

Almulla, Dur; Aljughaiman, Abdullah A.

Article

Does financial technology matter? Evidence from an alternative banking system

Cogent Economics & Finance

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Almulla, Dur; Aljughaiman, Abdullah A. (2021) : Does financial technology matter? Evidence from an alternative banking system, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 9, Iss. 1, pp. 1-21, <https://doi.org/10.1080/23322039.2021.1934978>

This Version is available at:

<https://hdl.handle.net/10419/270106>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Does financial technology matter? Evidence from an alternative banking system

Dur Almulla & Abdullah A. Aljughaiman |

To cite this article: Dur Almulla & Abdullah A. Aljughaiman | (2021) Does financial technology matter? Evidence from an alternative banking system, Cogent Economics & Finance, 9:1, 1934978, DOI: [10.1080/23322039.2021.1934978](https://doi.org/10.1080/23322039.2021.1934978)

To link to this article: <https://doi.org/10.1080/23322039.2021.1934978>



© 2021 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.



Published online: 09 Jun 2021.



Submit your article to this journal [↗](#)



Article views: 6020



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 9 View citing articles [↗](#)



Received: 15 February 2021
Accepted: 21 May 2021

*Corresponding author: Abdullah A. Aljughaiman, Finance Department, Business School, King Faisal University, Al-ahsa 36363, Saudi Arabia
E-mail: abjuqhaiman@kfu.edu.sa

Reviewing editor:
Vassilios Papavassiliou, University College Dublin, Dublin, IRELAND

Additional information is available at the end of the article

FINANCIAL ECONOMICS | RESEARCH ARTICLE

Does financial technology matter? Evidence from an alternative banking system

Dur Almulla¹ and Abdullah A. Aljughaiman^{1*}

Abstract: The purpose of this study is to examine the impact of the financial technology (fintech) services provided by banks on their performance. We also investigate the influence of fintech firms' growth (as competitor firms) on banks' financial performance. We extend our analysis to investigate the differences between conventional banks (CBs) and Islamic banks (IBs) in this relationship and utilise a sample of 40 listed banks from Gulf Cooperation Countries, where fintech growth was impressive in the period 2014–2019. We find a negative relationship between fintech services and bank performance for both types of bank. Furthermore, we show that the growth of fintech firms in a country negatively influences CBs' financial performance but has no significant impact on IBs' performance. In addition, we test our hypotheses through multiple additional tests and robustness tests, such as the generalised method of moments. The findings could be relevant to banks, policy makers, and academic research.

Subjects: Technology; Finance; Banking

Keywords: Fintech services; fintech firms; Islamic banks; conventional banks; financial performance

Subjects: G20; G21

ABOUT THE AUTHOR

Abdullah A. Aljughaiman is an assistant professor of finance at King Faisal University, Saudi Arabia. He is the vice dean of scientific research for Business school. He received his PhD in finance from Newcastle University, United Kingdom. His research focuses on corporate finance, corporate governance, and risk-taking. His Publications appear in number of journals such as *Journal of Accounting and Public Policies* and *International Review of Financial Analysis*.

PUBLIC INTEREST STATEMENT

Information technology has become an integral part of societies, and it integrated with number of different sectors. One of the most important sectors that information technology merge with is the financial services. The emergence of information technologies and financial services has become a new topic, that refer to Financial technology (fintech). Fintech is a technical financial tool that has led to new innovations in business models, applications, products, and services merging. Currently, fintech are primary tools for financial services' clients through which they can have their financial services done. In this study, we examine the association between the financial technology (fintech) services provided by banks and their performance. We also investigate the influence of fintech firms' growth (as competitor firms) on banks' financial performance. The paper also examines the differences between conventional banks (CBs) and Islamic banks (IBs) in this relationship.

1. Introduction

In the past few years, the world has witnessed the Fourth Industrial Revolution, which was launched at the beginning of this century. It led to a new approach that seeks for information technology to become an integral part of society. The great technological progress, availability of the Internet and smart devices everywhere, and rise in customers' awareness have helped the spread of this revolution. This revolution is distinguished from the previous revolution in that it developed at a rapid rate and relied on multiple technologies, resulting in unprecedented transformations in the areas of the economy, business, and individuals. Many institutions and companies in various sectors have come to rely on using technologies to operate.

The financial sector has been affected by this industrial revolution, as the emergence of information technologies and financial services has become common. Financial technology (fintech) is a technical financial tool that has led to new innovations in business models, applications, products, and services (Schindler, 2017). According to a Klynveld Peat Marwick Goerdeler report (Klynveld Peat Marwick Goerdeler, 2017), fintech is an evolution in financial services that has resulted in changes to customer expectations and financing methods. It works by merging financial services with the latest technologies to develop and create new flexible, fast, and cost-effective financial products and services. Fintech is also characterised by its widespread use, due to the diversity of its services, ease of use, and high level of transparency. It covers several areas, including banking services, such as providing personal loans, payment services, money transfers, and lending. It also helps in managing assets and wealth, such as providing an automatic advisory service and managing portfolios (Wahiba & Al Zahraa, 2019). However, despite the financial sector engaging in financial innovations, only a few financial services are participating in new technological innovations (Brandl & Hornuf, 2020). The purpose of this study is to investigate the association between the fintech services provided by banks and their performance.

Fintech offer several advantages for banks, including expanding their customer base and developing the products and services offered. The use of technology may also lead to expansion into new markets, generating new sources of income, and improving banks' efficiency. Therefore, it has become necessary for banks to adopt these technologies, as they often suffer from an innovation gap due to their stable position in the market and compliance with complex government regulations (Anagnostopoulos, 2018). Fintech services can affect banks' performance in two ways. First, due to the spread of smart devices, fintech services facilitate the usage of banking services and lead to an increase in the number of customers (Ky et al., 2019). Therefore, on the one hand, this results in an injection of money into these banks, which, in turn, strengthens bank deposits and liquidity, helping them to invest more in their assets and generate more profit. On the other hand, developing banking services and integrating them with technology is not easy, as the banking sector is highly regulated. This might make banks take additional steps to merge information technology into their operations. Consequently, providing fintech services may lead to paying a high cost for digital solution development, which could negatively affect banks' performance (Beccalli, 2007; Jalal-Karim & Hamdan, 2010; Thakor, 2020).

Nevertheless, financial services are not only restricted to financial institutions, as a number of firms outside the financial sector have started to provide them. Thus, fintech companies providing financial services in an innovative way will upset the balance of traditional financial institutions and negatively affect them (Phan et al., 2020). According to consumer theory (Aaker and Keller, 1990), new services that meet consumer desires and demands can replace old services. Consequently, banks could encounter a big challenge that may negatively affect their financial outcomes. Therefore, our interest in this study extends to the investigation of the association between fintech firms' growth and banks' financial performance.

Furthermore, as our sample consists of countries that have a dual banking system, namely Islamic (IBs) and conventional banks (CBs), our research also examines how the impact of banks providing financial innovation services and fintech firms' growth on bank performance might differ between IBs and CBs. There are significant differences between IBs and CBs. IBs must comply with the principles of *shari'ah*. As discussed by (Beck et al., 2013; Trinh et al., 2020), IBs are prohibited from charging interest (*riba*) on payments, are not allowed to engage in speculation, and are based on profit and loss sharing; thus, their model is a risk-sharing one. In addition, IBs have an additional governance layer, namely *shari'ah* supervision boards, which are considered as the 'Supra Authority' (Choudhury & Hoque, 2019). Unlike IBs' business model, CBs deal with a risk-transferring model and have no such religious restrictions, which might allow them the freedom to improve and develop their operation systems and accommodate any changes in the sector as a whole.

