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EFFECTS OF FINTECH FIRMS ON BANKING PROFITABILITY IN ASEAN-5 DURING THE PANDEMIC COVID-19

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ABSTRACT

Fintech and fintech businesses have advanced banking and finance innovation. Since COVID-19 in 2020, fintech has accelerated the adoption of digital technology in banks to help individual and business customers during the crisis and the new normal. This research seeks to assess the correlations among fintech firms (FIN) and bank performance metrics, specifically Return on Total Assets (ROA) and Return on Equity (ROE), alongside bank attributes, i.e., Total Assets (SIZE), Leverage (LEV), Loans (LOAN), Deposits (DEPO) and Scale (SCA). Additionally, it investigates the influence of FIN on these essential bank profitability indicators in conjunction with macroeconomic variables, including GDP, Consumer Price Index (INF) and the occurrence of COVID-19. Based on consumer and disruptive innovation theories, dataset including 57 banks from Indonesia, Thailand, Malaysia, the Philippines and Vietnam from 2017 to 2021, the study used the dynamic panel model with the two-step Generalised Method of Moments (GMM) estimator, to demonstrate that fintech firms negatively affected bank profitability across ASEAN countries. Fintech hurts small banks more than large banks, and COVID-19 exacerbated its negative impact on ASEAN-5 bank profitability.

Keywords: ASEAN, Bank profitability, Fintech, Generalised Method of Moments (GMM)

INTRODUCTION

Fintech, a swiftly advancing industry utilising technology to improve financial services, has become a significant worldwide phenomenon, progressively infiltrating regional markets, especially in the ASEAN area. This region confronts a substantial challenge, with a significant population unbanked; for example, data reveals that in Indonesia, around 95 million individuals lack banking access, underscoring a considerable opportunity for fintech to enhance financial inclusion by delivering essential services to these groups (Setiawan et al., 2021). Moreover, the increase in internet and mobile penetration throughout ASEAN countries has enhanced the accessibility of digital financial services, which proved crucial in the post-COVID-19 recovery period. Reports indicate that the adoption of fintech is surging significantly in Southeast Asia, with firms experiencing substantial growth amid the pandemic, as traditional banking practices become less favoured due to health concerns regarding cash transactions (Abdelsalam & Sajid, 2023; Candy et al., 2022). As shown in Table 1, the number of operating fintech firms in ASEAN countries – particularly Indonesia and Singapore – grew consistently from 2017 to 2021, including during the pandemic period. This shift towards digital solutions is critical in an academic context as the connections among fintech and traditional banks is poised to redefine competition within the banking industry, especially amidst crises that demand agility and innovation. The 2025 ASEAN Economic Community Blueprint emphasises financial integration, presenting a clear motivation for studying fintech's effects, as this sector's evolution may lead to transformed banking landscapes, fostering a more inclusive financial ecosystem (Jose, 2020; Morgan, 2022). Such dynamics necessitate a deeper understanding of fintech's implications for banks, especially as economies strive to emerge stronger from disruptions like COVID-19, ultimately aiming for greater financial resilience within the region (Banna & Alam, 2021).

TABLE 1
Number of new and operating fintech firms in ASEAN-6

Country	2017		2018		2019		2020		2021	
	New	Oper	New	Oper	New	Oper	New	Oper	New	Oper
Singapore	208	770	266	1,036	159	1,195	120	1,315	35	1,350
Indonesia	100	440	142	583	108	691	67	758	27	785
Malaysia	68	346	72	418	57	475	48	523	26	549
Philippines	34	177	31	208	35	243	18	261	7	268
Thailand	39	181	42	223	27	250	13	263	5	268
Vietnam	20	112	32	144	25	169	12	181	7	188

Source: UOB (2020; 2022). *Note:* Oper = Operating

Prior research examining the role of fintech in various ASEAN countries, such as Indonesia, Malaysia and Vietnam, reveals a nuanced landscape with mixed findings regarding whether fintech serves as a complement or a threat to traditional banking systems. Research in Indonesia indicates that although fintech innovations substantially enhance economic growth and financial inclusion, certain banks encounter difficulties in integrating and competing with these new entities, raising concerns regarding their market share and relevance (Maryunita & Nugroho, 2022). For example, the study by Maryunita and Nugroho emphasises that banks may lose customers if they do not adopt fintech innovations, underlining the competitive pressure fintech imposes on existing financial institutions (Maryunita & Nugroho, 2022). Conversely, the analysis by Effendi and Widajatun (2024) suggests that fintech can coexist with conventional banks, potentially enhancing service efficiency, thereby showing that fintech might act more as a complementary force in certain contexts. This pattern is echoed in Malaysian studies, which indicate that users perceive fintech services positively, attributing their satisfaction and usage intentions to perceived ease of use and benefits (Yussof & Al-Harthy, 2020). However, deficiencies in consumer trust and regulatory challenges continue to impede widespread adoption, as evidenced by studies that explore the hesitance among users to fully embrace digital solutions (Yuspita et al., 2019). This complex interplay of variables—ranging from user perceptions to the strategic responses of banks—illustrates recurring themes in the literature, including the importance of user trust, satisfaction and the need for banks to innovate or risk obsolescence. As fintech continues to evolve, understanding these intricate dynamics will be crucial for policymakers and banking institutions in navigating this transformative period (Fidhayanti et al., 2024).

The existing body of research on fintech in the ASEAN context reveals a notable lack of cross-country empirical studies, which limits the understanding of fintech's impact on banking systems across diverse regulatory and economic environments. While recent literature has focused on individual countries, such as Vietnam, Indonesia and Malaysia, these studies often fail to provide comparative analyses that could elucidate regional patterns and variations in fintech activity. Moreover, there is an inconsistency in measuring fintech across various studies, with researchers employing different metrics and frameworks, complicating the generalisation of findings. For instance, the metrics used to quantify fintech adoption and its effects on banking performance vary significantly, affecting the clarity of conclusions drawn (Lozano-Vivas & Pasiouras, 2010; Shi & Lu, 2024). Additionally, many studies neglect the COVID-19 pandemic as a crucial shock or moderator in their analyses, missing out on how this unprecedented scenario uniquely influenced fintech growth and its interactions with traditional banks (Wu & Kao, 2022). Finally, differences in bank sizes, which may critically affect how institutions adapt to or compete with fintech, remain under-explored within fintech impact studies. Understanding how varying bank sizes influence the effects of fintech could provide deeper insights into the competitive landscape and strategic responses required within the sector (Elsaid, 2023). This deficiency in the literature highlights the necessity for more comprehensive, cross-national research methodologies that account for many elements, particularly the evolving context established by the pandemic crisis which was trigged since the beginning of 2020.

