KENYA BANKERS ASSOCIATION

One Industry. Transforming Kenya.

WPS/06/23

Fintech and Bank Stability in a Small-Open Economy Context: The Case of Kenya

Jared Osoro and Josea Kiplangat

May 2023

KBA Centre for Research on Financial Markets and Policy®
Working Paper Series

69

KENYA BANKERS ASSOCIATION

One Industry. Transforming Kenya.

Working Paper Series

Centre for Research on Financial Markets and Policy

The Centre for Research on Financial Markets and Policy® was established by the Kenya Bankers Association in 2012 to offer an array of research, commentary, and dialogue regarding critical policy matters that impact on financial markets in Kenya. The Centre sponsors original research, provides thoughtful commentary, and hosts dialogues and conferences involving scholars and practitioners on key financial market issues. Through these activities, the Centre acts as a platform for intellectual engagement and dialogue between financial market experts, the banking sector and the policy makers in Kenya. It therefore contributes to an informed discussion that influences critical financial market debates and policies.

The Kenya Bankers Association (KBA) *Working Papers Series* disseminates research findings of studies conducted by the KBA Centre for Research on Financial Markets and Policy. *The Working Papers* constitute "work in progress" and are published to stimulate discussion and contribute to the advancement of the banking industry's knowledge of matters of markets, economic outcomes and policy. Constructive feedback on the *Working Papers* is welcome. *The Working Papers* are published in the names of the author(s). Therefore their views do not necessarily represent those of the KBA.

Fintech and Bank Stability in a Small-Open Economy Context: The Case of Kenya

Jared Osoro & Josea Kiplangat[1]

Abstract

This paper seeks to examine the effect of Fintech credit on bank stability using an unbalanced panel dataset of 37 commercial banks in Kenya between 2013 and 2020. The recent evolution of Fintech comes with the promise of being both revolutionary and disruptive. The temptation of a unidirectional expectation that effects of Fintech will only be positive masks the potential destabilization effects, hence the motivation to examine possibility of its being a source of fragility in the banking sector in Kenya. We employ both static panel models and a dynamic panel of System Generalized Method of Moments (GMM) that lead us to the conclusion that Fintech credit has not occasioned concerns of market fragility. If anything, the empirical results reveal that the FinTech credit is associated with higher bank stability in the sense that FinTech intermediated credit is associated with a higher Z-score suggesting higher overall bank stability. The relationship is however nonlinear, with the squared term of the FinTech credit being negative and statistically significant. We infer that the influence of FinTech on bank stability is inverted "U" type relationship. Bank-specific factors such as equity to assets, asset quality and cost-to-income rations having a strong influence on bank stability. That is a pointer to the possibility of the current magnitude of Fintech credit – the possible conduit of instability – not being associated with fragility, with the likelihood of that changing as the its share of bank assets grows with time.

Keywords: Bank Stability; FinTech; Kenya

1.0 Introduction

This paper seeks to examine the effect of Fintech on Bank Stability. The characterization of FinTech as both "revolutionary" and "disruptive" is ubiquitous (World Economic Forum, 2017). The hype around FinTech is traceable to the nature of activities that it embodies, being defined as "technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services" (CGFS and FSB, 2017). The multifaceted nature of FinTech points to its potential influence on how financial services are structured, provisioned and consumed.

The extent of the FinTechs' influence, when they act on their own, is often overstated. Seldom lacking in ambition, many of them seek to overtake incumbents in financial service provision as dominant players. While it can be argued that FinTech firms – including small, technically enabled new entrants – have shaped the basis of competition in financial markets, they are yet to materially change the competitive landscape. These aspects are aptly encapsulated in Navaretti, Calzolari and Pozzolo (2017) at two levels.

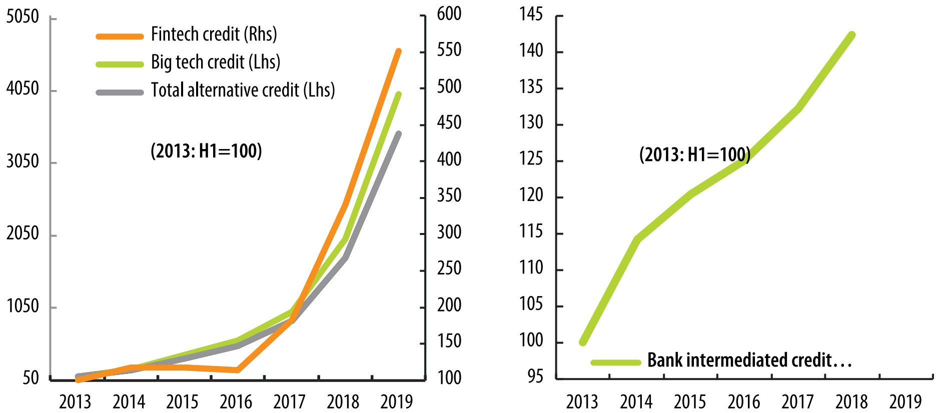
First, FinTechs have facilitated the provision of services that traditional financial institutions do less efficiently, or not at all, and facilitated new users. Second, they have enhanced efficiency in the provision of the same old financial services. While they are not able to replace banks – the dominant financial service provider in small open economies - in their key function of intermediation, banks have adopted FinTech innovations to old things in new ways. As Fintechs struggle with scale and customer adoption, they have elected to partnerships with banks.

