

INTERNATIONAL MONETARY FUND

Promise (Un)kept? Fintech and Financial Inclusion

Serhan Cevik

WP/24/131

**2024
JUN**



WORKING PAPER

IMF Working Paper

European Department

Promise (Un)kept? Fintech and Financial Inclusion**Prepared by Serhan Cevik¹**

Authorized for distribution by Bernardin Akitoby

June 2024

IMF Working Papers describe research in progress by the author(s) and are published to elicit comments and to encourage debate. The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Abstract

The emergence of financial technologies—fintech—has become an engine of change, promising to expand access to financial services and give a boost to financial inclusion. The ownership of accounts in formal financial institutions increased from 51 percent of the world's adult population in 2011 to 76 percent in 2021, but there is still significant variation across countries. So has the rapid growth of fintech delivered the promise of broadening financial services to the under-served populations? In this paper, I use a comprehensive dataset to investigate the relationship between fintech and financial inclusion in a panel of 84 countries over the period 2012–2020 and obtain interesting empirical insights. First, the magnitude and statistical significance of fintech on financial inclusion varies according to the type of instrument. While digital lending has a significant negative effect on financial inclusion, digital capital raising is statistically insignificant. Second, the overall impact of fintech is also statistically insignificant for the full sample, but becomes positive and statistically highly significant in developing countries. Policymakers need to develop an adequate regulatory framework that balances fostering innovation and ensuring equitable treatment of individuals and groups. This requires better financial education, strong regulatory institutions, and well-calibrated prudential regulations for a level playing field and effective supervision.

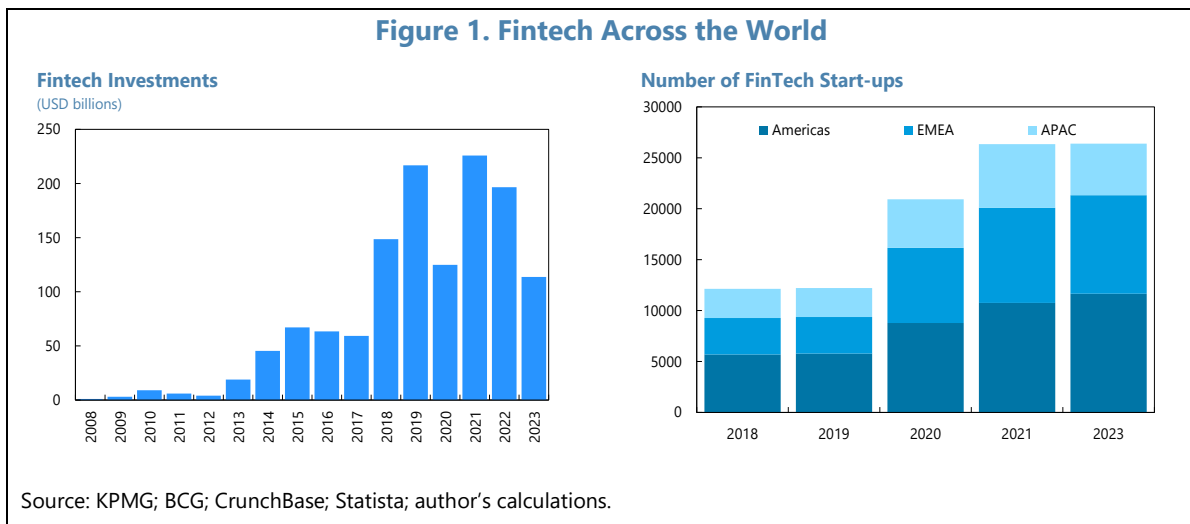
JEL Classification Numbers:	D31; D63; E44; G28; G50
Keywords:	Fintech; financial innovation; financial inclusion
Author's E-Mail Address:	scevik@imf.org

¹ The author would like to thank Itai Agur, Bernardin Akitoby, Zulma Barrail, Jeff Kearns, Sumiko Ogawa, and Manmohan Singh for helpful comments and suggestions.