Our sample consisted of data from 40 listed banks in the United Arab Emirates (UAE), Saudi Arabia (KSA), and Bahrain for a period of six years, ranging from 2014 to 2019. We chose this sample and period as we noticed that the banks had started to use fintech services profusely, and fintech start-ups were becoming evident. Furthermore, these countries are more interested in fintech and have undertaken rapidly improved procedures. The growth of fintech has been phenomenal (Wahiba & Al Zahraa, 2019), as shown in Figures 1 and 2, and this trend makes these countries an interesting case study to analyse how fintech influences bank performance.

Figure 1 shows the trend of the scores of Saudi banks using fintech services each year during the period 2014–2019. We can see the development of banks' use of fintech services in the past few years. Based on the results, we found that the ALJAZIRA and SAUDI FRANSI banks were among the most used bank fintech services in 2014. In addition, we noticed that the ALINMA and ALRAJHI banks had a low score in 2014 and then rapidly progressed to reach the same high score of the ALJAZIRA bank in 2019.

Figure 2 shows the number of fintech firms established in each year in the UAE, KSA, and Bahrain in the period 2014–2019. The trend shows a continuous increase in the number of fintech firms each year. We noticed that the number of UAE fintech firms was very high and that it increased at a high rate. This was followed by Bahrain and the KSA.

A significant negative relationship was found between fintech services provided by banks and their performance. We further found that there was no difference in the impact of fintech services

Figure 1. Fintech services in KSA banks only in 2014–2019.

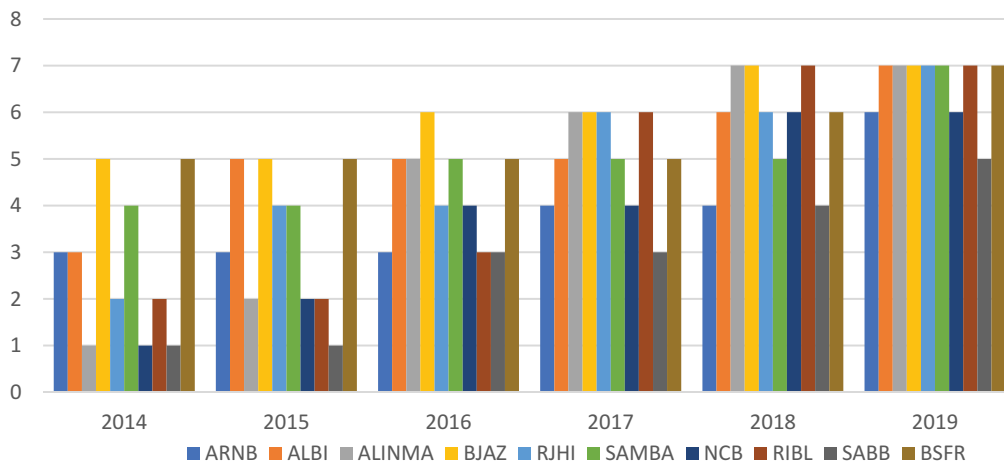
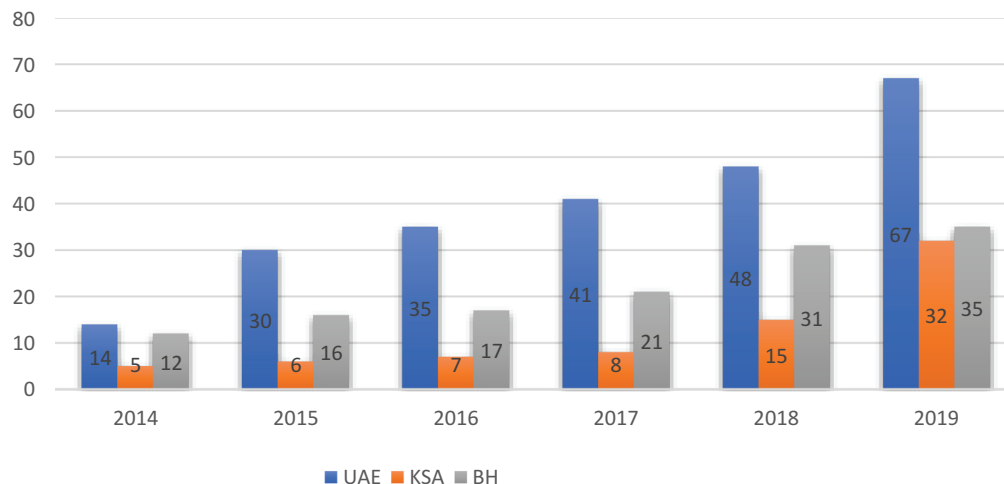


Figure 2. Number of Fintech firms in UAE, KSA, BH in 2014–2019.



on bank performance between CBs and IBs. In terms of coemption, the results reveal a significant negative relationship between fintech firms' growth and bank performance. However, this finding did not hold for IBs, as no significant relationship was found between fintech firms' growth and IBs' financial performance.

This study contributes to the literature in several ways. First, to the best of our knowledge, this study is the first to empirically investigate the relationship between fintech services and bank performance using an aggregated index to measure the degree to which a bank is providing fintech services. Previous studies (e.g., Ky et al., 2019 ; El Charani & El Abiad, 2018; Bu et al., 2021) measured fintech services using one indicator, such as mobile money, Internet banking, mobile banking, automated teller machines (ATMs), or investment in computer software. We also contribute to the literature by extending our analysis to examine the differences between IBs and CBs in terms of the influence of fintech services on bank performance.

Our study not only focused on fintech services, but also considered the competition aspect by investigating the influence of fintech firms' growth on bank performance. Unlike the study by Phan et al. (2020), we investigated the different influences of IBs and CBs. Finally, whilst previous studies paid more attention to the theoretical aspect (e.g., Ali et al., 2019) with the empirical aspect being ignored, our study is among the first to apply an empirical fintech study in Gulf Cooperation Council (GCC) countries. Thus, this study aimed to fill this gap in the empirical literature related to the potential impact of fintech on IBs and CBs in the UAE, KSA, and Bahrain.

This paper is organised into three sections. The literature review and hypotheses development are provided in Section 2, followed by a discussion of the data and estimation models in Section 3. Finally, a discussion of the main results is presented in section 4.

2. Literature review and hypotheses development

2.1. Fintech background

Fintech is currently a popular topic. Although the interplay between information technology and financial services is not a new topic, it has begun to be discussed during the past few decades due to the Fourth Industrial Revolution. Malika and Yousef (2018) described fintech as financial products and services that rely on technology to improve the quality of traditional financial

services. In addition, it is fast and easy to use. Thakor (2020) expected information technology to encourage the emergence of specialists creating markets with the best products that cater to customer preferences. As a result of this new technology, financial services are now not only provided by financial institutions, as a number of start-up firms have begun to provide fintech services and compete with banks.

Fintech companies provide several services, such as crowdfunding, micro-lending, digital payments, money transfers, digital saving, robo-advisory services, blockchain cryptocurrency, and wealth management. All of these start-ups have been able to extend their influence in many areas and convert many banking services, such as lending, payments, and investment, into services that use technology for speed, comfort, and low cost. These features of fintech companies are considered an attractive factor for bank customers, which, in turn, could weaken customers' use of bank services and reduce banks' profitability.

According to a PricewaterhouseCoopers report on the effect of fintech companies on the banking sector, 28% of banking and payment channels are at risk of losses in revenue due to fintech companies in 2020. Fintech companies are a strong threat to financial institutions that still rely on traditional methods to complete their operations and have not yet embarked on the wave of change and development. Finally, fintech companies can replace banks by providing services at a lower cost and with greater efficiency (Phan et al., 2020).