The Fintechs – Banks partnership model on the back of bank dominance has not obviated standalone Tech Credit. Despite a volatile environment, FinTech activities continue to register significant growth (World FinTech Report, 2021). A synthesis of existing literature by Anagnostopoulos (2018) on the implications of FinTech and Regtech on regulators and banks summarizes the enablers of its adoption as: changing demographics and high national internet and mobile penetration; shifting customer expectations; the need to re-invent the business models; pursuit of cost-efficiency; niche competition; innovations and significant improvement in cyber security surveillance; regulation-led innovation after 2007-08 Global Financial Crisis; diversification opportunities and funds disintermediation; and a supportive current regulatory environment.

In Sub-Sahara Africa, FinTech activities are gaining sizeable traction albeit from a low base, and therefore are relatively small compared to other regions globally (Yermack, 2018)[1]. Funding for Fintech activity is on the rise[2] and is mainly dominated by digital payments. In addition, the credit volume intermediated by Fintech while still low, has been characterized by a growth rate substantially higher than that of conventional financial intermediaries (Cornelli, Frost, Gambacorta, Rau, Wardrop and Ziegler, 2020; **Figure 1**). In Kenya for instance, Fintech credit has grown from US$ 9 million in 2013 to US$ 51 million in 2019, a five-fold increase, and a 23.1 percent compounded annual growth rate (CAGR), while bank-intermediated credit, on the other hand, has grown two-fold over the same period.

The proliferation of FinTech has consequences on the financial sector, especially banking sector, and all not necessarily positive. Given the interlinkages between FinTech and banks, the implications on broad market stability hinge on: (i) FinTechs competing for similar business segments as banks; although from a different

Figure 1: Growth in Bank Intermediated, Big tech and Fintech Credit



Source: Cornelli, G., Frost, J., Gambacorta, L., Rau, P. R., Wardrop, R., & Ziegler, T. (2020).

1. See Yermack (2018) for a detailed discussion on the growth of FinTech applications in consumer finance, especially in the payments space, social media, digital currency, and more importantly on micro-credit.
2. See State of the FinTech Report: Investment and Sector Trends to watch (2021). Accessed on March 29, 2022, from https://www.cbinsights.com/reports/CB-Insights_Fintech-Report-Q4-2020.pdf

regulatory platform; (ii) they are also collaborating with banks and therefore come with a possibility of new risk-taking attribute; and (iii) incumbent banks have increased investments in FinTechs. While the focus of the interlinkages has been on emerging opportunities, the possible adverse implications are less understood. Existing empirical investigation focuses on developed economies. While theoretical channels of the transmission of the effects of FinTech surge on banking system has been documented, empirical evidence remains limited.

We take the Kenyan banking system as interesting in a small open economy set up. The banking system operates in a policy framework that allows not just free entry and exit of market players, resource flows in and out of the system is assured by the economy's open capital account. The rest of the paper is organized as follows: the next section provides a reviews literature and is followed by the empirical assessment upon which conclusions and inferences are drawn.

2.0 A Review and Synthesis of Literature

There are several strands of literature assessing the implications of fintech developments on financial systems, which we cluster into four streams. The first strand relates to the impact of fintech developments on bank performance whereby it can either complement or squeeze bank performance especially in stances where FinTechs are competing with banks. Using a sample of Chinese banks, Zhao, Yu, Chen and Lee (2022) assess the impact on FinTech innovation, particular fintech development and capabilities on bank performance and shows that it is associated with a decline in bank profitability and asset quality, but improves management efficiency.

Lee, Li, Yu and Zhao (2021) documents evidence showing that among Chinese banks, fintech innovations is efficiency enhancing while also enhancing bank's technology especially when the innovations are market driven. On the nexus between fintech innovations and bank stock returns, Carlini, Del Gaudio, Porzio and Previtali (2022) finds that it fintech innovations dampens stock market returns, especially when investments by banks are in younger, and technology-oriented Fintech firms.