I. INTRODUCTION

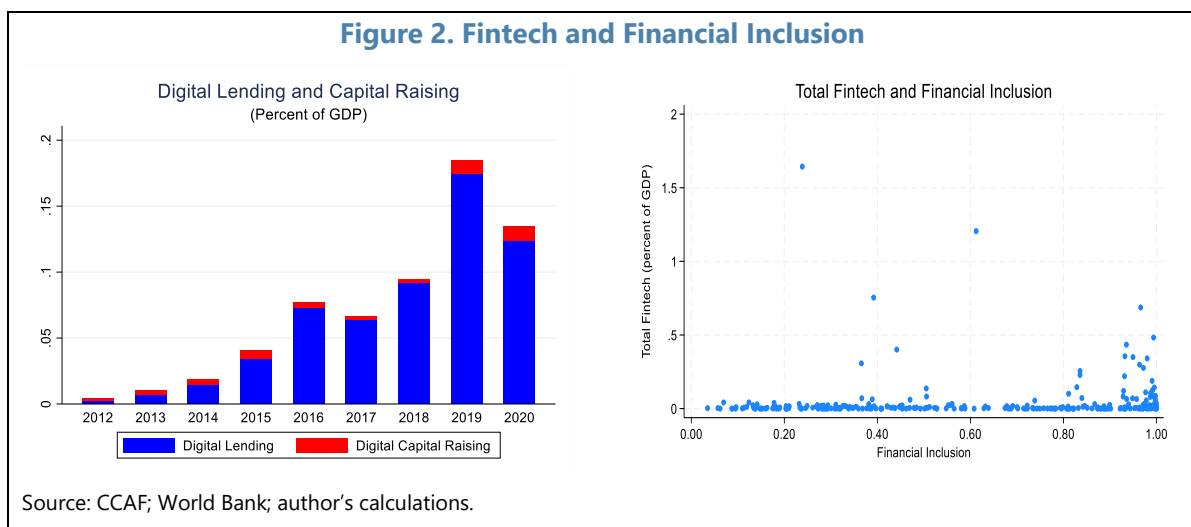
The emergence of financial technologies—fintech—has become an engine of change, promising to expand affordable access to financial services and give a boost to financial inclusion—defined as affordable access to basic financial products and services. The total value of start-up investments into fintech worldwide increased from US\$1 billion in 2008 to over US\$200 billion before the COVID-19 pandemic (Figure 1). During this period, access to financial products and services has improved globally, with the ownership of accounts in formal financial institutions increasing from 51 percent of the world’s adult population in 2011 to 76 percent in 2021, according to the World Bank. But there is still significant variation in access to financial products and services across the world, with account ownership reaching 100 percent of adults in some advanced economies compared to as little as 2.5 percent in some developing countries. So has the rapid growth of fintech delivered the promise of broadening financial services to the under-served populations? As shown in Figure 2, there is no discernible relationship between fintech activity and financial inclusion, but it is necessary to look beyond outliers in the data and develop a granular empirical analysis to answer this important question.

There is a growing literature that explores the relationship between fintech and macro-financial developments. With regards to financial stability, studies obtain mixed results on whether it presents a threat or opportunity (Minto, Voelkerling, and Wulff, 2017; Pantelieieva *et al.*, 2018; Baba *et al.*, 2020; Fung *et al.*, 2020; Pieri and Timmer, 2020; Vucinic, 2020; An and Rau, 2021; Feyen *et al.*, 2021; Wang, Liu, and Luo, 2021; Daud *et al.*, 2022; Nguyen and Dang, 2022; Ben Naceur *et al.*, 2023; Haddad and Hornuf, 2023; Cevik, 2024a). Some of these papers conclude that fintech could mitigate financial risks by enhancing decentralization and diversification, deepening financial markets, and strengthening efficiency and transparency in the delivery of financial services. Others, however, find that that fintech could become vulnerable to cybersecurity risks, amplify market volatility, compound aggregate risk-taking and contagious behavior among both consumers and financial institutions, and thereby undermine financial stability. With regards to economic growth, studies document a positive association between fintech and growth (Li, Wu, and Xiao, 2019; Zhang *et al.*, 2020; Chen, Teng, and Chen, 2022; Song and Appiah-Otoo, 2022;



Bu, Yu, and Li, 2023; Cevik, 2024b). While financial innovation can mobilize savings and provide funding for growth opportunities in the real economy, it is important not to ignore the effect of fintech on financial stability, which in turn may have adverse consequences for growth. With regards to financial inclusion, the limited literature tends to find a positive relationship between fintech and financial inclusion (Quamruzzaman and Wei, 2019; Beck, 2020; Breza, Kanz, and Klapper, 2020; Philippon, 2020; Sahay *et al.*, 2020; Kanga *et al.*, 2022; Tok and Geng, 2022; Yang and Zhang, 2022; Agarwal and Assenova, 2023; Ha *et al.*, 2024), but these studies mostly rely on indirect measures of fintech such as mobile phone penetration, broadband internet access or prevalence of digital payments.