This study's goal is to investigate how the presence of fintech firms affects bankers' profitability in Indonesia, Malaysia, the Philippines, Thailand and Vietnam (so-called ASEAN-5) from 2017 to 2021, encompassing the pandemic period that occurred since the end of 2019. Specifically, the research evaluates the influences of fintech on key business metrics of bankers, namely ROA and ROE, providing a comprehensive understanding of banks' financial health in the context of fintech competition. The study also seeks to examine the variations in the effects of fintech according to bank size, acknowledging that larger banks may face distinct competitive pressures relative to smaller entities. Concurrently, it will evaluate the impact of COVID-19 as a moderator, examining how the pandemic has modified the correlations between fintech activities and bank performance, possibly redefining the competitive dynamics within the financial sector (Liem et al., 2022; Sapulette et al., 2022). This work also identifies several deficiencies

in the current literature, notably the few cross-national empirical studies in the ASEAN setting and the discrepancies in assessing fintech activity across different investigations (Riaz et al., 2023). By focusing on these critical aspects, the study seeks to considerably increase insights into fintech's disruptive impact on banks across ASEAN.

Academically, this work is expected to provide novel insights of the fintech businesses' influences on banks' profitability across the ASEAN-5 in the time frame of 2017–2021, specifically throughout the period influenced by COVID-19. Conducting this study, a cross-country panel analysis of 57 banks using the Generalised Method of Moments (GMM) is used to empirically investigate the relationship between fintech presence and bank business metrics, as measured by ROA and ROE, in support of Zheng et al. (2022). The theoretical framework is anchored in consumer theory and disruptive innovation theory, allowing for a comprehensive assessment of how fintech may act as a disruptive force or a complementary service to traditional banking (Buchak et al., 2018). Additionally, this study will explore differences in the fintech impact based on bank size, recognising that large and small banks may experience varying degrees of challenge and opportunity in the fintech-dominated landscape (Rohman & Nurkhin, 2023). The role of COVID-19 as a moderating factor will also be thoroughly examined, addressing the unique shock that may have influenced both banks and fintech firms during this critical period (Xiazi & Shabir, 2022; Miklaszewska et al., 2021). This comprehensive approach addresses the literature deficiencies concerning the interplay between fintech and banking performance during a global crisis, while also offering practical insights for policymakers, banks and fintech stakeholders, thus enhancing strategic decision-making in the sector (Nurkhin et al., 2024).

LITERATURE REVIEW

Fintech and Fintech Firms

Indeed, Puschmann (2017) claims that the term "financial technology", short for "fintech", reflects the IT-induced transformation in the global financial service industry, especially in banking. Four key areas of fintech consist of Artificial Intelligence, blockchain, cloud computing and big data (Lai et al., 2020). Furthermore, Yang and Zhang (2022, p. 5) argue that

"internet-enabled technology such as mobile transactions, cloud computing, social networks and search engines has led to fundamental changes in the ways finance is shaped." More practically, both Lin (2016) and Van Loo (2018) agree that fintech refers to financial enterprises using new technology to deliver their services to customers as their competitive advantage. As a consequence, the consumption and payment that takes place on fintech platforms have become more popular in China and the banking system of this country with the largest population has been reformed (Yang & Zhang, 2022; Zhao et al., 2022b).

Gomber et al. (2017) assert that advancements in fintech have rendered fintech businesses indispensable, upset the financial system and revolutionising the provision, utilisation and integration of services. In contrast to conventional financial institutions, frequently limited by outdated systems, fintech firms utilise advanced technologies to deliver more user-centric, efficient and tailored services (Mittal et al., 2025). Haddad and Hornuf (2019) argue that these businesses often operate in niche markets, focusing on specific financial services, e.g., peer-to-peer loan, e-payments, and cryptocurrency exchanges. Furthermore, fintech companies frequently partner with, rather than rival, conventional financial institutions (Arnaut & Bećirović, 2023; Suprun et al., 2020). These collaborations are particularly prevalent in sectors such as banking, where financial institutions securely share consumer data with fintech companies to deliver more integrated and seamless experiences (Brodsky & Oakes, 2017). Consequently, the presence of fintech businesses provides innovative solutions for banking inclusion through mobile banking applications, e-wallets and alternative loaning or lending platforms (Agarwal & Zhang, 2020; Elsaid, 2023), connecting the unbanked with financial institutions. As these companies expand, regulatory frameworks are being modified to guarantee consumer safety and financial stability. The equilibrium between fostering innovation and maintaining regulatory control is a significant problem for policymakers globally (Arner et al., 2015).

To sum up, there are various ways to understand the term fintech firm. Based on previous studies, this study defines a fintech firm as a start-up that utilises disruptive technologies to provide financial products, positioning itself as a competitor to conventional financial organisations. Consequently, fintech companies' expansion may adversely impact bank performance by attracting bank clientele and diminishing market share.

The Influences of Fintech Firms on Bankers' Performance

Academically, many scholars have examined the influences of fintech firms on bankers' performance. Through Google Scholar, Elsaid (2023) gathers numerous studies belonging to the Scopus and SSRN databases for the review study, which focused on assessing fintech enterprises' impacts on the banking industry. The existing studies also show that fintech companies are penetrating the market share of conventional banks, but they play the role of a supplement rather than a substitute bank. In addition, fintech firm existing is an acceleration factor for banking digitalisation to compete with financial companies. Furthermore, both banks and fintech firms benefit from the collaboration strategy, positively influencing the finance market and enhancing customer satisfaction. Review studies conducted by Anagnostopoulos (2018) and Gomber et al. (2017) concurred that fintech businesses pose both threats and opportunities for commercial banks. Fintech companies adversely impact existing bankers; nonetheless, they foster innovation in product offerings and internal processes for banking advancement.