The second strand relates to the Fintech, competition, and risk-taking nexus. Tseng and Guo (2018) build a theoretical model on the implications of FinTech on bank credit competition and risk-taking behaviour and document the existence of trade-offs. This line of analysis shows that if FinTech helps mitigate agency problems between banks and borrowers, it fosters monitoring incentives of banks. In the process, information asymmetry is lessened, thereby invigorating credit market competition but inducing less monitoring effort. In addition, it shows that capital regulation, particularly an increase in capital requirements, mitigates the reduction of monitoring efforts arising from FinTechs.

Li, Li, Zhu, Yao and Casu (2020) examines the risk spillovers between FinTech and traditional financial institutions in the United States using stock return information and document increased risk contagion from FinTech institutions to financial institutions and therefore advocate for the need for supervision and regulation to avert systemic risks from destabilizing the financial system. Banna, Hassan and Rashid (2021) finds that Fintech financial inclusion (FFI) is associated with a decline in bank risk-taking behaviour in a sample of 534 banks from 24 Organization of Islamic Cooperation (OIC) countries but exposes banks towards heightened uncertainty as they compete in Fintech investments.

The third strand evaluates the implications of FinTech on bank lending and asset quality. Balyuk, Berger, and Hackney (2020) shows that among small businesses in the United States (US), FinTech loans disintermediate bank loans[3]. However, their loans are risky, especially in instances where small businesses have both FinTech and bank loans but becomes less risky as the overlaps in borrowing diminish. An interesting conclusion of this analysis is that both FinTech and bank loans are beneficial to the real economy.

Bao, and Huang (2020), examines the effect of exogenous shocks, the COVID-19 pandemic, on FinTech and bank lending in China, showing the existence of pecking orders in repayment and default behaviour. In this assessment, Fintech loans to new and financially constrained borrowers during the COVID-19 period grew sizably while unsecured bank loans were muted, but the delinquency of Fintech loans rose significantly, while that of banks remains relatively unaffected. First, both FinTech and bank loans preshock tend to have similar delinquency rates. Then with the onset of the COVID-19 pandemic, borrowers have a pecking order in defaulting, starting with FinTech loans first. In the same token, there is an evident pecking order in repayment behaviour, with borrowers prioritizing payment of bank loans over FinTech loans.

Hodula (2021) finds evidence supporting both the complementary and substitution effect of Fintech credit on bank credit. On the one hand, it finds that in liquid, stable and competitive banking systems, fintech credit complements traditional credit. On the other hand, in less stable and less competitive banking systems, Fintech credit substitutes for bank credit.

The fourth strand is on the interrelationships between Fintech developments and financial stability. Braggion, Manconi, and Zhu (2017) implements a differenceindifference approach to examine the implications of FinTech activity on financial stability in China. It documents evidence of FinTech activity to the effect along the lines of peer-to-peer (P2P) lending and the undermining credit market regulations, culminating in excessive household indebtedness. Daud, and Khalid and Azman-Saini (2021) in a panel of 63 countries spanning 2006 to 2017 finds that FinTech fosters bank stability through the channels of artificial intelligence, cloud, and data technology.

Fung, Lee, Yeh and Yuen (2020) using a panel of banks from 84 countries, examines the role of exogenous shocks from introduction of FinTech regulatory sandboxes on financial institution's fragility. It shows that in the assessment of Fintech innovations-financial institution fragility nexus, no effect on fragility is

3 Balyuk, Berger, and Hackney (2020) attributes the observation to the fact that FinTechs enjoy comparative advantage over banks in the efficiency in processing of hard information

evident if no control for market characteristics is undertaken. However, when market characteristics are accounted for, they find evidence in support of FinTech innovations associated with decreased financial fragility in emerging financial markets, increasingly so in developed financial markets with the transmission mechanism being through the profitability channel.

We seek to complement the diverse strands of literature on Fintech by examining the implications of financial technology innovations for banking stability from an emerging market context.

3.0 Data and Methodology

3.1 Sample

This paper uses data from varied sources in its empirical assessment. Banklevel information comes from the annual audited bank financial statements compiled by the Kenya Bankers Association. To limit the focus of analysis to operations in Kenya for the Kenyan banks with a regional footprint, we extract financials relating to activity in Kenya. Macroeconomic data are obtained from the Economic Surveys and Statistical Abstracts of the Kenya National Bureau of Statistics (KNBS). FinTech, and BigTech credit information is obtained from the Bank for International Settlements (BIS) database.