This study contributes to the literature by using a comprehensive dataset of direct measures of fintech to investigate the relationship between fintech developments and financial inclusion in a broad panel of 84 countries over the period 2012–2020. The results provide interesting empirical insights, based on alternative estimation techniques including the two-stage least squares (2SLS) methodology with instrumental variables (IV) to address omitted variable bias and account for potential endogeneity. The magnitude and statistical significance of fintech on financial inclusion varies according to the type of instrument (digital lending vs. digital capital raising) when the model with control variables is estimated for the entire sample of countries. While digital lending has a statistically significant negative effect on financial inclusion as gauged by the share of adults with an account at a formal financial institution, digital capital raising is statistically insignificant. As a result, the overall impact of fintech including all instruments also turns out to be negative and statistically insignificant for the whole sample of countries. This pattern of findings, however, changes when I estimate the model separately for advanced economies and developing countries, albeit at varying degrees of significance. The impact of fintech on financial inclusion is statistically insignificant (and negative) in advanced economies, but it becomes positive in developing countries with a statistically highly significant overall effect. Overall, these results—robust to alternative estimation methods—indicate that fintech endeavors may have so far failed to promote financial inclusion across all countries, but helped expand financial inclusion to a certain extent in developing countries.



Fintech is still small relative to traditional financial institutions—0.1 percent of GDP vs. 59 percent of GDP, but it is advancing rapidly and therefore the nature and magnitude of its effects on financial inclusion will evolve over time, especially with increasing adaptation by large established institutions and big-tech companies. The empirical analysis presented in this paper indicates that fintech has not yet enhanced financial inclusion across all countries—possibly due to deep cultural, institutional, and socioeconomic undercurrents, gaps in access to digital technology infrastructure, and biases in data and algorithms used in fintech solutions that continue excluding certain groups in society (elderly, low-income, women and minorities) from gaining greater access to financial products and services (Bartlett *et al.*, 2019; Gillis and Spiess, 2019; Blattner and Nelson, 2021; Gillis, 2022). It should also be noted that although fintech can reduce the cost of financial transactions and provide new products and services to a wider audience, individuals may still opt for voluntary financial exclusion due to personal circumstances and preferences.

Policymakers need to acknowledge potential risks and threats and develop an adequate regulatory framework that balances fostering innovation and ensuring equitable treatment of individuals and groups. This requires better financial education, strong regulatory institutions with enhanced technological capabilities, extensive cross-border coordination and appropriately calibrated prudential regulations for a level playing field and effective monitoring and supervision of traditional and emerging financial institutions (Arner *et al.*, 2017; He *et al.*, 2017; Magnuson, 2018; Boot *et al.*, 2021; Adrian *et al.*, 2023; Bains and Wu, 2023).

The remainder of this paper is structured as follows. Section II provides an overview of the data used in the empirical analysis. Section III describes the econometric methodology and presents the findings. Finally, Section IV summarizes and provides concluding remarks.

II. DATA OVERVIEW

The empirical analysis presented in this paper is based on an unbalanced panel dataset of annual observations covering 84 countries over the period 2012–2020. The dependent variable is financial inclusion as measured by the percentage of adults (aged 15 and above) with an account at a formal financial institution, which is drawn from the World Bank’s Global Findex Database (Demirguc-Kunt *et al.*, 2022).² The key explanatory variable of interest in this analysis is the volume of fintech transactions (excluding cryptocurrencies) as a share of GDP. The primary fintech data is obtained from the Cambridge Centre for Alternative Finance (CCAF) at the University of Cambridge Judge Business School. The CCAF database covers more than 4,400 fintech entities across the world and divides fintech developments into two main categories: (i)

² The most widely used measure of financial inclusion is the share of adults who have an account at a formal financial institution, but financial inclusion can be measured in three dimensions: (i) access to financial services; (ii) usage of financial services; and (iii) the quality of products and service delivery. Hence, I also estimate the model using alternative measures of financial inclusion (the share of adults with savings at a formal financial institution and the share of adults with debit or credit cards) and obtain comparable results.

digital lending and (ii) digital capital raising (CCAF, 2021; Ran, Rau, and Ziegler, 2022).³ Digital lending is the volume of lending instruments through digital platforms, including balance sheet lending, peer-to-peer and marketplace lending, debt-based lending, and invoice trading. Digital capital raising refers to the volume of capital raising instruments through digital platforms, including investment-based crowdfunding such as real estate crowdfunding, and non-investment-based crowdfunding such as donation-based or reward-based crowdfunding. To have a broad measure of fintech developments, I combine digital lending and digital capital raising with other types of fintech (such as micro finance and pension-led funding) and scale it by GDP.

To control for the influence of other development-related factors, I introduce a range of economic, social and institutional variables, including the level of real GDP per capita, consumer price inflation, trade openness as measured by the share of exports and imports in GDP, financial development as measured by domestic credit to the private sector as a share of GDP, educational attainments as measured by the share of labor force with basic education, and composite measures of government stability and bureaucratic quality, which are obtained from the World Bank and the International Country Risk Guide.