2.2. Fintech services and financial performance

The consumer theory by Aaker and Keller (1990) discusses how people decide to spend their money based on their preferences and budgets. The theory suggests that new services that meet the same consumer demands or preferences can replace old services. Fintech services are about meeting the same customers' needs for financial services but using technology. This will help improve customer perceptions and reinforce customers' trust, which in turn may affect financial performance. Liang et al. (2009) found that customer perceptions created by customer satisfaction and trust have a positive association with financial performance. Furthermore, providing such services might add to the financial strength of banks by attracting more customer deposits. Based on this theory, we expect there to be an impact from the emergence of new fintech services on the financial performance of banks that provide old services.

The results of various empirical studies revealed the positive impact of some innovation dimensions on the performance of the banking sector. For example, Ky et al., 2019 examined the impact of mobile money on bank performance during the period 2009–2015. They found a strong positive and significant relationship in the time that elapsed from the banks' adoption of mobile money as one of the aspects of fintechs and the performance of these banks by studying the profitability, efficiency, and stability of banks. In addition, El Chaarani and El Abiad (2018) examined the impact of technological innovation, such as Internet banking, mobile banking, ATMs, and investment in computer software, on Lebanese bank performance from 2010 to 2017. The results showed that investment in ATMs and Internet banking had a positive impact on bank performance. In Saudi Arabia, during 1998–2007 (Alber, 2011), phone banking had a positive impact on bank performance. Onay et al. (2008) found a positive impact of Internet banking on the performance of banks in Turkey between 1996 and 2005.

However, some researchers revealed the negative impact of technology on the profitability of banks. For example, Beccalli (2007) found a negative impact of investment in hardware and software on bank performance in the short term. Alber (2011) and Jalal-Karim and Hamdan (2010) concluded that ATMs had a negative impact on bank performance. In addition, Thakor (2020) argued that fintech could bring cost economies to banking that have long been elusive.

Finally, some studies did not find any significant impact of technologies on bank performance, such as El Chaarani and El Abiad (2018), who found a non-significant impact of mobile banking and investments in computer software on banks' performance. Based on the different previous discussions, this research predicted that providing fintech services would have an impact on banks' performance.

H1: There is a significant association between the fintech services provided by banks and their financial performance.

2.3. Fintech services and financial performance: the case of IBs

According to Ali et al. (2019), financial technology has a great potential impact on both the traditional finance industry and Islamic finance, and this potential impact appears in both positive and negative ways. However, the reaction and response of the IB finance industry to the emergence of fintech and its potential impact appear to be very slow when compared to CBs. This might be a result of the different business models that IBs use (profit and loss sharing concept) in operation. IBs have to comply with *shari'ah* principles, and their ability to change and adopt new financial services is restricted by the approval of the *shari'ah* supervisory board. However, prior studies (e.g., Bebas & Fali, 2020; Lazahari & Hajjaj, 2018) concluded that it is necessary to adapt IBs to fintech in order for them to compete and maintain their customers through partnering with fintech companies. Nevertheless, Al-Jarrah and Molyneux (2005) claim that IBs are more cost- and profit-efficient banks than CBs and investment banks. Mohamad et al. (2008) investigated the impact of cost efficiency on CBs and IBs and found no significant difference between them, irrespective of size, age, and geographical location. In addition, Majid et al., 2003 found no statistically significant difference in efficiency levels between IBs and CBs. Based on the findings of the previous literature, it seems that IBs would face the same additional cost as CBs in order to inject technology into their services. Even though applying fintech services may lower the cost efficiency of IBs, their customers are very likely religious clients that care more about the banks' activities and compliance with *shari'ah* principles. According to the discussion above, we expect that the influence of fintech services on bank performance differs between CBs and IBs.

H2: There are significant differences in the association between bank's fintech services and the financial performance across IBs and CBs.

2.4. Fintech firms' growth and financial performance

Based on disruptive innovation theory (Christensen, 1997), new goods and services provided by new entrants using innovative technology will be more accessible and cost-effective and can create competition in the market. In this case, fintech firms are new entrants involved in traditional bank activities. Jun and Yeo (2016) support this argument and provide a two-sided market model that emphasises firm entry. Wahiba et al. (2019) argue that the institutions most fearful of fintech firms are banks, based on studies in GCC countries. Consistent with Chishti and Barberis (2016), Brandl & Hornuf, 2020, and Puschmann (2017), we argue that any firm that applies innovative technology to provide services previously restricted and provided by banks, such as lending, payments, or investments might eventually substitute for traditional banks and, therefore, influence banks' performance.

Even though information technology has been massively merged with the financial industry, only a few studies (e.g., Brandl & Hornuf 2020; Haddad & Hornuf, 2018) investigated technology usage in financial services. Phan et al. (2020) investigated the association between fintech firms' growth and bank performance and found that fintech firms' growth had a negative impact on bank performance. Furthermore, they discussed that despite the strong and clear threat from fintech firms,

financial institutions' attempts to adopt new technical innovations and use them were weak and slow. Li et al. (2017) focused on how fintech start-ups influenced retail banks' share prices and found a negative influence. Based on the arguments above and the empirical literature, we argue that fintech firms' growth has a negative influence on bank performance.

H3: There is a significant and negative association between fintech firms' growth and banks' performance.

2.5. Fintech firms and financial performance: the case of IBs

As discussed before, IBs operate under special business models that have to follow Islamic law. Most IB clients invest in or open an account with a bank for moral reasons. Specifically, they target IBs for religious reasons. For example, interest payments are not allowed under Islamic law, and IBs must comply with this principle. According to Abedifar et al. (2013), religious people have a strong loyalty towards their bank and focus on bank activities using their money, regardless of the technologies used. As discussed previously, a new competitor entering the market might affect banks. Lower cost, effective services provided by competitors might weaken banks' financial strength and reduce the clients' deposits (withdrawal risk). Phan et al. (2020) argue that fintech firms might work as substitutes for traditional banking services, leading to negative effects on bank performance. However, IB clients not only focus on bank services, but other aspects, such as morality and bank activities. Therefore, even though banks might be affected by fintech firms' growth, that growth might have less impact on IBs. Specifically, we argue that the risk of clients withdrawing their funds from IBs and depositing it with fintech firms because of new technology will be minimal. Therefore, we expect that the influence of fintech firms' growth on bank performance is different between CBs and IBs.

H4: There are significant differences in the association between fintech firms' growth and financial performance across IBs and CBs.

3. Methodology

3.1. Sample

The sample for this study consisted of 40 listed banks in both banking systems, 18 of which were IBs and 22 were CBs from GCC countries over a period of 6 years, ranging from 2014 to 2019.¹ We filtered the sample following the three criteria used in the previous literature (e.g., Aljughaiman & Salama, 2019; Beck et al., 2013), as follows: (1) fintech data needed to be available, (2) each country had to have both types of bank, (3) the banks needed to be fully fledged CBs, and (4) the banks needed to have over three years' of data. The final sample included 240 bank-year observations for IBs and CBs, providing 108 and 132 bank-year observations for each sub-sample, respectively. The sample distributions are listed in Table 1.

The consolidated financial data were mainly obtained from the Bloomberg database. Corporate governance data, such as board size and percentage of independent directors on the board, were manually collected from banks' corporate governance reports available on their official websites. Country-level variables were obtained from the World Bank databases. We used two primary sources of data to collect the main independent variables. First, we used banks' annual reports available on their official websites to find the fintech services they started providing.² Furthermore, to obtain our second independent variable, fintech firm growth,³ we collected the annual number of fintech firms in each year from the Saudi Arabian Monetary Authority and Capital Market Authority, Bahrain Fintech Ecosystem report 2018, and Dubai International Financial Centre.

Table 1. Sample distribution

| | United Arab Emirates | Saudi Arabia | Bahrain | Total | observations |
|--------------------|-----------------------------|---------------------|----------------|--------------|---------------------|
| Islamic Banks | 9 | 4 | 5 | 18 | 108 |
| Conventional Banks | 12 | 6 | 4 | 22 | 132 |
| Full sample | 21 | 10 | 9 | 40 | 240 |

Note: This table presents the final sample that employs an unbalanced panel data of 40 commercial listed banks (240 bank year-observations), operating in UAE, KSA and BH.