3.2 Methodology

To investigate the effect of fintech credit on bank stability we rely on the following baseline panel equation: -

$$Fin_{i,t}=\alpha_i+\delta_t+\gamma_1\ FinTech_t+\emptyset X_{i,t}+\theta Z_{i,t}+\varepsilon_{i,t}$$

where i and t are the bank and year subscripts, respectively. $Fin_{i,t}$ is a measure of stability for bank i in period t and we measure this using the Z-score in line with the extant banking literature (Ashraf 2017; Wang and Sui 2019). The Z-Score is the sum of the return on assets and capital-to-asset ratio divided by the standard deviation of asset returns[4]. Roy (1952) interpreted the Z-score as the number of standard deviations of profits that must be less than its mean to bankrupt the bank, and it is viewed as the inverse of the probability of bank failure. Therefore, a higher Z-score suggests higher overall bank stability or lower exposure to insolvency risk.

4. Various approaches have been adopted in the literature to measure the Z-score, especially in the construction of the denominator. Some studies computed the asset returns standard deviation over the entire sample period while some studies computed the standard deviation over a rolling window. Different rolling windows have been adopted with the most common used is a three-year rolling window, a four-year rolling window, and a five-year rolling window. In this study, the standard deviation over the entire sample period is adopted.

$FinTech$ is Fintech intermediated credit, and its associated coefficient γ_1 captures the effect of Fintech on bank stability and is hypothesized to either be positive or negative. If γ_1 is negative, it implies that fintech credit dampens bank stability, and positive is bank stability enhancing. $X_{i,t}$ represents the bank control variables affecting bank stability comprising bank size, equity to assets ratio (capital ratio), asset quality proxied by the ratio of non-performing loans to gross loans, and bank efficiency proxied by cost-to-income ratio. Size, which is calculated as a natural logarithm of total assets, is expected to impact bank stability but with ambiguous effects (Afonso, Santos, and Traina 2014; Cubillas and González 2014). We also control for leverage calculated as a bank's equity as a share of its total assets (Berger and Bouwman 2017). In addition, we include bank Efficiency measured as the ratio of operating costs to total income (Fiordelisi, Marques, and Molyneux 2011; Sturm and Williams 2004). Finally, we control for asset quality as it affects bank stability.

$Z_{i,t}$ captures the bank invariant macroeconomic control variables, particularly annual growth rate while α_i and δ_t captures the bank and year-fixed effects, respectively with the former capturing bank time invariant heterogeneity and the latter capturing bank time-varying heterogeneity. $\varepsilon_{i,t}$ is the error term, which is assumed to be iid.

4.0 Results and Discussions

Table 1 reports the descriptive statistics. The Z-scores of the sample banks are distributed with a mean value of 2.754 and a standard deviation of 0.703. The values range between a minimum of 0.139 and a maximum of 4.15. With respect to FinTech credit (natural logarithm), the mean value is 10.528, and the standard deviation is 1.285.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Bank Z-Score	274	2.754	0.703	0.139	4.15
Natural logarithm of FinTech credit	274	10.528	1.285	8.538	12.282
Squared natural logarithm of Fintech credit	274	112.49	27.019	72.898	150.84
Natural logarithm of bank total assets	274	10.833	1.339	8.21	13.411
Equity to asset ratio	274	0.153	0.042	0.022	0.332
Non-performing loan ratio	274	0.126	0.112	0	0.55
Cost to income ratio	261	0.802	0.192	0.424	1.337
Annual GDP growth	274	0.041	0.017	-0.003	0.056

The pairwise correlations between the variables in the baseline model are reported in **Table 2.** The correlation between the Z-score and FinTech is negative, albeit statistically significant. The bank characteristic variables and macro variables are found not to be strongly correlated with each other, implying that a joint inclusion of these variables will not occasion multicollinearity problems.

Table 2: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Bank Z-Score	1.000							
(2) Natural logarithm of FinTech credit	-0.082	1.000						
(3) Squared natural logarithm of Fintech credit	-0.084	0.999*	1.000					
(4) Natural logarithm of bank total assets	0.115	0.188*	0.189*	1.000				
(5) Equity to asset ratio	0.409*	-0.052	-0.061	-0.183*	1.000			
(6) Non-performing loan ratio	-0.423*	0.275*	0.272*	-0.354*	0.014	1.000		
(7) Cost to income ratio	-0.594*	0.168*	0.165*	-0.520*	-0.170*	0.586*	1.000	
(8) Annual GDP growth	0.074	-0.317*	-0.336*	-0.069	0.085	-0.071	-0.141*	1.000

*** p<0.01, ** p<0.05, * p<0.1

4.1 Baseline regression results - Contemporaneous effect of FinTech Credit on Bank Stability

The results of the baseline the pooled OLS (POLS) are reported in **Table 3.** We estimate two linear POLS models, and the results are reported in Column (1)-(2). In Column 1, the univariate POLS results of the nexus between FinTech credit and bank stability, and a negative and statistically significant effect is evident. However, controlling for bank-specific characteristics and macroeconomic factors, the relationship turns positive and statistically significant at 10% level of significance as reported in Column 2.