Table 1 reports a full set of summary statistics for the variables used in the empirical analysis. There is a great degree of dispersion across countries and over time in terms of financial inclusion. The mean value of the percentage of adults with an account at a formal financial institution is 56.3 percent over the sample period, but it shows significant variation from a minimum of 2.5 percent to a maximum of 100 percent. The main explanatory variable of interest is fintech, measured by (i) digital lending, (ii) digital capital raising and (iii) total including all fintech instruments as a share of GDP. These fintech measures exhibit substantial cross-country heterogeneity during the sample period. With an upward trend in the amount of fintech

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Financial inclusion	423	56.3	0.3	2.5	100.0
Fintech					
Digital lending	498	0.1	0.2	0.0	1.6
Digital capital raising	840	0.0	0.0	0.0	0.5
Total	862	0.1	0.1	0.0	1.6
Real GDP per capita	1,197	14,860	19,598	270	108,352
Inflation	1,156	3.7	5.4	-4.3	62.2
Trade openness	1,198	91.3	59.7	18.4	442.6
Domestic credit to the private sector	1,096	59.3	45.3	4.8	252.6
Educational attainments	768	46.9	16.7	12.6	96.6
Government stability	925	7.1	1.1	4.0	11.0
Bureaucratic quality	925	2.4	1.1	0.0	4.0

Source: CCAF; ICRG; World Bank; author's calculations.

³ The CCAF dataset excludes mobile money and internet banking, which are also operated by traditional financial institutions. Methodological information on digital lending and digital capital raising is available at <https://ccaf.io/cafb/methodology>.

transactions, the mean value of digital lending is 0.1 percent of GDP with a minimum of nil and a maximum of 1.6 percent. Likewise, the volume of digital capital raising as a share of GDP ranges from a minimum of nil to a maximum of 0.5 percent, with a mean value close to 0 percent over the sample period. Other explanatory variables show analogous patterns of considerable variation across countries, highlighting the importance of economic and institutional differences.

III. EMPIRICAL STRATEGY AND RESULTS

The empirical objective of this paper is to investigate the impact of fintech (excluding cryptocurrencies) on financial inclusion in a large panel of countries over the period 2012–2020. Taking advantage of the panel structure in the data, I estimate the following baseline specification:

$$y_{it} = \beta_1 + \beta_2 \text{fintech}_{it} + \beta_3 X_{it} + \eta_i + \mu_t + \varepsilon_{it}$$

where y_{it} denotes financial inclusion as measured by the share of adults (aged 15 and above) with an account at a formal financial institution in country i and time t ; fintech_{it} represents (i) digital lending as a share of GDP, (ii) digital capital raising as a share of GDP, or (iii) all fintech instruments as a share of GDP; X_{it} represents a vector of control variables including real GDP per capita, inflation, trade openness, domestic credit to the private sector, educational attainments, and measures of government stability and bureaucratic quality. The η_i and μ_t coefficients denote the time-invariant country-specific effects and the time effects controlling for common shocks that may affect economic growth across all countries in a given year, respectively. ε_{it} is the idiosyncratic error term. I account for possible heteroskedasticity, autocorrelation and cross-sectional dependence within the data by using the Driscoll-Kraay (1998) standard errors, which are particularly robust in an unbalanced panel with a shorter time dimension.

Endogeneity might be an important concern in this context. That is, there could be greater demand for fintech in countries with higher level of financial inclusion, potentially resulting in reverse causality, which makes the parameter estimates biased and inconsistent. Therefore, it is necessary to address omitted variable bias and account for potential endogeneity in an econometric analysis of this nature. Since identifying a suitable time-varying IV for various fintech instruments is not feasible, this paper uses the 2SLS-IV approach and instruments the contemporaneous measure of fintech with its own lags.

The empirical analysis provides interesting insights into the relationship between fintech and financial inclusion across countries and over time. As presented in Table 2, the magnitude and statistical significance of fintech on financial inclusion varies according to the type of instrument (digital lending vs. digital capital raising) when the model with control variables is estimated for the entire sample of countries. The coefficient on the volume of digital lending in column [1] has a statistically significant negative effect on financial inclusion as measured by the share of adults with an account at a formal financial institution, whereas the coefficient on the volume of digital capital raising in column [2] is negative but statistically insignificant. In other words, an increase in digital lending (or capital raising) is associated with a decline in the percentage of adults (aged 15 and above) with an account at a formal financial institution and thereby a deterioration in

financial inclusion. As a result, the overall impact of fintech including all instruments in column [3] turns out to be negative and statistically insignificant for the entire sample of countries used in this analysis.⁴

To obtain a better understanding of how the level of economic development influences the impact of fintech on financial inclusion, I also estimate the model separately for different income groups—advanced economies (in Table 3) and developing countries (in Table 4).⁵ Even with a