Indeed, the quantitative research of the fintech firms' influences on commercial bankers' performance vary in scope, variable measurement and data analysis, as well as estimation results. Firstly, from the facet of the scope, many researchers (such as Dwivedi et al., 2021; Iman, 2019; Wang et al., 2021; Zhao et al., 2022a) investigate in an individual country such as UAE, Indonesia or China, while others (such as Almulla & Aljughaiman, 2021; Ky et al., 2019; Nguyen et al., 2022) expand their studies across-nation experiments (such as Gulf Cooperation Countries and East African Community) are conducted by. Secondly, from the perspective of variable measurement, the fintech firms' performance variable is measured by number of mobile money transfer and internet services (Mustapha, 2018), fintech credit (Cornelli et al., 2020), Global Fintech adoption index (Al-Matari et al., 2022), self-constructed fintech index (Cheng & Qu, 2020); while bank performance is proxied by bank profitability (Phan et al., 2020), bank efficiency (Varma & Nijjer, 2022), banking customer satisfaction (Carbó-Valverde et al., 2020), bank stability (Ky et al., 2019), etc. Thirdly, for data analysis techniques, the popular methods used are Pearson correlation test (Agboola et al., 2019), a two-step generalised method of moment (Lee et al., 2021; Phan et al., 2020), SWOT and PESTEL (Pu et al., 2021), ordinary least squares method (Jagtiani & Lemieux, 2018), Granger causality test

(Li et al., 2020). Finally, the anticipated outcome illustrates that fintech businesses have positive effects on bankers' performance, as evidenced by Al-Matari et al. (2022) and Zhao et al. (2022a). Conversely, Stulz (2019) and Varma and Nijjer (2022) explore their negative effects on bankers' profitability. However, Asmarani and Wijaya (2020) and Wang et al. (2021) indicate that this negative effect is in U-shaped but insignificant.

This work builds upon previous research by Almulla and Aljughaiman (2021) and Ky et al. (2019) on cross-country analyses, as well as Phan et al. (2020) related to the fintech business variable, to investigate the influence of fintech on bank performance from many perspectives. The research utilises the data collection methods and analytical techniques of Lee et al. (2021) and Phan et al. (2020) to evaluate the influence of fintech enterprises on banking performance. The dataset includes the duration of the COVID-19 pandemic, allowing the study to identify potential differences in the influence of fintech companies on bank performance between the pre-COVID-19 and during-COVID-19 periods. This method is a novel addition, enhancing the knowledge base in the fields of fintech and banking performance.

Hypothesis Development

This study formulates its hypothesis by including the Consumer theory, posited by Aaker and Keller (1990) and the Disruptive innovation theory, articulated by Christensen (1997), while also endorsing the research done by Almulla and Aljughaiman (2021) and Elsaid (2023). According to Aaker and Keller (1990), the Consumer theory argue that consumers shift to newer products that are more competitive than their predecessors. While, in his theory, Christensen (1997) explains that new entrants, who proactively adopt disruptive technologies, has a competitive advantage over established incumbents within the sector.

In the context of this study, we assert that in the banking industry, fintech firms represent new entrants that pose a significant threat to commercial banks (Milian et al., 2019; Vives, 2017). Furthermore, Lee and Shin (2018) highlight that fintech firms are more cost-effective compared to traditional commercial banks. This suggests that fintech companies can offer more advanced products that excel in user experience, pricing and convenience

compared to the services provided by commercial banks (Arner et al., 2015). Therefore, these theories support the assumption that the increasing number of fintech firms may result in a wider range of fintech products, potentially exerting a negative impact on commercial banks. Additionally, it is implied that banking customers are increasingly inclined to use fintech products over traditional banking services, leading to a decline in bank profits and overall performance.

Practically, the reports by UOB (2020; 2022) reveal that in ASEAN, fintech is a remarkable and inexplicable phenomenon, which significantly influences the whole economy and banking industry included. The growth of fintech firms has changed banking customer behaviors as both positive and negative factor for incumbents in the finance market. In the specific case study, Pham et al. (2021), Phan et al. (2020), and Schellhase and Garcia (2019) demonstrate the negative impacts of fintech firms on bank accomplishment in Vietnam, Indonesia and the Philippines. Therefore, this investigation is also assumed that the increased number of fintech firms may decrease bank profitability.

Therefore, this study, utilising consumer theory, disruptive innovation theory and empirical evidence, posits the premise that the presence of fintech businesses adversely impacts bank profitability.

RESEARCH METHOD

Dynamic Panel Models

The studies by Lee et al. (2021), Phan et al. (2020), and Safiullah and Paramati (2024) indicated that the dynamic panel model is highly valued for estimating the effect of fintech on bank performance. This model incorporates lagged bank performance, fintech, lagged fintech, bank-specific characteristics and macroeconomic conditions. Lagged bank performance reflects that banks with strong past performance may continue to benefit from established customer relationships, operational efficiency and favourable market positioning. Meanwhile, lagged fintech captures the delayed impact of fintech development, as banks and customers require time to adapt to new entrants. This delay means that the effects of fintech are not immediate and competitive pressures introduced by fintech can influence

bank performance in subsequent periods. Based on these foundations, the conceptual model is proposed as follows:

$$PRO_{it} = \alpha_i + \beta_1 FIN_t + \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \quad (1)$$

$$PRO_{it} = \alpha_i + \beta_2 FIN_{t-1} + \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \quad (2)$$

Where, PRO_{it} is the dependent variable of the bank-level that comprises the ROA and ROE of bank ith at time t; FIN_t is the independent variable representing the presence of fintech businesses, which serves as a proxy for fintech firms at time t; $BANK_{it}$ is the set of bank-specific variables serving as control variables, represented by total assets (SIZE), leverage (LEV), loans (LOAN), and deposits (DEPO) of bank i at time t; MAR_t is the macroeconomic situation including the gross domestic product (GDP) growth rate and the consumer price index (CPI) at time t; and $\varepsilon_{it} = \mu_i + \sigma_{it}$ representing the bank-specific impact and the idiosyncratic error term.