We extend the baseline regression model and estimate a quadratic panel, with the results reported in Column (3)-(4). Controls for bank-specific and macroeconomic factors are considered, and the results reveal that the FinTech credit is associated with higher bank stability. In other words, the higher the FinTech intermediated credit, the higher Z-score suggesting higher overall bank stability, albeit in a non-linearly way as the squared term of the FinTech credit is negative and statistically significant. Other bank-specific factors also significantly affect bank stability. Higher equity to assets ratio, the higher the Z-Score, while the lower the asset quality and the higher the costtoincome ratio, the lower the Z-Score.

Table 3: Contemporaneous POLS effect of FinTech Credit on Bank Stability

VARIABLES	Linear Model		Quadratic Model	
	(1)	(2)	(3)	(4)
	Z-Score	Z-Score	Z-Score	Z-Score
Natural logarithm of FinTech credit	-0.0477**	0.0679*	18.06**	0.820*
	(0.0232)	(0.0367)	(7.190)	(0.455)
Squared natural logarithm of Fintech credit			-0.870**	-0.0362*
			(0.345)	(0.0208)
Natural logarithm of bank total assets		-0.0321		-0.0321
		(0.0688)		(0.0688)
Equity to asset ratio		6.196***		6.196***
		(1.376)		(1.376)
Non-performing loan ratio		-1.534**		-1.534**
		(0.634)		(0.634)
Cost to income ratio		-1.537***		-1.537***
		(0.410)		(0.410)
Annual GDP growth		-1.125		-1.201
		(0.777)		(0.801)
Constant	3.182***	2.864***	-88.01**	-0.919
	(0.218)	(0.850)	(36.22)	(2.035)
Yes Effects	YES	YES	YES	YES
Observations	274	261	274	261
R-squared	0.011	0.534	0.011	0.534

Notes: Clustered (at bank-level) robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4.2 Contemporaneous Static Panel Estimation of FinTech Credit on Bank Stability

The results for the static panel, where we estimate the fixed effect (FE) and random effect (RE) regression are presented in **Table 4**. To choose an appropriate model between the FE and RE models, we perform the Hausman test, with the results confirm the suitability of the individual fixed effects (FE) model as reported in **Table 4**. In Columns (5)-(8), the linear and quadratic estimations of the nexus between FinTech credit and bank stability is estimated without controlling for bank-specific and macroeconomic characteristics.

The results obtained under the two models are qualitatively similar to those obtained under the POLS model reported in earlier, but different in magnitudes. In particular, the results in **table 4** show that the estimated coefficients of FinTech credit and its squared term are reported in Column (7) are highly consistent with those reported in **Table 3** Column (4). The coefficient of FinTech credit is positive and significant, while the coefficient of its squared term is negative and significant, indicating that the influence of FinTech on bank stability is an inverted "U" type relationship. However, controlling for bank-specific effects and macroeconomic variables, mixed signs are observed, albeit insignificant as reported in Column (9) and (12) suggesting that in the early stage, the development of FinTech does not statistically influence bank stability.

Table 4: Contemporaneous Static Panel Estimation of FinTech Credit on Bank Stability

VARIABLES	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Z-Score FE	Z-Score RE	Z-Score FE	Z-Score RE	Z-Score FE	Z-Score RE	Z-Score FE	Z-Score RE
Natural logarithm of FinTech credit	-0.0462***	-0.0463***	18.07*	18.07*	-0.0155	-0.0101	-0.0196	0.0192
	(0.0139)	(0.0142)	(9.914)	(10.08)	(0.0106)	(0.0103)	(0.263)	(0.277)
Squared natural logarithm of Fintech credit			-0.870*	-0.870*			0.000199	-0.00141
			(0.477)	(0.484)			(0.0127)	(0.0133)
Natural logarithm of bank total assets					0.0698*	0.0535*	0.0698*	0.0535*
					(0.0355)	(0.0322)	(0.0355)	(0.0322)
Equity to asset ratio					6.532***	6.579***	6.532***	6.579***
					(0.255)	(0.266)	(0.255)	(0.266)
Non-performing loan ratio					-0.372***	-0.433***	-0.372***	-0.433***
					(0.138)	(0.140)	(0.138)	(0.140)
Cost to income ratio					-0.790***	-0.817***	-0.790***	-0.817***
					(0.0849)	(0.0885)	(0.0849)	(0.0885)