3.2. Measures of variables

3.2.1. Banks' performance measures

Following the previous literature (Ismail, 2017; Jaouad & Lahsen, 2018; Kaneza, 2016; Mollah & Zaman, 2015), we measured banks' performance using two different aspects: the accounting aspect (return on assets [ROA]) and the market aspect (return on equity [ROE]). ROA is defined as the ability of a bank's management to generate profits from the bank's assets. The second measure, ROE, reflects the returns to shareholders on their equity.

3.2.2. Measures of explanatory variables

Unlike previous studies, we used a novel approach to measure fintech services. Specifically, we scanned the literature to determine the most common services that can be classified as fintech services. Then, we created a score that expressed the bank's development of new fintech services every year (2014–2019).⁴ In more detail, we created seven dummy variables (one variable for each service). Each variable got a value of 1 if the bank provided that service in that year, and 0 otherwise. Later, we aggregated these seven variables to determine the bank fintech score for each year. For example, if a bank had a fintech score of 5 out of 7 in 2016, it indicated that during 2016, the bank developed 5 fintech services only. However, to determine the impact of fintech services on IBs, we considered the interaction between the IBs and fintech services score variables. For H3 and H4, we used fintech firms' growth, as Phan et al. (2020) used. We measured fintech firms' growth by taking the number of fintech firms in each country for each year (2014–2019).

3.2.3. Controls

Following prior studies (Ky et al., 2019; Phan et al., 2020; Mollah & Zaman, 2015), we controlled for firm-level characteristics: bank size measured by the natural logarithm of total assets (S); capital ratio; total capital to total assets (CAP); loan size, which equals total loans to total assets (LS); loan loss provisions measured by dividing loan loss provisions by total loans (LLP); income diversification, which equals non-interest income to total income (NONIN); beta; the market risk computed using the CAPM model using the prior three years of returns (monthly) (B); and IB, measured as a dummy variable that takes the value of 1 if the bank is Islamic, and 0 if otherwise (Islamic). Consistent with the previous literature (e.g., Aljughaiman & Salama, 2019; Gafoor et al., 2018; Jaouad & Lahsen, 2018), we also controlled for corporate governance variables: the board size of directors, which reflects the number of members on the board (BS); and independent directors, as the percentage of independent directors on the board (IND). In addition, we controlled for macroeconomic variables, namely gross domestic product growth rate (GDP) and inflation rate (INF), as additional controls.

3.3. Estimation models

To examine our hypotheses, we used pooled ordinary least squares with robust standard errors to control for heteroscedasticity. We ran our models using different classifications of control variables, namely bank-specific variables and country-specific variables, to test the sensitivity of the results. We also controlled for year and country fixed effects. Furthermore, we re-estimated our models using the generalised methods of moments (GMM) to control for endogeneity problems.

We used the following models:

$$Y_{it} = \alpha_0 + \beta_* X_{it} + \delta_{t+} C_{i+} \varepsilon_{it}$$

Where Y_{it} is the bank performance i at time t as expressed by ROA and ROE, i refers to an individual bank, t refers to year, α_{it} is a constant, X_{it} is the independent and control variables described in Table 2, δ_t is the year-fixed effect, C_i is the country fixed effects, and ε_i is an error term.

| Table 2. Variables definition and abbreviation | | |
|--|---|--------------|
| Variables | Description | Abbreviation |
| Dependent variables | | |
| Banks' performance | Net Profit to Total Assets | ROA |
| | Net Profit to Equity | ROE |
| Independent variables | | |
| Fintech Firms | Number of Fintech Firms | FF |
| Fintech Services | Score of bank's usage Fintech | FS |
| Fintech Services*IBs | Fintech services multiply Islamic bank | FS*Islamic |
| Control Variables | | |
| Board size | The number of members in the board | BS |
| Independent directors | The percentage of independent directors on the board | IND |
| Bank size | Natural Log of total asset | SIZE |
| Capital ratio | Total capital to total assets | CAP |
| Loan size | Total loan to total assets | LS |
| Loan Loss provision | Loan loss provisions to total loans | LLP |
| Islamic Bank | A dummy that takes the value of 1 if the bank Islamic, and 0 otherwise | Islamic |
| Income Diversification | Non-interest income to total income | NONIN |
| Beta | The market risk which is computed using the CAPM model using the prior 3 years of returns (monthly) | BETA |
| GDP | Annual GDP growth rate | GDP |
| Inflation | Annual Inflation Rate (Consumer Price Index, CPI) | INF |

Note: this table presents the definition and Abbreviation of all variables.

4. Model 1: testing the impact of fintech services on banks' performance

$$\begin{aligned} Performance_{it} = & \alpha_0 + \beta_1 FintechServices_{it} + \beta_2 S_{it} + \beta_3 CAP_{it} + \beta_4 BS_{it} + \beta_5 IND_{it} + \beta_6 islamic_{it} \\ & + \beta_7 LS_{it} + \beta_8 LLP_{it} + \beta_9 NONIN_{it} + \beta_{10} GDP_{it} \\ & + \beta_{11} INF_{it} + \beta_{12} B_{it} + \beta_{13} FSislamic_{it} + \delta_t + \epsilon_{it} \end{aligned}$$

5. Model 2: testing the impact of fintech firms' growth on banks' performance

$$\begin{aligned} Performance_{it} = & \alpha_0 + \beta_1 FintechFirms_{it} + \beta_2 S_{it} + \beta_3 CAP_{it} + \beta_4 BS_{it} + \\ & \beta_5 IND_{it} + \beta_6 islamic_{it} + \beta_7 LS_{it} + \beta_8 LLP_{it} + \beta_9 NONIN_{it} + \beta_{10} GDP_{it} \\ & + \beta_{11} INF_{it} + \beta_{12} B_{it} + \delta_t + \epsilon_{it} \end{aligned}$$

6. Main results

6.1. Descriptive statistics and correlation

We report the descriptive statistics for the full sample (2014–2019) in Table 3 (Column 1). We also present the means for the CBs and IBs (columns 9–10). With regards to the dependent variables, we found the mean for the full sample (CB sample and IB sample); the ROE was 9.12% (12.45%; 12.13%) and the ROA was 1.31% (1.90%; 1.72%). We also determined that the mean for the independent variable (number of fintech firms) in the CBs and IBs was 12, and the mean for the other independent variable (fintech services) in the IBs (5.20) was higher than in the CBs (4.41). Regarding the control variables, the results suggested that the mean board size (BS) for the IBs was higher than it was for the CBs (9.47; 9.96), while the mean value of the independent directors in the CBs was higher than that of the IBs (IND), being 0.53 and 0.43, respectively. In addition, the mean bank size (S) in the CBs (12.31) was higher than the mean of the IBs (11.62). When we compared the mean of the capital ratio (CAP), the CBs had a stronger capital position (0.22%) when compared to the IBs (0.19%), and the loan size (LS) in the IBs (4.88%) was less than that in the CBs (5.50%); subsequently, the LLP in the IBs (0.59%) was less than that in the CBs (0.60%); the IBs had a higher beta (B) (2.90) when compared to the CBs (2.58), and the mean of income diversification (NONIN) was 0.01% in both the CBs and IBs. The fintech services*IB for IBs was 5.17, and IB (Islamic) was 1 in the IBs. Finally, the mean of the full sample for GDP was 2.71%, and the INF was 1.63%.

Table 4 reports the correlation for the full sample to investigate any multicollinearity problems. The table reveals that there was no high correlation between the variables, which means that no coefficient had a value higher than 80% between the explanatory variables. The table shows that our variables of interest for fintech services and fintech firms were negatively correlated with GDP, INF, IND and NONIN, but positively associated with Cap-ratio, LS, LLP, BS and B.