	[1]	[2]	[3]
Digital lending	-0.068*** [0.015]		
Digital capital raising		-0.823 [0.349]	
Total fintech			-0.062 [0.014]
Real GDP per capita	0.640*** [0.091]	0.622*** [0.077]	0.601*** [0.078]
Inflation	-0.005 [0.002]	-0.003 [0.002]	-0.003 [0.001]
Trade openness	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Financial development	0.001 [0.000]	0.001 [0.000]	0.001 [0.000]
Educational attainments	0.002*** [0.000]	0.002*** [0.000]	0.002*** [0.000]
Government stability	0.002 [0.001]	0.001 [0.003]	0.002 [0.002]
Bureaucratic quality	0.125*** [0.013]	0.111*** [0.011]	0.120*** [0.012]
Number of observations	127	167	176
Number of countries	69	83	84
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R ²	0.53	0.49	0.50

Note: The dependent variable is financial inclusion as measured by the percentage of adults (aged 15 and above) with an account at a formal financial institution. Driscoll-Kraay standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.
Source: Author's estimations.

⁴ When I estimate the impact of fintech on the gender gap in financial inclusion (i.e., the difference between female and male in account ownership), the results indicate that financial inclusion helps close the gender gap, but this effect is not statistically significant across all countries.

⁵ As an additional robustness check, I estimate the model for the pre-pandemic period and obtain similar results.

lower number of observations in country subsamples, this disaggregation reveals important differences in how fintech developments affect financial inclusion in advanced and developing economies. First, the estimated coefficients on fintech variables show a similar pattern of negative effects on financial inclusion in advanced economies, but these are statistically insignificant at conventional levels. Second, the impact of fintech on financial inclusion becomes positive in developing countries and the overall effect of fintech (including all instruments) is statistically highly significant. In other words, fintech endeavors in developing countries helped expand financial inclusion, but fintech is still small relative to traditional financial institutions.

With regards to control variables, I obtain consistent and intuitive estimation results. The level of real GDP per capita is positively and significantly correlated with financial inclusion across all countries. Inflation appears to have a negative association with financial inclusion, especially in

Table 3. Fintech and Financial Inclusion: Advanced Economies

	[1]	[2]	[3]
Digital lending	-0.081 [0.040]		
Digital capital raising		-0.269 [0.132]	
Total fintech			-0.043 [0.034]
Real GDP per capita	0.409*** [0.101]	0.274*** [0.024]	0.360*** [0.099]
Inflation	-0.002 [0.001]	-0.007*** [0.002]	-0.005*** [0.001]
Trade openness	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Financial development	0.001 [0.000]	0.000 [0.000]	0.000 [0.000]
Educational attainments	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Government stability	0.003*** [0.000]	0.000 [0.001]	0.001 [0.001]
Bureaucratic quality	0.072*** [0.018]	0.006 [0.003]	0.031 [0.016]
Number of observations	72	77	84
Number of countries	28	29	29
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R ²	0.38	0.28	0.30

Note: The dependent variable is financial inclusion as measured by the percentage of adults (aged 15 and above) with an account at a formal financial institution. Driscoll-Kraay standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

developing countries, while trade openness—a measure of international economic integration and development—has a positive effect that is statistically significant only in developing countries. The overall level of financial development as measured by domestic credit to the private sector as a share of GDP has a negative coefficient across all specifications, but it is not statistically significant. Educational attainments make a positive contribution to expanding financial inclusion, while institutional and political variables have the expected effects on reducing financial exclusion, with greater magnitude and statistical significance in developing countries.

While I obtain some evidence that fintech has inclusive effects in developing countries, the results presented in this study taken as a whole suggest that digital lending and capital raising activities facilitated by fintech platforms may lead to financial exclusion due to gaps in access to

Table 4. Fintech and Financial Inclusion: Developing Countries

	[1]	[2]	[3]
Digital lending	0.036 [0.044]		
Digital capital raising		0.642 [1.300]	
Total fintech			0.552*** [0.116]
Real GDP per capita	0.770*** [0.070]	0.587*** [0.047]	0.585*** [0.046]
Inflation	-0.006*** [0.001]	-0.004*** [0.001]	-0.005*** [0.001]
Trade openness	0.005*** [0.001]	0.003*** [0.001]	0.003*** [0.001]
Financial development	0.009*** [0.000]	0.004** [0.000]	0.003* [0.001]
Educational attainments	0.010*** [0.001]	0.003*** [0.001]	0.002*** [0.000]
Government stability	0.044*** [0.003]	0.010** [0.002]	0.012** [0.002]
Bureaucratic quality	0.028*** [0.006]	0.100*** [0.014]	0.042*** [0.006]
Number of observations	55	90	92
Number of countries	41	54	55
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R ²	0.95	0.63	0.69

Note: The dependent variable is financial inclusion as measured by the percentage of adults (aged 15 and above) with an account at a formal financial institution. Driscoll-Kraay standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

digital technology infrastructure and biases in data and algorithms used in fintech solutions. Persistent exclusion may reflect deep cultural, institutional, and socioeconomic undercurrents that continue excluding certain groups in society (elderly, low-income, women and minorities) from gaining greater access to financial products and services, even though fintech tends to reduce the cost of financial transactions and provide new products and services to a wider audience.