VARIABLES	(5) Z-Score FE	(6) Z-Score RE	(7) Z-Score FE	(8) Z-Score RE	(9) Z-Score FE	(10) Z-Score RE	(11) Z-Score FE	(12) Z-Score RE
Annual GDP growth					0.0181	-0.0530	0.0185	-0.0560
					(0.508)	(0.534)	(0.524)	(0.550)
Constant	3.171***	3.170***	-88.07*	-88.07*	1.796***	1.997***	1.817	1.850
	(0.145)	(0.180)	(49.91)	(50.74)	(0.337)	(0.320)	(1.300)	(1.370)
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	274	274	274	274	261	261	261	261
Hausman Test	0.0141		0.0287		0.0001		0.0001	
R-squared	0.134		0.134		0.816		0.816	
Number of Bank	37	37	37	37	37	37	37	37

Notes: Clustered (at bank-level) robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The Hausman test results report are P-values and the Null hypothesis: RE assumptions hold (i.e., RE and FE are both consistent but prefer RE because it is more efficient than FE) is rejected, and therefore the results interpreted are those of FE model.

4.3 Robustness analysis: Dynamic Panel Estimation of FinTech Credit on Bank Stability

The results in the previous sections are conducted within a static panel framework. For robustness, we also consider a dynamic panel setting to estimate the effect of FinTech credit on bank stability using a two-step system generalized method of moments (GMM) in the lines of Arellano and Bover (1995) and Blundell and Bond (1998)[5], thus reducing the potential endogeneity issues. The results of the linear estimates of the two-step system GMM are reported in **Table 5**. We also test the validity of our instruments by using the Sargan test of overidentifying restrictions. In all models, the test statistic accepts the null hypothesis that the instruments are exogenous. Furthermore, we test for first- and second-order autocorrelation and the results reveal that there is no second-order autocorrelation.

The results show that FinTech credit coefficient is of the same sign but different magnitude. FinTech credit has a significantly positive effect on bank stability. Further, the effect of bank-specific factors remains qualitatively similar to those reported in the static panel setting.

5. System GMM is appropriate for the following reasons. First, the system GMM estimator enables us to remove the strict exogenous assumption for the regressions and eliminate the unobserved bankspecific effects. Second, the estimation of the dynamic panel model can be applied to control for path dependence in the series of the dependent variable. Third, system GMM allows bank stability to be modeled dynamically, given that bank stability may persist over time owing to intertemporal smoothing.

Table 5: Two-Step System GMM Estimation of FinTech Credit on Bank Stability

VARIABLES	Z-Score
Lagged Z-Score	-0.0655
	(0.197)
Natural logarithm of FinTech credit	0.228***
	(0.0528)
Natural logarithm of bank total assets	-1.111**
	(0.431)
Equity to asset ratio	5.824***
	(1.430)
Non-performing loan ratio	-2.860**
	(1.323)
Cost to income ratio	0.225
	(0.780)
Annual GDP growth	-0.398
	(1.191)
Number of Instruments	13
Arellano-Bond test for AR(2) test	0.911
Sargan test	0.135
Hansen test	0.034
Difference-in-Hansen	0.792
Observations	188
Number of Bank	37

Note: The standard errors are reported in parentheses except for the Sargan and Difference-in-Hansen tests, which are p-values. The significance at 1%, 5%, and 10% is represented by ***, **, and *, respectively. Note: We estimate all regressions using the two-step system GMM, as proposed by Arellano and Bover (1995) and Blundell and Bond (1998).

5.0 Conclusions

The recent evolution of Fintech comes with the promise of being both revolutionary and disruptive. The temptation of a unidirectional expectation that effects of Fintech will only be positive masks the potential destabilization effects, hence the motivation to examine possibility of its being a source of fragility in the banking sector in Kenya. The empirical results reveal that the FinTech credit is associated with higher bank stability in the sense that FinTech intermediated credit is associated with a higher Z-score suggesting higher overall bank stability. The relationship is however nonlinear, with the squared term of the FinTech credit being negative and statistically significant.

We infer that the influence of FinTech on bank stability is inverted "U" type relationship. Bank-specific factors such as equity to assets, asset quality and cost-to-income rations having a strong influence on bank stability. That is a pointer to the possibility of the current magnitude of Fintech credit – the possible conduit of instability – not being associated with fragility, with the likelihood of that changing as the its share of bank assets grows with time. This paper complements the diverse strands of literature on Fintech in a manner that will interest both policy makers and market practitioners.

References

1. Afonso, G., Santos, J. A., & Traina, J. (2014). Do'Too-Big-To-Fail'Banks Take on More Risk?. *Economic Policy Review, 20*(2), 41-58.