In December 2019, the inaugural verified case of COVID-19 was identified in Wuhan, China; COVID-19 has proliferated swiftly to adjacent nations and beyond, including ASEAN. According to Bao and Huang (2021) and Demirgüç-Kunt et al. (2021), COVID-19 has a substantial effect on the fintech and financial sectors. Consequently, the COVID-19 variable is incorporated into the estimate model to examine its impact on the link between fintech businesses and bank profitability.

Motivated by existing studies, such as of Phan et al. (2020) on estimation models, Zhang et al. (2020) on the moderating role of COVID-19 in financial relationships, and Fu and Mishra (2022) highlighting how fintech responded during COVID-19, the models are formulated as follows:

$$\begin{aligned} PRO_{it} = {} & \alpha_i + \beta_3 FIN_t * COV + \beta_4 FIN_t * (1 - COV) \\ & + \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \end{aligned} \quad (3)$$

$$\begin{aligned} PRO_{it} = {} & \alpha_i + \beta_5 FIN_{t-1} * COV + \beta_6 FIN_{t-1} * (1 - COV) + \\ & \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \end{aligned} \quad (4)$$

Where *COV* represents the COVID-19 factor, a dummy variable, a dummy variable that assumes a value of 1 if the year is subsequent to 2019, and 0 otherwise.

In detail, $FIN_t * COV$ directly captures how fintech firms impact bank performance during the pandemic, while $FIN_t * (1 - COV)$ is the fintech effect in the pre-COVID-19 period, ensuring distinct interpretations for these two phases. Following Wooldridge (2010), this structure allows for a direct comparison of the fintech effect across periods, helping to identify whether fintech activity is more beneficial or disruptive to banks during crises compared to normal times.

Haller and Siedschlag (2011), Phan et al. (2020) and Scott et al. (2017) assert that company size significantly affects the relationship between technological innovation and firm success. Consequently, small enterprises exhibit greater proactivity than large corporations in assimilating technical innovations. Fintech is seen as a technology breakthrough that profoundly impacts the established entities within the finance sector (Thakor, 2020). This hypothesis suggests that the disparity in bank size may influence the reciprocal link between the fintech presence and banking profitability.

Utilising the formulations in Equations (3) and (4), the estimate models designed to analyse the impact of bank size on the link between fintech businesses and bank performance are articulated as follows:

$$PRO_{it} = \alpha_i + \beta_7 FIN_t * SCA + \beta_8 FIN_t * (1 - SCA) + \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \quad (5)$$

$$PRO_{it} = \alpha_i + \beta_9 FIN_{t-1} * SCA + \beta_{10} FIN_{t-1} * (1 - SCA) + \gamma PRO_{i,t-1} + \delta BANK_{it} + \theta MAR_t + \varepsilon_{it} \quad (6)$$

Based on the study conducted by Phan et al. (2020), *SCA* denotes the disparity in bank size, a dummy variable, of which value is 1 where the bank is belonging to the top half of the total asset ranking, and 0 otherwise (at the bottom half). In detail, $FIN_t * SCA$ captures the impact of large banks, while $FIN_t * (1 - SCA)$ represents the impact of small banks.

The estimation results of $\beta_1 \rightarrow \beta_{10}$ are the main task of this study, which will be reported and discussed mainly to clarify the influences of fintech firms on bankers' profitability. The specifications of the variable definitions are provided in Table 2.

TABLE 2
Variable definitions

Variable		Definition
ROA	Bank profitability (PRO)	Return on assets
ROE		Return on equity
FIN	Fintech firms	The logarithm of the number of fintech operating firms
SIZE	Bank characteristics (BANK)	The logarithm of total assets (million US dollars)
LEV		Liability on equity
LOAN		Loans on total assets
DEPO		Deposits on total assets
GDP	Macroeconomics (MAR)	The annual percentage growth rate of GDP
INF		The annual consumer price index
COV	COVID-19 pandemic	Equals 1 if the year is after 2020 and 0 otherwise
SCA	Difference in bank scale	Equal 1 if the bank is in the top half of total assets ranking, 0 otherwise

Data Collection

The data on fintech firms active from 2017 to 2021 is sourced from the UOB Group, which offers substantial statistics on fintech companies in ASEAN-5. The banks publish audited financial statements on their websites, which are aggregated and utilised to compute bank-level variables. The macroeconomic variables are sourced from the World Bank.

Following Banna and Alam (2021), Singapore is one of the best hubs of the finance market around the world, where digital financial inclusion is dramatically better than others in Southeast Asia. Additionally, UOB (2020; 2022) provided that the size of the fintech industry in Singapore is significantly larger than in other countries. Therefore, to mitigate bias estimation, we formulate a dataset that excludes Singapore.

Regarding the bank size ranking, the USD is used for uniformity due to the difference in the currency unit of the financial statements between countries. On 24 May 2022 (UTC 13:45–13:50), the exchange rates on Google were as follows: USD/VND = 23,220.01 (Vietnam), USD/THB = 34.14 (Thailand), USD/PHP = 52.33 (Philippines), USD/MYR = 4.40 (Malaysia) and USD/IDR = 14,645.10 (Indonesia), which are utilised for currency conversion. The total assets are categorised and delineated by the median (USD18,217 million) upon translation to USD. The upper section represents the big bank, while the lower section depicts the small one.

The data were collected from 57 banks in ASEAN-5 for the study, spanning 2017 to 2021, contingent upon data collection capability and availability. The descriptive statistics are shown in Table 3.

