	0.592***
	(0.0341)	(0.00782)	(0.0146)	(0.0126)	(0.0823)
Size	3.100***	0.751***	-0.157	-0.699***	-9.539***
	(0.431)	(0.0962)	(0.136)	(0.169)	(1.266)
Equity-Assets ratio	0.112***	0.0482***	0.0399***	0.0212***	-0.102**
	(0.0214)	(0.00540)	(0.00961)	(0.00691)	(0.0513)
Year=2012	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
Year=2013	-0.500	0.322***	1.299***	-0.325***	-3.748***
	(0.341)	(0.0758)	(0.145)	(0.125)	(0.811)
Year=2014	-0.110	0.477***	1.407***	-0.353**	-5.455***
	(0.380)	(0.0859)	(0.163)	(0.139)	(0.900)
Year=2015	-0.581	0.460***	1.567***	-0.380**	-6.074***
	(0.415)	(0.0935)	(0.179)	(0.153)	(0.992)
Year=2016	-0.798*	0.413***	1.681***	-0.360**	-5.702***
	(0.421)	(0.0946)	(0.184)	(0.151)	(1.002)
Year=2017	-0.985**	0.375***	1.801***	-0.344**	-5.665***
	(0.432)	(0.0944)	(0.187)	(0.152)	(1.021)
Year=2018	-0.476	0.408***	1.842***	-0.351**	-7.204***
	(0.447)	(0.0972)	(0.189)	(0.157)	(1.059)
Year=2019	-0.698	0.348***	1.855***	-0.298*	-6.652***
	(0.453)	(0.0964)	(0.188)	(0.158)	(1.071)
Year=2020	-2.475***	0.0269	1.256***	-0.357**	-2.322**
	(0.465)	(0.0975)	(0.194)	(0.157)	(1.098)
Constant	-31.69***	-8.032***	7.763***	9.253***	181.2***
	(5.077)	(1.123)	(1.655)	(1.900)	(14.63)
N	82613	82799	82513	82756	82461
rho	0.660	0.780	0.907	0.907	0.755

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 25: Excluding China observations from the sample

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0946***	-0.0254***	-0.0278***	0.0111***	0.138***
	(0.0115)	(0.00238)	(0.00344)	(0.00344)	(0.0298)
Size	3.275***	0.741***	-0.0960	-0.513***	-9.458***
	(0.427)	(0.0899)	(0.130)	(0.153)	(1.234)
Equity-Assets ratio	0.113***	0.0436***	0.0383***	0.0169**	-0.103*
	(0.0220)	(0.00544)	(0.00962)	(0.00671)	(0.0525)
GDP growth	0.224***	0.0352***	0.0389***	0.0107**	-0.410***
	(0.0155)	(0.00330)	(0.00554)	(0.00464)	(0.0369)
Inflation	-0.186***	-0.0569***	-0.0486**	0.0260	-0.138
	(0.0535)	(0.0117)	(0.0210)	(0.0189)	(0.101)
Policy rate	0.243***	0.102***	0.193***	0.00734	-0.550***
	(0.0426)	(0.0107)	(0.0220)	(0.0151)	(0.0757)
Concentration	-0.00669	-0.00312*	0.00413	0.00964***	0.0768***
	(0.00825)	(0.00183)	(0.00344)	(0.00258)	(0.0188)
Constant	-32.28***	-7.728***	5.578***	6.577***	181.7***
	(4.961)	(1.046)	(1.560)	(1.698)	(14.07)
N	78487	78665	78405	78631	78350
rho	0.676	0.771	0.910	0.912	0.755

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 26: Excluding China and US observations from the sample

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.101**	-0.0562***	-0.0708***	0.0615***	0.649***
	(0.0495)	(0.0113)	(0.0214)	(0.0166)	(0.116)
Size	3.163***	0.838***	-0.0831	-0.719***	-9.832***
	(0.555)	(0.127)	(0.171)	(0.203)	(1.680)
Equity-Assets ratio	0.0665***	0.0409***	0.0406***	0.0167**	-0.0387
	(0.0237)	(0.00609)	(0.0111)	(0.00748)	(0.0579)
GDP growth	0.243***	0.0455***	0.0773***	0.0266***	-0.168***
	(0.0216)	(0.00476)	(0.00852)	(0.00616)	(0.0458)
Inflation	-0.213***	-0.0593***	-0.0445*	0.0286	-0.0856
	(0.0576)	(0.0126)	(0.0229)	(0.0205)	(0.108)
Policy rate	0.253***	0.105***	0.189***	0.0147	-0.320***
	(0.0498)	(0.0121)	(0.0256)	(0.0179)	(0.0819)
Concentration	-0.00350	-0.00135	0.0105***	0.00799***	0.0304
	(0.00841)	(0.00180)	(0.00324)	(0.00240)	(0.0198)
Constant	-32.75***	-9.045***	7.857***	9.735***	178.3***
	(6.905)	(1.577)	(2.283)	(2.432)	(20.46)
N	30066	30224	30004	30191	29965
rho	0.684	0.742	0.891	0.883	0.763

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

Table 27: Excluding China, US, and UK observations from the sample

	(1) ROE	(2) ROA	(3) NIM	(4) NONIC	(5) CTI
FinTech	-0.0984**	-0.0550***	-0.0732***	0.0608***	0.648***
	(0.0499)	(0.0114)	(0.0215)	(0.0165)	(0.117)
Size	3.213***	0.851***	-0.0977	-0.602***	-9.721***
	(0.564)	(0.129)	(0.173)	(0.188)	(1.690)
Equity-Assets ratio	0.0655***	0.0412***	0.0413***	0.0154**	-0.0406
	(0.0241)	(0.00617)	(0.0112)	(0.00726)	(0.0580)
GDP growth	0.243***	0.0454***	0.0778***	0.0275***	-0.167***
	(0.0217)	(0.00477)	(0.00854)	(0.00612)	(0.0459)
Inflation	-0.217***	-0.0604***	-0.0424*	0.0273	-0.0863
	(0.0578)	(0.0127)	(0.0229)	(0.0205)	(0.109)
Policy rate	0.257***	0.106***	0.187***	0.0179	-0.317***
	(0.0500)	(0.0122)	(0.0256)	(0.0178)	(0.0821)
Concentration	-0.00608	-0.00219	0.0121***	0.00636***	0.0298
	(0.00843)	(0.00181)	(0.00323)	(0.00225)	(0.0199)
Constant	-33.12***	-9.138***	8.031***	8.395***	176.6***
	(7.000)	(1.598)	(2.306)	(2.256)	(20.51)
N	29488	29644	29430	29616	29398
rho	0.683	0.745	0.891	0.884	0.758

Source: Authors calculations

Notes: Standard errors in parentheses

*, **, and *** denote statistical significance at 10, 5, and 1 percent level, respectively.

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PUBLICATIONS

Is FinTech Eating the Bank's Lunch?

Working Paper No. WP/2023/239