6.2. Multivariate analyses

6.2.1. Fintech services and banks' performance

Table 5 shows the results after we regressed the fintech services on our dependent variable (ROA). Column 1 shows the results using ROA as the dependent variable, and column 2 shows the results using ROE as the dependent variable. The table reveals a negative relationship between ROA and fintech services, significant at the 1% level. Furthermore, the results held even after using market performance (ROE). The results were consistent with H1, in that fintech services had a significant impact on banks' financial performance. Specifically, we found that providing more fintech services may negatively influence banks' financial performance. Our result is supported by Beccalli (2007), who found that IT investment seems to reduce bank performance. It is essential for banks to invest in IT software and hardware to provide fintech services. This may result in a negative return from increased IT spending. Markus and Soh (1993) showed a negative association between IT spending and returns for large US banks. Onay et al. (2008) found that Internet banking has a negative impact on bank profitability. However, the result was inconsistent with Ky et al., 2019, who found a positive impact of fintech usage (technological innovation) on bank performance. The coefficients for fintech

Table 3. Descriptive statistics

| Variables | Observations | Full Sample | | | | CBs Sample | | | IBs Sample | |
|-----------|--------------|-------------|-------|-------|--------|------------|-----|-------|------------|-----|
| | | Mean | SD | MAX | MIN | Mean | MAX | MIN | Mean | MAX |
| ROE | 239 | 9.12 | 11.47 | 28.47 | -89.57 | 12.45 | | 12.13 | | |
| ROA | 239 | 1.31 | 1.44 | 7.29 | -9.51 | 1.9 | | 1.73 | | |
| FF | 240 | 28.55 | 17.72 | 67 | 5 | 12.56 | | 12.17 | | |
| FS | 60 | 4.62 | 1.79 | 7 | 1 | 4.41 | | 5.17 | | |
| ISLAMIC | 240 | 0.45 | 0.5 | 1 | 0 | 0 | | 1 | | |
| SIZE | 239 | 10.39 | 1.83 | 13.62 | 6.39 | 12.31 | | 11.62 | | |
| CAP | 239 | 0.27 | 0.12 | 0.8 | 0.05 | 0.22 | | 0.19 | | |
| LS | 239 | 12.48 | 11.15 | 60.32 | 0 | 5.5 | | 4.88 | | |
| LLP | 228 | 1.42 | 1.56 | 12.2 | -3.21 | 0.6 | | 0.59 | | |
| NONIN | 239 | 0.01 | 0.01 | 0.17 | -0.01 | 0.01 | | 0.01 | | |
| BS | 240 | 9.24 | 1.87 | 13 | 3 | 9.47 | | 9.96 | | |
| IND | 240 | 0.47 | 0.24 | 2 | 0 | 0.53 | | 0.43 | | |
| BETA | 229 | 1.73 | 7.25 | 57.49 | -37.04 | 2.85 | | 2.9 | | |
| GDP | 240 | 2.71 | 1.47 | 5.11 | -0.74 | 1.79 | | 1.91 | | |
| INF | 240 | 1.63 | 1.7 | 4.07 | -2.09 | 0.79 | | 0.84 | | |

Note: this table presents descriptive statistics of all variables used in all the regression models for the full sample. The statistics include the observation, mean, max, min, standard deviation, and the mean of CBs, IBs.

Table 4. Correlation matrix

| | FF | FS | ISLAMIC | SIZE | CAP | LS | LLP | NONIN | BS | IND | BETA | GDP | INF |
|---------|----------|----------|----------|----------|----------|--------|--------|---------|-------|-------|-------|--------|------|
| FF | 1.00 | | | | | | | | | | | | |
| FS | 0.64*** | 1.00 | | | | | | | | | | | |
| ISLAMIC | -0.02 | 0.22** | 1.00 | | | | | | | | | | |
| SIZE | 0.17 | -0.04 | -0.56*** | 1.00 | | | | | | | | | |
| CAP | 0.09 | 0.13 | -0.32*** | 0.17*** | 1.00 | | | | | | | | |
| LS | 0.05 | 0.24** | -0.09*** | -0.03*** | 0.71* | 1.00 | | | | | | | |
| LLP | 0.31*** | 0.08 | -0.01 | 0.25 | -0.15 | -0.11 | 1.00 | | | | | | |
| NONIN | -0.22 | -0.11 | 0.34 | -0.51*** | -0.31*** | 0.12** | -0.02 | 1.00 | | | | | |
| BS | 0.13*** | 0.04 | 0.16*** | -0.01 | -0.40** | -0.25 | 0.41 | 0.25*** | 1.00 | | | | |
| IND | 0.14 | -0.17 | -0.16 | 0.14 | 0.11*** | -0.12* | -0.19 | -0.04 | -0.77 | 1.00 | | | |
| BETA | 0.64 | 0.32** | 0.069 | 0.16 | 0.07 | 0.10 | 0.08 | -0.05 | 0.11* | -0.11 | 1.00 | | |
| GDP | -0.43*** | -0.50*** | 0.03 | -0.15 | -0.23 | -0.14 | -0.38* | 0.17* | -0.18 | 0.25 | -0.08 | 1.00 | |
| INF | -0.67*** | -0.44*** | 0.01 | -0.12 | -0.12 | -0.05 | -0.35 | 0.11 | -0.09 | 0.10 | -0.37 | 0.73** | 1.00 |

Note: this table presents spearman correlation matrix between all variables used in the regression models for the full sample. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 5. Regression results examining the impact of fintech services on banks' performance

| | (1) | (2) |
|---------------------|--------------|--------------|
| VARIABLES | ROA | ROE |
| FS | -0.110*** | -0.798*** |
| | (-3.33) | (-3.45) |
| FS*Islamic | 0.002 | -0.124 |
| | (0.030) | (-0.25) |
| BS | -0.005 | -0.136 |
| | (-0.14) | (-0.42) |
| IND | 0.618 | 0.304 |
| | (1.14) | (0.07) |
| LS | 0.003 | 0.732*** |
| | (0.17) | (4.46) |
| size | 0.597*** | 4.434*** |
| | (4.79) | (4.53) |
| CAP | -2.103 | -81.17*** |
| | (-0.66) | (-3.62) |
| NONIN | 27.60* | 186.0* |
| | (1.86) | (1.76) |
| LLP | -0.644*** | -4.044*** |
| | (-5.11) | (-3.90) |
| Beta | -0.001 | -0.045 |
| | (-0.18) | (-0.75) |
| Islamic | 0.232 | 2.287 |
| | (0.83) | (1.15) |
| GDP | -0.024 | 0.035 |
| | (-0.53) | (0.10) |
| Inflation | -0.099** | -0.906** |
| | (-2.14) | (-2.52) |
| Constant | -4.601** | -23.07* |
| | (-2.67) | (-1.74) |
| Year effects | YES | YES |
| Observations | 58 | 58 |
| R-squared | 0.590 | 0.627 |

Note: this table presents the results of fintech services regression using ROE and ROA. Table 2 shows the variables definitions. t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

services IB were not significant, which indicates that the effect of fintech services on financial performance is not significantly different between CBs and IBs (going against H2).