As discussed above, to address potentially endogeneity in this context, I use the 2SLS-IV approach and instrument the contemporaneous measure of fintech with its own lags. These results, presented in Table 5, confirm the baseline findings on how fintech affects financial inclusion. First, for the sample as a whole, the estimated coefficient on all fintech instruments as a share of GDP is negative and statistically significant at the 5 percent level. In other words, an increase in fintech activity is associated with a decline in financial inclusion as measured by the

	All	AE	EM
Total fintech	-0.211** [0.070]	-0.165 [0.132]	0.105 [0.211]
Real GDP per capita	0.429 [0.189]	0.722 [0.357]	0.045 [0.178]
Inflation	-0.005 [0.003]	-0.000 [0.008]	-0.006*** [0.001]
Trade openness	0.000 [0.001]	0.000 [0.001]	0.002 [0.001]
Financial development	0.000 [0.000]	0.000 [0.000]	0.005* [0.002]
Educational attainments	0.001** [0.000]	0.000 [0.000]	0.001** [0.000]
Government stability	0.003 [0.005]	0.002 [0.003]	0.016 [0.010]
Bureaucratic quality	0.097 [0.040]	0.043 [0.078]	0.017 [0.039]
Number of observations	156	84	92
Number of countries	84	29	55
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R ²	0.98	0.76	0.98

Note: The dependent variable is financial inclusion as measured by the percentage of adults (aged 15 and above) with an account at a formal financial institution. Robust standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

share of adults (aged 15 and above) with an account at a formal financial institution. Second, while the impact of fintech on financial inclusion remains negative in advanced economies, it is statistically insignificant at conventional levels. Third, as shown in baseline estimations, the relationship between fintech and financial inclusion turns positive in developing countries, albeit still statistically insignificant.

IV. CONCLUSION

Fintech is changing the financial landscape across the world, with a new range of products and companies using innovative technologies to improve and automate financial services. There is no doubt that fintech has the transformative potential to make financial systems more efficient and broaden financial inclusion. But has it really contributed to financial inclusion? This study contributes to the literature by using a comprehensive dataset of direct measures of fintech to investigate the relationship between fintech and financial inclusion in a panel of 84 countries over the period 2012–2020.

The results provide empirical interesting insights. The magnitude and statistical significance of fintech on financial inclusion varies according to the type of instrument (digital lending vs. digital capital raising) when the model with control variables is estimated for the entire sample of countries. While digital lending has a statistically significant negative effect on the share of adults with an account at a formal financial institution, digital capital raising is statistically insignificant. As a result, the overall impact of fintech including all instruments turns out to be negative and statistically insignificant for the entire sample of countries. This pattern of findings, however, changes when I estimate the model separately for advanced economies and developing countries. The impact of fintech on financial inclusion is statistically insignificant (and negative) in advanced economies, it becomes positive in developing countries with a statistically highly significant overall effect. Taken as a whole, these results—robust to alternative estimation methods—indicate that fintech endeavors may have so far failed to promote financial inclusion across all countries, but helped expand financial inclusion to a certain extent in developing countries.

Fintech is still small relative to traditional financial institutions, but it is growing rapidly and therefore the nature and magnitude of its effects on financial inclusion will evolve over time. The empirical analysis presented in this paper indicates that fintech may reduce the cost of financial transactions, but it has not yet enhanced financial inclusion across all countries. This is possibly due to cultural, institutional, and socioeconomic undercurrents, gaps in access to digital technology infrastructure, and biases in data and algorithms used in fintech solutions that continue excluding certain groups in society (elderly, low-income, women and minorities) from gaining greater access to financial products and services, as well as voluntary financial exclusion because of personal circumstances and preferences.

Looking forward, policymakers need to acknowledge potential risks and threats and develop an adequate regulatory framework that balances fostering innovation and ensuring equitable treatment of individuals and groups. This requires better financial education, strong regulatory

institutions with enhanced technological capabilities, extensive cross-border coordination and appropriately calibrated prudential regulations for a level playing field and effective monitoring and supervision of traditional and emerging financial institutions.