2. Agarwal, S., & Zhang, J. (2020). FinTech, lending and payment innovation: A review. *Asia- Pacific Journal of Financial Studies, 49*(3), 353-367. https://doi.org/10.1111/ajfs.12294

3. Anagnostopoulos, I. (2018). Fintech and Regtech: Impact on regulators and banks. *Journal of Economics and Business, 100*, 7-25. https://doi.org/10.1016/j.jeconbus.2018.07.003

4. Ashraf, B. N. (2017). Political institutions and bank risk-taking behaviour. *Journal of Financial Stability, 29*, 13-35.

5. Balyuk, T., Berger, A. N., & Hackney, J. (2020). What is fueling fintech lending? The role of banking market structure. *The Role of Banking Market Structure.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3633907

6. Banna, H., Hassan, M. K., & Rashid, M. (2021). Fintech-based financial inclusion and bank risk-taking: Evidence from OIC countries. *Journal of International Financial Markets, Institutions and Money, 75*, 101447. https://doi.org/10.1016/j.intfin.2021.101447

7. Bao, Z., & Huang, D. (2020). An Anatomy of FinTech Lending in China During COVID-19. https://iwfsas.org/iwfsas2021/wp-content/uploads/2021/08/14_An-Anatomy-of-FinTech-Lending-in-China-During-COVID-19.pdf

8. Berger, A. N., & Bouwman, C. H. (2017). Bank liquidity creation, monetary policy, and financial crises. *Journal of Financial Stability, 30*, 139-155.

9. Boot, A., Hoffmann, P., Laeven, L., & Ratnovski, L. (2021). Fintech: what's old, what's new?. *Journal of financial stability,* 53, 100836. https://doi.org/10.1016/j.jfs.2020.100836

10. Braggion, F., Manconi, A., & Zhu, H. (2017). Is Fintech a threat to financial stability? Evidence from

peer-to-peer lending in China. https://www.clevelandfed.org/~/media/content/events/2017/financial%20stability/braggion%20fabio%20paper.pdf?la=en

11. Carlini, F., Del Gaudio, B. L., Porzio, C., & Previtali, D. (2022). Banks, FinTech and stock returns. *Finance Research Letters, 45*, 102252. https://doi.org/10.1016/j.frl.2021.102252

12. Cornelli, G., Frost, J., Gambacorta, L., Rau, P. R., Wardrop, R., & Ziegler, T. (2020). Fintech and big tech credit: a new database. BIS Papers. https://www.bis.org/publ/work887.pdf

13. Cubillas, E., & González, F. (2014). Financial liberalization and bank risk-taking: International evidence. *Journal of Financial stability, 11*, 32-48.

14. Das, S. R. (2019). The future of Fintech. *Financial Management, 48*(4), 981-1007. https://doi.org/10.1111/fima.12297

15. Daud, S. N. M., Khalid, A., & Azman-Saini, W. N. W. (2021). Fintech and Financial Stability: Threat or Opportunity? *Finance Research Letters*, 102667. https://doi.org/10.1016/j.frl.2021.102667

16. Dudley, W. C. (2017). *FinTech credit: Market structure, business models and financial stability implications*. BIS. https://www.bis.org/publ/cgfs_fsb1.pdf

17. Elsaid, H. M. (2021). A review of literature directions regarding the impact of fintech firms on the banking industry. *Qualitative Research in Financial Markets*. https://doi.org/10.1108/QRFM-10-2020-0197

18. Ferrari, R. (2016). FinTech impact on retail banking—from a universal banking model to banking verticalization. *The FinTech book: The financial technology handbook for investors, entrepreneurs and visionaries*, 248-252. https://doi.org/10.1002/9781119218906.ch65

19. Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., & Saal, M. (2021). Fintech and the digital transformation of financial services: implications for market structure and public policy. *BIS Papers*. https://www.bis.org/publ/bppdf/bispap117.pdf

20. Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., & Saal, M. (2021). *Fintech and payments: regulating digital payment services and e-money*. BIS Papers. https://www.bis.org/fsi/publ/insights33.pdf

21. Fiordelisi, F., Marques-Ibanez, D., & Molyneux, P. (2011). Efficiency and risk in European banking. *Journal of banking & finance, 35*(5), 1315-1326.

22. Fung, D. W., Lee, W. Y., Yeh, J. J., & Yuen, F. L. (2020). Friend or foe: The divergent effects of FinTech on financial stability. *Emerging Markets Review, 45*, 100727. https://doi.org/10.1016/j.ememar.2020.100727.