Regarding the control variables, we noted a significant positive relationship between bank size, ROA, and ROE. This result is consistent with those of Pasiouras and Kosmidou (2007) and Smirlock (1985). Short (1979) argued that large banks have access to cheaper capital, which is reflected in healthy profitability. Djalilov and Piesse (2016) argued that large banks reducing their level of risk by diversifying their products and services contributes to higher operational efficiency and profitability. Flamini et al. (2009) documented that in a non-competitive environment, large banks can obtain higher profits

than small banks. This is because large banks hold a greater market share, offer lower deposit rates, and maintain high lending rates. We also noticed a negative significant relationship between LLP and ROA and ROE, which is consistent with Athanasoglou et al. (2008), Sufian (2009), and Dietrich and Wanzenried (2011), who suggested that increased exposure to credit risk is associated with decreased bank profitability, as bad loans are expected to reduce profitability. Therefore, we expect LLP to have a negative effect on bank performance. In addition, inflation rate negatively impacts bank performance. Studies such as those of Bourke (1989), Molyneux and Thornton (1992), Pasiouras and Kosmidou (2007), Athanasoglou et al. (2008), Claeys and Vander Vennet (2008), García-Herrero et al. (2009), and Kasman et al. (2010) show that inflation and profits are positively related. However, if inflation is unanticipated and banks fail to adjust their interest rates, costs may escalate faster than revenues, thus adversely affecting bank profits. These discussions imply that a priori there is an unknown effect of INF on profits.

6.2.2. *Fintech firms' growth and banks' performance*

Table 6 shows the regression results for the association between bank performance and fintech firms' growth variables. Panel A presents the association using the full sample. Panel B shows the results using the IB sample only, and panel C uses the CB sample. For each panel, we present the results for the entire period. The results show that there is a significant and negative relationship between fintech firms' growth and banks' financial performance across both measures (accounting and market). This result was consistent with our H3 hypothesis, in that fintech firms' growth was negatively associated with financial banks' performance. This indicates that if the number of fintech firms increases by one, banks' financial performance will decrease by 0.0364. This finding is consistent with that reported by Phan et al. (2020). For H4, Panels B and C of the table reveal that the negative association between fintech firms' growth and financial performance only holds for the CBs, and that this association for the IB sample is not significant. This means that fintech firms' growth has no influence on IBs' financial performance. Therefore, we can support H4, in that there were differences in the influence of fintech firms' growth on bank performance between CBs and IBs. For the control variables, we noticed a negative significant relationship between LLP and CB performance. Furthermore, we found a significant positive relationship between bank size and IB performance. In addition, there was a significant positive relationship between the capital ratio and CBs.

For the robustness check, we used two lines of inquiry to confirm robustness. First, we used ROE as an additional dependent variable to measure bank performance. Second, consistent with Wintoki et al. (2012) and Aljughaiman and Salama (2019), we used the GMM system dynamic panel estimator to control for endogeneity problems and to confirm that our results were correct. Table 7 shows the results for fintech services and firm growth/financial performance relationships using GMM specification models. Columns 1 and 2 present the results for testing the relationship between fintech firm growth and bank performance, while Columns 3 and 4 show the results for the association between fintech service scores and bank performance. We utilised a number of tests to ensure the validity of our GMM estimators. We provide the first-order serial correlation (AR(1)), the second-order correlation (AR(2)), and Hansen tests of over-identification. The AR(1) tests showed that the p-values were significant (p-value < 5%) across our models, which means that the residuals in the first differences were correlated. In addition, there was no serial correlation of the second differences, as the p-values of the AR(2) tests were not significant. Hansen's results revealed that our instruments were valid. The results of this test provided consistent evidence that Fintech scores were negatively associated with bank performance across IBs and CBs. On the other hand, fintech firm growth had a negative influence on financial performance.

Table 6. Regression results examining the impact of fintech firms growth on banks' performance

| VARIABLES | Panel A: Full sample (1) (2) | | Panel B: Islamic Banks (3) (4) | | Panel C: Conventional Banks (5) (6) | |
|-----------|---------------------------------|----------------------|-----------------------------------|--------------------|--|----------------------|
| | ROA | ROE | ROA | ROE | ROA | ROE |
| FF | -0.036*** (-2.64) | -0.276** (-2.25) | -0.001 (-0.15) | 0.001 (0.00) | -0.032* (-1.84) | -0.249** (-1.99) |
| BS | -0.108* (-1.79) | -0.918 (-1.61) | 0.108 (1.45) | 0.695 (1.55) | -0.040 (-0.72) | 0.006 (0.01) |
| IND | -0.130 (-0.33) | -0.703 (-0.23) | 0.392 (0.55) | 4.811 (1.23) | 0.107 (0.22) | 2.494 (0.54) |
| LS | -0.119*** (-4.43) | -0.321* (-1.97) | -0.103* (-1.96) | -0.195 (-0.88) | -0.128*** (-4.89) | -0.352 (-1.35) |
| size | 0.393*** (6.02) | 3.473*** (6.32) | 0.257*** (3.31) | 2.344*** (4.57) | 0.199** (1.98) | 1.563 (1.63) |
| CAP | 10.38*** (4.46) | 34.39** (2.21) | 7.022* (1.89) | 5.212 (0.34) | 20.44*** (4.73) | 134.4*** (2.91) |
| NONIIN | 29.66* (1.96) | 149.3 (1.31) | 43.04** (2.49) | 249.5*** (2.76) | 35.41* (-1.90) | 253.3 (1.33) |
| LLP | -0.402*** (-3.17) | -3.967*** (-3.37) | -0.074 (-0.67) | -1.372* (-1.99) | -0.535*** (-3.58) | -4.816*** (-3.47) |
| Beta | 0.018 (0.93) | 0.049 (0.37) | 0.044 (1.15) | 0.281** (2.35) | -0.018 (-0.81) | -0.264 (-1.21) |
| Islamic | 0.125 (0.91) | 2.767*** (2.61) | | | | |
| GDP | 0.001 (0.00) | -0.184 (-0.19) | -0.012 (-0.11) | -0.324 (-0.45) | 0.050 (0.38) | 0.479 (0.51) |
| Inflation | 0.051 (0.61) | 0.437 (0.58) | 0.059 (0.60) | 0.213 (0.32) | -0.054 (-0.47) | -0.127 (-0.12) |

(Continued)

Table 6. (Continued)

| VARIABLES | Panel A: Full sample (1) (2) | | Panel B: Islamic Banks (3) (4) | | Panel C: Conventional Banks (5) (6) | |
|-----------------|---------------------------------|-------------------|-----------------------------------|----------------------|--|--------------------|
| | ROA | ROE | ROA | ROE | ROA | ROE |
| Constant | -1.924* (-1.78) | -11.77 (-1.53) | -3.703*** (-2.78) | -20.62*** (-2.79) | -3.281* (-1.88) | -33.87* (-1.79) |
| Year effects | YES | YES | YES | YES | YES | YES |
| Country effects | YES | YES | YES | YES | YES | YES |
| Observations | 221 | 221 | 95 | 95 | 126 | 126 |
| R-squared | 0.506 | 0.463 | 0.528 | 0.643 | 0.674 | 0.595 |