TABLE 3
Descriptive statistic

Variable	Mean	S. D.	Min	Max
ASEAN-5				
ROA	0.015227	0.098118	–0.0378471	0.0469816
ROE	0.1380351	0.0901	–0.4040902	0.3423277
FIN	5.613676	0.5373919	4.718499	6.665684
SIZE	9.95687	1.194094	6.024508	12.21532
LEV	8.870634	3.723201	2.92407	23.61981
LOAN	0.6317094	0.0923201	0.2969801	0.7931857
DEPO	0.7123989	0.0920203	0.4417849	0.8838887
GDP	0.0327592	0.0434976	–0.0957303	0.0707579
INF	0.0232409	0.0144665	–0.011387	0.052116
Malaysia				
ROA	0.0112506	0.0059819	–0.0204697	0.0180077
ROE	0.1080848	0.0630745	–0.2234388	0.1851476
FIN	6.122583	0.1686665	5.846439	6.308098
SIZE	10.87293	0.8692008	9.482151	12.21532
LEV	8.691778	1.366388	6.214879	11.52453
LOAN	0.673379	0.0499534	0.5977756	0.7737126
DEPO	0.7323931	0.0515323	0.6492881	0.8220487
GDP	0.0251009	0.0422351	–0.0564694	0.0581272
INF	0.0135144	0.0172517	–0.011387	0.038712
Philippines				
ROA	0.0150714	0.0066577	0.0006166	0.0469816
ROE	0.1396047	0.0675941	0.0048665	0.3423277
FIN	5.432451	0.1567407	5.17615	5.590987
SIZE	9.578516	1.021224	7.504522	11.14544
LEV	8.412424	3.0234	4.29456	18.58786
LOAN	0.5611424	0.0844585	0.3637228	0.7053493
DEPO	0.7682315	0.0762651	0.5952203	0.8838887
GDP	0.0308787	0.0639378	–0.0957303	0.0693099
INF	0.033603	0.010131	0.0248028	0.052116
Thailand				
ROA	0.016514	0.0089234	–0.0021049	0.0348604
ROE	0.1331416	0.0695534	–0.0214516	0.3094484

(*Continued on next page*)

TABLE 3 (*Continued*)

Variable	Mean	S. D.	Min	Max
FIN	5.458054	0.1460189	5.198497	5.590987
SIZE	10.3353	1.090157	8.817085	11.75137
LEV	7.339021	1.182406	4.913099	9.653922
LOAN	0.6907528	0.0704027	0.5133452	0.7931857
DEPO	0.682609	0.080377	0.4628728	0.805965
GDP	0.0123167	0.038401	–0.0609898	0.0418959
INF	0.0056414	0.0074335	–0.0084594	0.012304
Indonesia				
ROA	0.0162373	0.0156771	–0.0378471	0.039655
ROE	0.0854422	0.1278783	–0.4040902	0.2253602
FIN	6.457894	0.2144042	6.086775	6.665684
SIZE	9.707424	1.707843	6.024508	11.67699
LEV	5.697366	2.027367	2.92407	12.55196
LOAN	0.6259485	0.0869914	0.2969801	0.7469075
DEPO	0.7166046	0.0589582	0.5904647	0.81157
GDP	0.0337724	0.0280503	–0.0206954	0.0517429
INF	0.0270377	0.0084433	0.0156013	0.038088
Vietnam				
ROA	0.0158651	0.0089741	0.001465	0.04086
ROE	0.1912986	0.0741608	0.0119829	0.3297934
FIN	5.05063	0.1907578	4.718499	5.236442
SIZE	9.684994	0.7554771	8.483371	11.23677
LEV	12.60183	4.208378	4.891617	23.61981
LOAN	0.6311858	0.0931197	0.3188186	0.7880603
DEPO	0.6723891	0.1174887	0.4417849	0.8837326
GDP	0.052789	0.0208764	0.0258322	0.0707579
INF	0.0298227	0.006381	0.0183472	0.0353963

Data Analysis

The models proposed above indicate that $PRO_{i,t-1}$ (where the dependent variable is $PRO_{i,t}$)and the characteristics of bank profitability ($BANK_{it}$) are the explanatory variables. These variables are also endogenous in the dynamic panel models, which may result in potential issues of endogeneity and unobserved heterogeneity. Additionally, heteroskedasticity and autocorrelation problems may be present in the panel model (Gujarati & Porter, 2009). The two-step system dynamic GMM, as advocated by Windmeijer (2005), is utilised to resolve these challenges. This method effectively mitigates endogeneity, heteroskedasticity and autocorrelation.

Furthermore, studies by Lee et al. (2021) and Phan et al. (2020) support the utilisation of GMM, as they applied it to estimate similar models in the contexts of Indonesia and China, respectively. Based on these considerations, GMM is deemed a highly appropriate method for investigating fintech firms' effects on bank performance in this study.

In accordance with Gujarati and Porter (2009), the correlation matrix is utilised to assess multicollinearity. The figures in Table 4 demonstrate that the maximum absolute correlation value among variable pairs is below the threshold of 0.8, namely $\left|r_{ROA-ROE}\right|_{max} = 0.7993$, while all other absolute correlation values between variables are under 0.5125. Furthermore, ROE and ROA are two dependent variables that do not exist inside the same model. Consequently, the multicollinearity issue is nonexistent in the model, indicating that these variables are suitable for additional research.

TABLE 4
Correlation matrix

Variable	ROA	ROE	FIN	SIZE	LEV	LOAN	DEPO	GDP	INF
ROA	1.0000								
ROE	0.7993	1.0000							
FIN	–0.0594	–0.3828	1.0000						
SIZE	0.2331	0.1912	0.1460	1.0000					
LEV	–0.3369	0.2078	–0.5125	–0.0450	1.0000				
LOAN	0.2103	0.1808	0.0469	0.2071	0.0049	1.0000			
DEPO	–0.2417	–0.1367	0.1425	0.0191	0.1819	0.0444	1.0000		
GDP	0.0368	0.1240	–0.2671	–0.1196	0.1944	–0.0009	–0.0666	1.0000	
INF	0.0402	0.1121	–0.2389	–0.2687	0.1892	–0.2753	0.1062	0.5301	1.0000

FINDINGS AND DISCUSSIONS

Influence of Fintech Firms on Banker Profitability

Table 5 presents the estimation results about the impact of fintech businesses on bank profitability. The findings of the Wald test, Arellano-Bond test (AR2) and Hansen test indicate that all models are statistically significant. The Wald test indicates that at least one independent variable significantly accounts for the variation in bank profitability. The Arellano-Bond test refutes the null hypothesis of second-order autocorrelation in the first-differenced residuals. The Hansen test indicates the lack of overidentifying limitations in the model.