REFERENCES

- Adrian, T., M. Moretti, A. Carvalho, H. Chon, K. Seal, F. Melo, and J. Surti (2023). "Good Supervision: Lessons from the Field," IMF Working Paper No. 23/181 (Washington, DC: International Monetary Fund).
- Agarwal, A., and V. Assenova (2023). "Mobile Money as a Steppingstone to Financial Inclusion: How Digital Multi-Sided Platforms Fill Institutional Voids," *Organization Science*, Vol. 35, pp. 769–1202.
- Allen, F., and E. Carletti (2006). "Credit Risk Transfer and Contagion," *Journal of Monetary Economics*, Vol. 53, pp. 89–111.
- An, J., and R. Rau (2021). "Finance, Technology and Disruption," *European Journal of Finance*, Vol. 27, pp. 334–345.
- Arcand, J., E. Berkes, and U. Panizza (2015). "Too Much Finance?" *Journal of Economic Growth*, Vol. 20, pp. 105–148.
- Arner, D., D. Zetzsche, R. Buckley, and J. Barberis (2017). "FinTech and RegTech: Enabling Innovation While Preserving Financial Stability," *Georgetown Journal of International Affairs*, Vol. 18, pp. 47–58.
- Baba, C., C. Batog, E. Flores, B. Gracia, I. Karpowicz, P. Kopyrski, J. Roaf, A. Shabunina, R. van Elkan, and X. Xu (2020). "Fintech in Europe: Promises and Threats," IMF Working Paper No. 20/241 (Washington, DC: International Monetary Fund).
- Bains, P., and C. Wu (2023). "Institutional Arrangements for Fintech Regulation: Supervisory Monitoring," IMF Fintech Notes No. 2023/004 (Washington, DC: International Monetary Fund).
- Bartlett, R., A. Morse, R. Standon, and N. Wallace (2019). "Consumer Lending Discrimination in the Fintech Era," NBER Working Paper No. 25943 (Cambridge, MA: National Bureau of Economic Research).
- Beck, T. (2020). "Fintech and Financial Inclusion: Opportunities and Pitfalls," ADBI Working Paper Series No. 1165 (Tokyo: Asian Development Bank Institute).
- Beck, T., T. Chen, C. Lin, and F. Song (2016). "Financial Innovation: The Bright and the Dark Sides," *Journal of Banking and Finance*, Vol. 72, pp. 28–51.
- Bencivenga, V., and B. Smith (1991). "Financial Intermediation and Endogenous Growth," *Review of Economic Studies*, Vol. 58, pp. 195–209.
- Ben Naceur, S., B. Candelon, S. Elekdag, and D. Emrullahu (2023). "Is FinTech Eating the Bank's Lunch?" IMF Working Paper No. 23/239 (Washington, DC: International Monetary Fund).
- Blattner, L., and S. Nelson (2021). "How Costly is Noise? Data and Disparities in Consumer Credit," Booth School of Business Working Paper (Chicago: University of Chicago)..
- Boot, A., P. Hoffmann, L. Laeven, and L. Ratnovski (2021). "Fintech: What's Old, What's New?" *Journal of Financial Stability*, Vol. 53, 100836.

- Breza, E., M. Kanz, and L. Klapper (2020). "Learning to Navigate a New Technology: Evidence from Payroll Accounts," NBER Working Paper No. 28249 (Cambridge, MA: National Bureau of Economic Research).
- Bu, Y., X. Yu, and H. Li (2023). "The Nonlinear Impact of Fintech on the Real Economic Growth: Evidence from China," *Economics of Innovation and New Technology*, Vol. 32, pp. 1138–1155.
- Cambridge Center for Alternative Finance (2021). *The Global Alternative Finance Market Benchmarking Report* (Cambridge, UK: University of Cambridge).
- Cecchetti, G., and E. Kharroubi (2012). "Reassessing the Impact of Finance on Growth," BIS Working Papers No. 381 (Basel: Bank for International Settlements).
- Cevik, S. (2024a). "The Dark Side of the Moon? Fintech and Financial Stability," *International Review of Economics*, Vol. 71, pp. 421–433.
- Cevik, S. (2024b). "Is Schumpeter Right? Fintech and Economic Growth," IMF Working Paper No. 24/20 (Washington, DC: International Monetary Fund).
- Chen, X., L. Teng, and W. Chen (2022). "How Does Fintech Affect the Development of the Digital Economy? Evidence from China" *North American Journal of Economics and Finance*, Vol. 61, 101697.
- Daud, S., A. Ahmad, A. Khalid, and W. Azman-Saini (2022). "FinTech and Financial Stability: Threat or Opportunity?" *Finance Research Letters*, Vol. 47, 102667.
- Demirguc-Kunt, A., L. Klapper, D. Singer, and S. Ansar (2022). "The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19 (Washington, DC: World Bank).
- Driscoll, J., and A. Kraay (1998). "Consistent Covariance Matrix Estimation With Spatially Dependent Panel Data," *Review of Economics and Statistics*, Vol. 80, pp. 549–560.
- Feyen, E., J. Frost, L. Gambacorta, H. Natarajan, and M. Saal (2021). "Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy," BIS Papers No. 117 (Basel: Bank for International Settlements).
- Fisman, R., and I. Love (2007). "Financial Dependence and Growth Revisited," *Journal of the European Economic Association*, Vol. 59, pp. 470–479.
- Fung, D., W. Lee, J. Yeh, and F. Yuen (2020). "Friend or Foe: The Divergent Effects of FinTech on Financial Stability," *Emerging Markets Review*, Vol. 45, 100727.
- Gennaioli, N., A. Shleifer, and R. Vishny (2012). "Neglected Risks, Financial Innovation, and Financial Fragility," *Journal of Financial Economics*, Vol. 104, pp. 452–468.
- Gillis, T. (2022) "The Input Fallacy," *Minnesota Law Review*, Vol. 106, pp. 1175–1263.
- Gillis, T., and J. Spiess (2019) "Big Data and Discrimination," *University of Chicago Law Review*, Vol. 86, pp. 459–487.
- Greenwood, J., and B. Jovanovic (1990). "Financial Development, Growth, and the Distribution of Income," *Journal of Political Economy*, Vol. 98, pp. 1076–1107.