23. Fung, D. W., Lee, W. Y., Yeh, J. J., & Yuen, F. L. (2020). Friend or foe: The divergent effects of FinTech on financial stability. *Emerging Markets Review, 45*, 100727. https://doi.org/10.1016/j.ememar.2020.100727.

24. Gelis, P. (2016). Why FinTech banks will rule the world. *The FinTech Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*, 235-237. https://doi.org/10.1002/9781119218906.ch61.

25. Hodson, D. (2021). The politics of FinTech: Technology, regulation, and disruption in UK and German retail banking. *Public Administration*, *99*(4), 859-872. https://doi.org/10.1111/padm.12731

26. Hodula, M. (2021). Does Fintech credit substitute for traditional credit? Evidence from 78 countries. *Finance Research Letters*, 102469. https://doi.org/10.1016/j.frl.2021.102469

27. Lagna, A., & Ravishankar, M. N. (2022). Making the world a better place with fintech research. *Information Systems Journal, 32*(1), 61-102. https://doi.org/10.1111/isj.12333

28. Lee, C. C., Li, X., Yu, C. H., & Zhao, J. (2021). Does fintech innovation improve bank efficiency? Evidence from China's banking industry. *International Review of Economics & Finance*, *74*, 468-483. https://doi.org/10.1016/j.iref.2021.03.009

29. Li, J., Li, J., Zhu, X., Yao, Y., & Casu, B. (2020). Risk spillovers between FinTech and Traditional Financial Institutions: Evidence from the US. *International Review of Financial Analysis*, *71*, 101544. https://doi.org/10.1016/j.irfa.2020.101544.

30. Nguyen, L., Tran, S., & Ho, T. (2021). Fintech credit, bank regulations and bank performance: a cross-country analysis. *Asia-Pacific Journal of Business Administration*. https://doi.org/10.1108/APJBA-05-2021-0196.

31. Nienaber, R. (2016). Banks need to think collaboration rather than competition. *The FinTech Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*, 20-21. https://doi.org/10.1002/9781119218906.ch4.

32. Phan, D. H. B., Narayan, P. K., Rahman, R. E., & Hutabarat, A. R. (2020). Do financial technology firms influence bank performance?. *Pacific-Basin finance journal*, 62, 101210. https://doi.org/10.1016/j.pacfin.2019.101210.

33. Stulz, R. M. (2022). FinTech, BigTech, and the Future of Banks. *Journal of Applied Corporate Finance*, *34*(1), 106-117. https://doi.org/10.1111/jacf.12378.

34. Sturm, J. E., & Williams, B. (2004). Foreign bank entry, deregulation, and bank efficiency: Lessons from the Australian experience. *Journal of Banking & Finance*, *28*(7), 1775-1799.

35. Tseng, P. L., & Guo, W. C. (2018). *Fintech, Credit Market Competition, and Bank Risk-Taking. Working paper.* https://www.sfm.url.tw/26thSFM/php/Papers/CompletePaper/077-690860509.pdf.

36. Wang, R., & Sui, Y. (2019). Political institutions and foreign banks' risk-taking in emerging markets. *Journal of Multinational Financial Management*, *51*, 45-60.

37. World FinTech Report (2021). Accessed on March 29, 2022 from https://fintechworldreport.com/wp-content/uploads/sites/9/2021/05/World-FinTech-Report-2021.pdf.

38. Yao, T., & Song, L. (2021). Fintech and the economic capital of Chinese commercial bank's risk: Based on theory and evidence. *International Journal of Finance & Economics.* https://doi.org/10.1002/ijfe.2528.

39. Yermack, D. (2018). *Fintech in Sub-Saharan Africa: what has worked well, and what hasn't* (No. w25007). National Bureau of Economic Research. https://www.nber.org/papers/w25007.

40. Zhang, A., Wang, S., Liu, B., & Liu, P. (2020). How Fintech impacts pre and post-loan risk in Chinese commercial banks. *International Journal of Finance & Economics.* https://doi.org/10.1002/ijfe.2284.

41. Zhao, J., Li, X., Yu, C. H., Chen, S., & Lee, C. C. (2022). Riding the FinTech innovation wave: FinTech, patents and bank performance. *Journal of International Money and Finance, 122,* 102552. https://doi.org/10.1016/j.jimonfin.2021.102552.

Kenya Bankers Association
13th Floor, International House, Mama Ngina Street
P.O. Box 73100– 00200 NAIROBI
Telephone: 254 20 2221704/2217757/2224014/5
Cell: 0733 812770/0711 562910
Fax: 254 20 2221792
Email: research@kba.co.ke
Website: www.kba.co.ke

KENYA BANKERS
ASSOCIATION

One Industry. Transforming Kenya.