TABLE 5
Effect of Fintech firms on bank profitability

Variable	ROA	ROA	ROE	ROE
FIN	–0.0033702***	–	–0.0319514***	–
	(–6.10)		(–6.39)	
FIN_{t-1}	–	–0.0030123***	–	–0.0283919***
		(–6.08)		(–5.48)
PRO_{t-1}	0.425244***	0.427303***	0.6083068***	0.618453***
	(14.76)	(15.88)	(32.29)	(34.59)
SIZE	0.0012678***	0.00125***	0.0095556***	0.0095294***
	(9.03)	(9.49]	(8.18)	(8.49)
LEV	–0.0008807***	–0.0008507***	–0.0013649***	–0.0008976**
	(–11.12)	(–12.01)	(–3.65)	(–2.36)
LOAN	0.0312924***	0.0305132***	0.1218712***	0.1079463***
	(10.88)	(10.46)	(5.38)	(4.98)
DEPO	–0.0350596***	–0.0355811***	0.2193337***	–0.2264643***
	(–13.59)	(–14.87)	(–14.18)	(–13.49)
GDP	–0.0048786	–0.0066167*	0.0167292	0.0050458
	(–1.45)	(–1.81)	(0.83)	(0.21)
INF	0.1456512***	0.1491812***	0.8120012***	0.8071385***
	(8.85)	(9.23)	(6.33)	(5.93)

(*Continued on next page*)

TABLE 5 (*Continued*)

Variable	ROA	ROA	ROE	ROE
Cons	0.0251066***	0.0234184***	0.2130858***	0.1979109***
	(5.81)	(6.43)	(6.77)	(7.11)
Wald	22645.97***	23230.73***	122556.00***	68059.28***
AR(2)	0.40	0.47	0.86	0.88
Hansen	41.44	41.42	41.26	41.53

Notes: *, **, and *** is significant value at 10%, 5% and 1%, respectively.

This table reports the estimation results of the models:

$$PRO_{it} = \alpha_i + \beta_1 FIN_t + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_2 FIN_{t-1} + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

PRO is represented by ROA and ROE.

In addition, Table 5 shows that β_1 (or β_{FINt}) and β_2 (or $\beta_{\text{FINt-1}}$) are statistically negative. It can be implied that the increasing prevalence of fintech enterprises may decrease bank profitability. Besides, based on $\left|\beta_{FIN_t}^{ROA}\right| > \left|\beta_{FIN_{t-1}}^{ROA}\right|$ and $\left|\beta_{FIN_t}^{ROE}\right| > \left|\beta_{FIN_{t-1}}^{ROE}\right|$, it may be claimed that the immediate adverse impact of fintech businesses on bank profitability at time *t* is more pronounced than the delayed effect. The findings are consistent with consumer and disruptive technology theories. In practice, it may be inferred that fintech businesses utilise disruptive technology to offer sophisticated financial solutions, which alter banking client behaviour due to the increasing popularity and widespread adoption of fintech products in Southeast Asia.

Furthermore, several worthy findings are found. All γ (or $\gamma_{PRO_{t-1}}$) are considerably positive at the level of 1%, illustrating that if the bank exhibits positive profitability at time *t*, its profitability in the subsequent year will improve and conversely. While all δ_1 (or δ_{SIZE}) are significantly positive at a 1% level. In detail, if *SIZE* increases by 1%, *ROA* increases by about 0.12% ($\delta_{SIZE}^{ROA} = 0.0012678$ and $\delta_{SIZE}^{ROA} = 0.00125$) and ROE increases by about 0.95% ($\delta_{SIZE}^{ROA} = 0.0095556$ and $\delta_{SIZE}^{ROA} = 0.0095294$). Thus, it can be suggested that the bankers may increase their profitability by expanding their scale. However, all (or δ_{LEV}) are significantly negative at the level from 1% to 5%, this means that the capital increase will reduce bank profitability.

In other aspect, δ_3 (or δ_{LOAN}) are significantly positive at a 1% level. It means that bankers may improve bank profitability by extending credit. This research demonstrates its appropriateness for the context of credit development in emerging nations, where a significant portion of the population is unbanked. While, all δ_4 (or δ_{DEPO}) are notably negative at the level of 1%, which reveals the increase in deposits may reduce bankers' profitability. In addition, there is an interesting finding that the corresponding absolute value of δ_{DEPO} is higher than δ_{LOAN} (or $\left|\delta_{DEPO}\right| > \left|\delta_{LOAN}\right|$, correspondingly and details can be found in Table 5). This means that bankers' profitability is more sensitive to deposit (or deposit interest rate) than loan (or loan interest rate). The contemporaneous change of the uptrend may lessen bank profitability rather than the downtrend.

One another finding is that all θ_2 (or θ_{INF}) are significantly positive at a 1% level, while only one (or) is significantly negative at a 10% level (weakly). It demonstrates that bank profitability is more sensitive to inflation (significant link to interest rate) than GDP. The increase in inflation improves the profitability of banks. In the sample, we argue that there is proper inflation in ASEAN-5, namely $INF_{mean}^{ASEAN-5} = 2.3\%$, $INF_{mean}^{MALAYSIA} = 1.35\%$, $INF_{mean}^{Philippines} = 3.36\%$, $INF_{mean}^{Thailand} = 0.006\%$, $INF_{mean}^{Indonesia} = 2.7\%$ and $INF_{mean}^{Vietnam} = 2.98\%$, which facilitates bank development.

Effect of Fintech Firms on Bank Profitability Sorted by Bank Scale Under COVID-19 Impact

Similarly to Table 5, all the estimation results of the Wald test, Arellano-Bond test (AR2) and Hansen test in Table 6 provide that all models are significant.