Note: this table presents the regression results for fintech firms and bank financial performance for full sample and for sub-sample (IB and CBs) Variables definition are presented in Table 2. t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 7. Robustness check: the associations between Fintech firms' growth, fintech services score and banks' performance after controlling for endogeneity using GMM models

| | (1) | (2) | (3) | (4) |
|---|-----------------------|-----------------------|---------------------|----------------------|
| VARIABLES | ROA | ROE | ROA | ROE |
| L.Dv | 0.147*** (3.02) | 0.277*** (7.06) | -0.020 (-1.23) | 0.028 (0.16) |
| FF | -0.061** (-2.71) | -0.685*** (-3.27) | | |
| FS | | | -0.108* (-1.69) | -0.945* (-1.91) |
| FS*Islamic | | | 0.023 (0.26) | 0.337 (0.46) |
| BS | -0.036 (-0.68) | -0.412 (-0.92) | -0.001 (-0.03) | -0.014 (-0.03) |
| IND | -0.053 (-0.10) | -1.483 (-0.42) | 0.700 (0.80) | -0.918 (-0.14) |
| LS | -0.076** (-2.05) | -0.490 (-1.17) | 0.012 (0.28) | 0.713* (1.77) |
| Size | 0.539*** (4.33) | 4.516*** (4.60) | 0.627*** (2.94) | 3.751* (1.65) |
| CAP | 7.625** (2.07) | 66.32* (1.98) | -1.745 (-0.44) | -67.57* (-1.90) |
| NONIN | 69.82*** (5.34) | 467.5** (2.39) | 17.19 (0.55) | 56.80 (0.19) |
| LLP | -0.490*** (-10.06) | -4.625*** (-10.39) | -0.582** (-2.37) | -3.915** (-2.05) |
| Beta | 0.010 (1.13) | 0.117* (1.82) | -0.004 (-0.42) | -0.067 (-0.71) |
| Islamic | 0.312* (1.69) | 2.919 (1.53) | 0.178 (0.38) | 0.083 (0.02) |
| GDP | -0.042 (-1.04) | -0.090 (-0.34) | -0.011 (-0.19) | 0.232 (0.49) |
| Inflation | -0.061 (-1.31) | -0.351 (-0.83) | -0.106** (-2.02) | -1.073*** (-2.66) |
| Constant | -3.274** (-2.06) | -26.35** (-2.11) | -5.072* (-1.83) | -16.57 (-0.51) |
| Year effects | YES | YES | YES | YES |
| Country effects | YES | YES | NO | NO |
| Observations | 188 | 188 | 49 | 49 |
| AR (1) test (p-value) | 0.05 | 0.045 | 0.005 | 0.027 |
| AR (2) test (p-value) | 0.865 | 0.713 | 0.710 | 0.30 |
| Hansen test of over-identification (p-value) | 0.394 | 0.311 | 0.197 | 0.243 |

Note: The table presents regression results for full sample using GMM estimation to control for endogeneity problem. See Table 2 for variables description. t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

7. Conclusion

This paper was inspired by the phenomenal growth of fintech services and firms in the UAE, KSA, Bahrain, and, indeed, globally. Very little is known about whether such services and firms have an impact on the banking sector. In this study, we investigated the association between fintech scores and banks' performance and how this association might differ between IBs and CBs. We also extended our analysis to examine the association between fintech firms' growth and financial performance. In addition, we tested whether there were any differences in the association between fintech firms' growth and banks' performance across IBs and CBs.

Our sample covered the UAE, KSA, and Bahrain, consisting of 40 banks, for the period of 2014 to 2019. We found that the fintech score had a significant and negative relationship with bank performance across both bank types (IBs and CBs). We also showed that fintech firms' growth was negatively associated with CB performance only and had no significant impact on the banks' financial performance.

This study contributes further evidence to the literature by concentrating on information technology that has been used intensively in the financial sector. To the best of our knowledge, research on fintech has been rare, and no previous literature in this area has focused on the Islamic banking system. Our study also examined the effects of fintech firms' growth. The implications of our study apply to regulators and banks due to their nature linking them to the development rate in the financial industry. Future work should be conducted on a sample that consists of banks providing and not providing fintech services to investigate whether the difference in performance of firms that pursue fintech is statistically different from those that do not.

Funding

The authors received no direct funding for this research.

Author details

Dur Almulla¹
Abdullah A. Aljughaiman¹
E-mail: abjuqhaiman@kfu.edu.sa
ORCID ID: <http://orcid.org/0000-0002-6123-3671>
¹ Business School, Finance Department, King Faisal University, Al-ahsa, Saudi Arabia.

Citation information

Cite this article as: Does financial technology matter? Evidence from an alternative banking system, Dur Almulla & Abdullah A. Aljughaiman, *Cogent Economics & Finance* (2021), 9: 1934978.

Notes

1. We chose this sample and period due to the significant increase in fintech in the GCC area during this period. Furthermore, we were able to find data from only three countries, the UAE, KSA, and Bahrain.
2. *Fintech services* are new services provided by using the latest technology. We tested H1 and H2 only on the Saudi bank sample, as data were only available for those banks.
3. *Fintech firms* are new supply firms and settlement processes related to the banking sector, such as consumable micro-lending, digital payments, digital saving association, crowd funding, robo-advisory, blockchain, and wealth management.
4. This measure of fintech provides an estimate of fintech services' existence in the bank, but not the usage intensity.

Competing interest statement

Declarations of interest: none. This manuscript has not been published and is not under consideration for publication elsewhere.

References

- Aaker, D. A., & Keller, K. L. (1990). Consumer evaluations of brand extensions. *Journal of marketing*, 54(1), 27–41. <https://doi.org/10.1177/002224299005400102>
- Abedifar, P., Molyneux, P., & Tarazi, A. (2013). Risk in Islamic banking. *Review of Finance*, 17(6), 2035–2096. <https://doi.org/10.1093/rfr/rfs041>
- Alber, N. (2011). The effect of banking expansion on profit efficiency of Saudi Arabia Commercial Banks. *Journal of Global Business and Economics*, 3(1), 11–23.
- Ali, H., Abdullah, R., & Zaini, M. Z. (2019). Fintech and its potential impact on Islamic banking and finance industry: A case study of Brunei Darussalam and Malaysia. *International Journal of Islamic Economics and Finance (IJIEF)*, 2(1), 73–108. <https://doi.org/10.18196/ijief.2116>
- Al-Jarrah, I., & Molyneux, P. (2005). Efficiency in Arabian banking. In M. Iqbal & R. Wilson (Eds.), *Islamic perspectives on wealth creation*. Edinburgh University Press. 97–117
- Aljughaiman, A. A., & Salama, A. (2019). Do banks effectively manage their risks? The role of risk governance in the MENA region. *Journal of Accounting and Public Policy*, 38(5), 106680. <https://doi.org/10.1016/j.jaccpubpol.2019.106680>
- Anagnostopoulos, I. (2018). Fintech and regtech: Impact on regulators and banks. *Journal of Economics and Business*, 100(November–December), 7–25. <https://doi.org/10.1016/j.jeconbus.2018.07.003>
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic

- determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121–136. <https://doi.org/10.1016/j.intfin.2006.07.001>
- Bebas, M., & Fali, N. (2020). The Islamic banking facing financial technology challenges: A case study of Malaysia and GCC countries. *International Review of Entrepreneurial Finance*, 3(1), 38–52.
- Beccalli, E. (2007). Does IT investment improve bank performance? Evidence from Europe. *Journal of Banking & Finance*, 31(7), 2205–2230. <https://doi.org/10.1016/j.jbankfin.2006.10.022>
- Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). *Islamic vs. conventional banking: Business model, efficiency and stability*. The World Bank.
- Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance*, 13(1), 65–79. [https://doi.org/10.1016/0378-4266\(89\)90020-4](https://doi.org/10.1016/0378-4266(89)90020-4)
- Bu, Y., Li, H., & Wu, X. (2021). Effective regulations of FinTech innovations: The case of China. *Economics of innovation and new technology*, 1–19. DOI:10.1080/10438599.2020.1868069
- Chishti, S., & Barberis, J. (2016). *The FinTech book*. Wiley.
- Choudhury, M. A., & Hoque, M. Z. (2019). Corporate Governance in Comparative Islamic Perspective1. In *Research in corporate and Shari'ah governance in the Muslim world: theory and practice*. Emerald Publishing Limited, Bingley, 43–61. <https://doi.org/10.1108/978-1-78973-007-420191004>
- Christensen, C. M. (1997). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship
- Claeys, S., & Vander Vennet, R. (2008). Determinants of bank interest margins in central and Eastern Europe: A comparison with the west. *Economic Systems*, 32(2), 197–216. <https://doi.org/10.1016/j.ecosys.2007.04.001>
- Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3), 307–327. <https://doi.org/10.1016/j.intfin.2010.11.002>
- Djalilov, K., & Piesse, J. (2016). Determinants of bank profitability in transition countries: What matters most? *Research International Business Finance*, 38, 69–82. <https://doi.org/10.1016/j.ribaf.2016.03.015>
- El Chaarani, H., & El Abiad, Z. (2018). The impact of technological innovation on banks' performance. *Journal of Internet Banking and Commerce*, 23(3), 1–33. <https://ssrn.com/abstract=3845169>
- Flamini, V., McDonald, C. A., & Schumacher, L. B. (2009). The determinants of commercial bank profitability in Sub-Saharan Africa. IMF Working Papers, 1–30
- Gafoor, C. A., Mariappan, V., & Thyagarajan, S. (2018). Board characteristics and banks' performance in India. *IIMB Management Review*, 30(2), 160–167. <https://doi.org/10.1016/j.iimb.2018.01.007>
- García-Herrero, A., Gavilá, S., & Santabarbara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking & Finance*, 33(11), 2080–2092. <https://doi.org/10.1016/j.jbankfin.2009.05.005>
- Haddad, C., & Hornuf, L. (2018). The emergence of the global fintech market: Economic and technological determinants. *Small Business Economics*, 53(1), 81–105. <https://doi.org/10.1007/s11187-018-9991-x>
- Ismail, I. N. (2017). The Roles of Corporate Governance and its Influences on Risk and Performance: Tesco Plc.
- Jalal-Karim, A., & Hamdan, A. M. (2010). The impact of information technology on improving banking performance matrix: Jordanian banks as case study. In *European Mediterranean and Middle Eastern Conference on Information System, (Abu Dhabi, UAE)*, 21–33.
- Jaouad, E., & Lahsen, O. (2018). Factors affecting banks' performance: Empirical evidence from Morocco. *European Scientific Journal*, 14(34), 255–267. Doi:10.19044/esj.2018.v14n34p255
- Jun, J., & Yeo, E. (2016). Entry of Fintech firms and competition in the retail payments market. *Asia-Pacific Journal of Financial Studies*, 45(2), 159–184. <https://doi.org/10.1111/ojfs.12126>
- Kaneza, C. (2016). *Factors Affecting the Financial Performance Of Commercial Banks Listed On the Nairobi Securities Exchange* (Doctoral dissertation, United States International University-Africa).
- Kasman, A., Tunc, G., Vardar, G., & Okan, B. (2010). Consolidation and commercial bank net interest margins: Evidence from the old and new European Union members and candidate countries. *Economic Modelling*, 27(3), 648–655. <https://doi.org/10.1016/j.econmod.2010.01.004>
- Klynveld Peat Marwick Goerdeler. (2017). *Value of fintech*. KPMG. <https://assets.kpmg/content/dam/kpmg/uk/pdf/2017/10/value-of-fintech.pdf>
- Ky, S., Rugemintwari, C., & Sauviat, A. (2019). Is fintech good for banks' performance? The case of mobile money in the East African Community. *The Case of Mobile Money in the East African Community (June 5, 2019)*.
- Lazahari, Z., & Hajjaj, N. (2018). Financial technology revolution of financial payment, reality and prospects. *Revue al-Ijtihad des Études Juridiques and Économiques*, 7(3), 61–85.
- Li, Y., Spigt, R., & Swinkels, L. (2017). The impact of FinTech start-ups on incumbent retail banks' share price. *Financial Innovation*, 3(1), 1–16. <https://doi.org/10.1186/s40854-017-0076-7>
- Liang, C. J., Wang, W. H., & Farquhar, J. D. (2009). The influence of customer perceptions on financial performance in financial services. *International Journal of Bank Marketing*, 27(2), 129–149. <https://doi.org/10.1108/02652320910935616>
- Majid, A. M., Nor, N. G., & Said, F. F. (2003). Efficiency of Islamic banks in Malaysia. *Paper presented to the Fifth International Conference on Islamic Economics and Banking*, Bahrain, October 7–9, 2003.
- Malika, A., & Yousef. (2018). The role of financial technology in supporting the financial and banking services sector. *Revue al-Ijtihad des Études Juridiques and Économiques*, 7(3), 86–107.
- Markus, M. L., & Soh, C. (1993). Banking on information technology: Converting IT spending into firm performance. In *Strategic information technology management: Perspectives on organizational growth and competitive advantage*, IGI Global, Hershey, PA United States (pp. 375–403).
- Mohamad, S., Hassan, T., & Bader, M. K. I. (2008). Efficiency of conventional versus Islamic banks: International evidence using the Stochastic Frontier Approach (SFA). *Journal of Islamic Economics, Banking and Finance*, 4(2), 107–130.
- Mollah, S., & Zaman, M. (2015). Shari'ah supervision, corporate governance and performance: Conventional vs. Islamic banks. *Journal of Banking & Finance*, 58

- (September), 418–435. <https://doi.org/10.1016/j.jbankfin.2015.04.030>
- Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking & Finance*, 16(6), 1173–1178. [https://doi.org/10.1016/0378-4266\(92\)90065-8](https://doi.org/10.1016/0378-4266(92)90065-8)
- Onay, C., Ozsoz, E., & Helvacioğlu, A. P. D. A. D. (2008). The impact of internet-banking on bank profitability-The case of Turkey. In *2008 Oxford Business & Economics Conference Program*, St. Hugh's College, Oxford, UK.
- Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21(2), 222–237. <https://doi.org/10.1016/j.ribaf.2006.03.007>
- Phan, D. H. B., Narayan, P. K., Rahman, R. E., & Hutabarat, A. R. (2020). Do financial technology firms influence banks' performance? *Pacific-Basin Finance Journal*, 62 (September), 101210. <https://doi.org/10.1016/j.pacfin.2019.101210>
- PricewaterhouseCoopers. *How Fintech is shaping financial services*. Global Fintech report, PWC. <https://www.pwc.com/gx/en/industries/financial-services/fintech-survey/blurred-lines.html>
- Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, 59(1), 69–76. <https://doi.org/10.1007/s12599-017-0464-6>
- Schindler, J. W. (2017). FinTech and financial innovation: Drivers and depth.
- Short, B. (1979). The relation between commercial bank profit rates and banking concentration in Canada, Western Europe, and Japan. *Journal of Banking & Finance*, 3(3), 209–219. [https://doi.org/10.1016/0378-4266\(79\)90016-5](https://doi.org/10.1016/0378-4266(79)90016-5)
- Smirlock, M. (1985). Evidence on the (non)relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking*, 17(1), 69–83. <https://doi.org/10.2307/1992507>
- Sufian, F. (2009). Determinants of bank efficiency during unstable macroeconomic environment: Empirical evidence from Malaysia. *Research in international business and finance*, 23(1), 54–77. <https://doi.org/10.1016/j.ribaf.2008.07.002>
- Thakor, A. V. (2020). Fintech and banking: What do we know? *Journal of Financial Intermediation*, 41 (January), 100833. <https://doi.org/10.1016/j.jfi.2019.100833>
- Trinh, V. Q., Aljughaiman, A. A., & Cao, N. D. (2020). Fetching better deals from creditors: Board busyness, agency relationships and the bank cost of debt. *International Review of Financial Analysis*, 69 (May), 101472. <https://doi.org/10.1016/j.irfa.2020.101472>
- Wahiba, A., & Al Zahraa, A. (2019). Financial technology in the gulf countries between novelty of the phenomenon and the speed of absorption. *Journal of Economic*, 13(2), 2602–2925.
- Wahiba, A., Ameen, S., & Nadiyah, A. (2019). Financial technology firms in the Middle East and North Africa.
- Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*, 105(3), 581–606. <https://doi.org/10.1016/j.jfineco.2012.03.005>



© 2021 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.



***Cogent Economics & Finance* (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.**

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com