TABLE 6
Effect of fintech firms on bank profitability sorted by scale and COVID-19

Panel A: Sorted by bank scale				
Variable	**ROA**	**ROA**	**ROE**	**ROE**
FIN*SCA	–0.0031497***		–0.0328412***	
	(–5.16)		(–6.62)	
FIN*(1-SCA)	–0.003166***		–0.0325979***	
	(–4.67)		(–6.16)	
FIN_{t-1}*SCA		–0.0028765***		–0.0261301***
		(–7.52)		(–5.28)
FIN_{t-1}*(1-SCA)		–0.0032325***		–0.0288389***
		(–7.93)		(–5.69)
Wald	84555.86***	38280.54***	113671.95***	137354.91***
AR(2)	0.41	0.42	0.86	0.87
Hansen	41.78	42.70	41.46	40.72
Obs.	228	228	228	228

(*Continued on next page*)

TABLE 6 (*Continued*)

Panel B: Sorted by COVID-19				
Variable	**ROA**	**ROA**	**ROE**	**ROE**
FIN*COV	–0.0033717***		–0.0346858***	
	(–5.74)		(–6.67)	
FIN*(1-COV)	–0.0034768***		–0.0355393***	
	(–5.92)		(–6.87)	
FIN_{t-1}*COV		–0.0034967***		–0.0381197***
		[–6.84]		[–7.29]
FIN_{t-1}*(1-COV)		–0.0038008***		–0.0405926***
		[–7.14]		[–7.65]
Wald	24665.55***	19184.78***	244813.74***	473660.02***
AR(2)	0.36	0.37	0.85	0.82
Hansen	42.79	46.80	42.88	49.95

Notes: *, **, and *** is significant value at 10%, 5%, and 1%, respectively. This table reports the value and t-statistic value of β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9, and β_{10} of the estimation results of the models:

$$PRO_{it} = \beta_i + \beta_3 FIN_t * COV + \beta_4 FIN_t * (1 - COV) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_5 FIN_{t-1} * COV + \beta_6 FIN_{t-1} * (1 - COV) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_7 FIN_t * SCA + \beta_8 FIN_t * (1 - SCA) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_9 FIN_{t-1} * SCA + \beta_{10} FIN_{t-1} * (1 - SCA) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

PRO is represented by ROA and ROE.

Figures in Table 6 also show that all β_3, β_4, β_5 and β_6, (or $\beta_{FIN*SCA}$, $\beta_{\text{FIN*(1–SCA)}}$, $\beta_{FIN_{t-1}*SCA}$ and $\beta_{FIN_{t-1}*(1-SCA)}$, respectively) are significantly negative at a 1% level. It indicates that both large and small banks are negative with the existence of fintech firms. Additionally, the outcomes of $\left|\beta^{ROA}_{FIN*SCA}\right| < \left|\beta^{ROA}_{FIN*(1-SCA)}\right|$, $\left|\beta^{ROA}_{FIN_{t-1}*SCA}\right| < \left|\beta^{ROA}_{FIN_{t-1}*(1-SCA)}\right|$ and $\left|\beta^{ROE}_{FIN_{t-1}*SCA}\right| < \left|\beta^{ROE}_{FIN_{t-1}*(1-SCA)}\right|$ present a compelling discovery that fintech companies' influence on the profitability of small banks surpasses that of larger banks. It may be inferred that small banks have heightened sensitivity to technological innovation, resulting in a more pronounced influence of fintech on their assets compared to bigger banks. The results correspond with the studies of Phan et al. (2020) and Scott et al. (2017), which assert that small firms have heightened proactivity in embracing technological advancements relative to bigger organisations. In addition, large banks may easily profit through expanding economies of scale with lower capital costs and reputation (Berger, 1995). On the basis of that, it can be inferred when there is a technological transformation, large banks slowly react, negatively influencing their profitability, especially profit on capital.

The study results also show that β_7, β_8, β_9 and β_{10}, (or $\beta_{FIN*COV}$, $\beta_{\text{FIN*(1–COV)}}$, $\beta_{FIN_{t-1}*COV}$ and $\beta_{FIN_{t-1}*(1-COV)}$, respectively) have the significant negative at the level of 1%. It reveals that in both stages of pre- and during COVID-19, the existence of fintech firms may have a negative impact on bank profitability, which is stronger for pre-COVID-19 compared to that during COVID-19 time ($\left|\beta^{ROA,ROE}_{COV*SCA}\right| < \left|\beta^{ROA,ROE}_{COV*(1-SCA)}\right|$ and $\left|\beta^{ROA,ROE}_{COV_{t-1}*SCA}\right| < \left|\beta^{ROA,ROE}_{COV_{t-1}*(1-SCA)}\right|$). The findings additionally show that the bank profitability before COVID-19 is higher than during COVID-19 ($ROA^{Covid}_{mean} = 0.013658 < ROA^{pre-Covid}_{mean} = 0.01441$ and $ROE^{Covid}_{mean} = 0.126681 > ROE^{pre-Covid}_{mean} = 0.137054$), which means that COVID-19 may reduce bankers' profitability during social distancing time. It is consistent with the study by Demirgüç-Kunt et al. (2021) on the negative effect of COVID pandemic on bank performance. Besides, a comparison of the value between β_7, β_8, β_9 and β_{10}, it is explored that the noteworthy finding that COVID-19 is a critical factor which may mitigate the negative effect of fintech firms on bank profitability.

Robustness Check by Alternative Fintech Variables

A robustness check is conducted utilising different fintech variables from newly established fintech enterprises and the development rate of operational fintech companies to enhance the evaluation of the influence of fintech firms on bank profitability. Table 7 outlines the definitions and characteristics of two variables (NEW and GOPER), indicating that the relationship between these alternative variables (independent and dependent) is appropriate for future investigation.

TABLE 7
Characteristics of alternative variables

Panel A: Variable characteristics					
Variable	**Definition**	**Mean**	**SD**	**Min**	**Max**
NEW	Logarithm of newly registered fintech firms	3.331979	0.8411941	1.609438	4.955827
GOPER	Growth rate of fintech operating firms	0.1288007	0.0872941	0.0190114	0.325

Panel B: Correlation								
Variable	**ROA**	**ROE**	**SIZE**	**LEV**	**LOAN**	**DEPO**	**GDP**	**INF**
NEW	–0.0026	–0.2083	0.0063	–0.2699	0.1179	0.0432	0.1946	0.0761
GOPER	0.0661	0.0431	–0.1068	0.0643	0.1103	–0.0886	0.4628	0.2829

Furthermore, Table 8 indicates that the estimation findings validate the adverse impact of fintech businesses on bank performance, with a more pronounced effect on small banks relative to large banks. In addition, it is interesting to discover that regards the impact of the stronger alternative variable of fintech firms (new registered fintech firms and the growth rate of fintech firms) on bankers' profitability during pandemic time compared to before COVID-19. The finding shows that COVID-19 is an acceleration factor that negatively influences bank profitability. The finding implies that COVID-19 affects changing banking customer behaviour because banking customers adopt and prefer fintech products instead of convention banking products. Therefore, it can be concluded that COVID-19 may be one of factors that decreases bank profit. This finding also support the research findings of Bao and Huang (2021), which argue that COVID-19 pandemic factor increases credit risks, which erodes bank profits.

TABLE 8
Effect of Fintech alternative variables on bank profitability

Variable	New registered fintech firms		Growth rate of fintech firms	
	ROA	**ROE**	**ROA**	**ROE**
FIN	–0.0010254***	–0.0127049***	–0.0049701***	–0.0717967***
	[–5.09]	[–9.34]	[–3.02]	[–5.31]
FIN_{t-1}	–0.0018957***	–0.0200573***	–0.0035586	–0.0472607**
	[–7.17]	[–10.69]	[–1.62]	[–2.48]
FIN*SCA	–0.0009255***	–0.011473***	–0.0028333*	–0.0577468***
	[–4.79]	[–7.46]	[–1.68]	[–3.54]
FIN*(1-SCA)	–0.001181***	–0.0141646***	–0.0078866***	–0.0819935***
	[–5.51]	[–9.86]	[–4.70]	[–5.29]
FIN_{t-1}*SCA	–0.0015938***	–0.0173545***	–0.0061646*	–0.0964063***
	[–6.54]	[–7.85]	[–1.95]	[–3.95]
FIN_{t-1}*(1-SCA)	–0.0021635***	–0.0213119***	–0.0006556	0.0149685
	[–7.85]	[–11.22]	[–0.31]	[0.60]
FIN*COV	–0.0026908***	–0.0253969***	–0.0751601***	–0.6701999***
	[–6.35]	[–10.19]	[–7.20]	[–12.45]
FIN*(1-COV)	–0.0016921***	–0.016694***	–0.0129737***	–0.1454577***
	[–6.56]	[–11.00]	[–5.73]	[–9.74]
FIN_{t-1}*COV	–0.0022646***	–0.0205111***	–0.0353529**	–0.287991***
	[–5.68]	[–4.30]	[–2.46]	[–2.95]
FIN_{t-1}*(1-COV)	–0.0020862***	–0.0196498***	–0.0129282***	–0.1209459***
	[–6.41]	[–5.47]	[–2.87]	[–3.90]

Notes: *, **, and *** is significant value at 10%, 5%, and 1%, respectively. This table reports the value and *t*-statistic value of β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9 and β_{10} of the estimation results of the models:

$$PRO_{it} = \alpha_i + \beta_1 FIN_t + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_2 FIN_{t-1} + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_3 FIN_t * COV + \beta_4 FIN_t * (1 - COV) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_5 FIN_{t-1} * COV + \beta_6 FIN_{t-1} * (1 - COV) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_7 FIN_t * SCA + \beta_8 FIN_t * (1 - SCA) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

$$PRO_{it} = \alpha_i + \beta_9 FIN_{t-1} * SCA + \beta_{10} FIN_{t-1} * (1 - SCA) + \gamma PRO_{i,t-1} + \delta_1 SIZE_{it} + \delta_2 LEV_{it} + \delta_3 LOAN_{it} + \delta_4 DEPO_{it} + \theta_1 GDP_t + \theta_2 INF_t + \varepsilon_{it}$$

PRO is represented by ROA and ROE. The estimation results of the Wald test, Arellano-Bond test (AR2) and Hansen test provide that all models are significant. FIN consists of New registered fintech firms (NEW) and Growth rate of fintech firms (GOPER).

CONCLUSION

This article offers empirical information regarding the correlation between the existence of fintech businesses and the profitability of commercial banks in the ASEAN-5 throughout the period from 2017 to 2021, which includes the COVID-19 epidemic time. The analysis utilised a dynamic panel data model based on Consumer theory and Disruptive innovation theory, employing the two-step (GMM) estimator. The research findings consistently demonstrate that the proliferation of fintech companies correlates with a statistically significant reduction in bankers' profitability, as assessed by ROA and ROE.

Importantly, the results reveal two key moderating dynamics. First, the adverse impact of fintech competition is more pronounced for smaller banks than for larger institutions. This suggests that smaller banks, lacking the scale, capital, or technological infrastructure to effectively respond to fintech-driven disruption, are more vulnerable to market share erosion. Second, the COVID-19 pandemic amplified these effects, accelerating consumer adoption of digitalisation for financial services and further weakening the competitive position of traditional banks. However, comparative analysis also shows that while fintech firms had a negative impact during both before and after pandemic periods, the magnitude of the effect was slightly mitigated during the pandemic, potentially due to increased demand for all forms of financial services during the crisis.

This research enhances the academic literature in several aspects. First, it addresses the scarcity of cross-country empirical studies on fintech's impact within the ASEAN context. Existing research tends to be country-specific, limiting generalisability across the region. Second, it enhances theoretical understanding by integrating consumer and innovation theories into the analysis of digital disruption in banking. Third, by incorporating the COVID-19 shock and analysing differential effects by bank size, it offers a deeper understanding of how macroeconomic and institutional factors condition the fintech–bank profitability relationship.

From a policy perspective, the findings offer several implications. Regulators should consider frameworks that promote synergies rather than rivalry between banks and fintech firms. Regulatory sandboxes and open banking initiatives may facilitate innovation while preserving financial stability. For fintech investors, the results suggest the need to focus on sustainable scaling strategies that complement the existing financial ecosystem rather than aggressively displacing it. Commercial banks, particularly small and mid-sized institutions, should accelerate digital transformation efforts and consider strategic partnerships with fintech firms to integrate innovative technologies, e.g., AI, blockchain, IoT and mobile platforms, into their service offerings.

Nonetheless, the study is subject to certain limitations. The use of the number of fintech firms as a proxy for fintech activity may not fully capture the diversity and intensity of fintech operations. Similarly, relying solely on accounting-based profitability indicators may not reflect broader market performance or innovation outcomes. Future research could benefit from incorporating alternative fintech metrics, such as transaction volume, funding raised or user adoption rates, as well as additional bank performance indicators, including market valuation, efficiency ratios or risk-adjusted returns.

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