- Haddad, C., and L. Hornuf (2023). "How Do Fintech Start-Ups Affect Financial Institutions' Performance and Default Risk?" *European Journal of Finance*, Vol. 29, pp. 1761–1792.
- He, D., R. Leckow, V. Haksar, T. Mancini-Griffoli, N. Jenkinson, M. Kashima, T. Khiaonarong, C. Rochon, and H. Tourpe (2017). "Fintech and Financial Services: Initial Considerations," IMF Staff Discussion Note No. 17/05 (Washington, DC: International Monetary Fund).
- Ha, D., M. Nguyen, K. Nguyen, and A. Şensoy (2024). "Unveiling Financial Inclusion Dynamics: Fintech's Resonance in Association of Southeast Asian Nations (ASEAN)," *International Journal of Finance and Economics*, pp. 1–24.
- Kanga, D., C. Oughton, L. Harris, and V. Murinde (2022). "The Diffusion of Fintech, Financial Inclusion and Income Per Capita," *European Journal of Finance*, Vol. 28, pp. 108–136.
- King, R., and R. Levine (1993a). "Finance, Entrepreneurship, and Growth," *Journal of Monetary Economics*, Vol. 32, pp. 513–542.
- King, R., and R. Levine (1993b). "Finance and Growth: Schumpeter Might Be Right," *Quarterly Journal of Economics*, Vol. 108, pp. 717–737.
- Laeven, L., R. Levine, and S. Michalopoulos (2015). "Financial Innovation and Endogenous Growth," *Journal of Financial Intermediation*, Vol. 4, pp. 12–22.
- Law, S., and N. Singh (2014). "Does Too Much Finance Harm Economic Growth?" *Journal of Banking and Finance*, Vol. 41, pp. 36–44.
- Li, J., Y. Wu, and J. Xiao (2019). "The Impact of Digital Finance on Household Consumption: Evidence from China," *Economic Modeling*, Vol. 86, pp. 317–326.
- Magnuson, W. (2018). "Regulating Fintech," *Vanderbilt Law Review*, Vol. 71, pp. 1167–1226.
- Minto, A., M. Voelkerling, and M. Wulff (2017). "Separating Apples from Oranges: Identifying Threats to Financial Stability Originating from Fintech," *Capital Markets Law Journal*, Vol. 12, pp. 428–465.
- Nguyen, Q., and V. Dang (2022). "The Effect of FinTech Development on Financial Stability in an Emerging Market: The Role of Market Discipline" *Research in Globalization*, Vol. 5, 100105.
- Pantelieieva, N., S. Krynytsia, M. Khutorna, and L. Potapenko (2018). "Fintech, Transformation of Financial Intermediation and Financial Stability," Presented at the 2018 International Scientific-Practical Conference Problems of Infocommunications.
- Philippon, T. (2020). "On Fintech and Financial Inclusion," BIS Working Papers No. 841 (Basel: Bank for International Settlements).
- Pierri, N., and Y. Timmer (2020). "Tech in Fin before FinTech: Blessing or Curse for Financial Stability?" IMF Working Paper No. 20/14 (Washington, DC: International Monetary Fund).
- Rajan, R., and L. Zingales (1998). "Financial Dependence and Growth," *American Economic Review*, Vol. 88, pp. 559–586.
- Rajan, R. (2006). "Has Finance Made the World Riskier?" *European Financial Management*, Vol. 12, pp. 499–533.

- Ran, Z., P. Rau, and T. Ziegler (2022). "Sometimes, Always, Never: Regulatory Clarity and the Development of Digital Financing," Available at SSRN: <https://ssrn.com/abstract=3797886>.
- Rousseau, P., and P. Wachtel (2011). "What Is Happening to the Impact of Financial Deepening on Economic Growth?" *Economic Inquiry*, Vol. 49, pp. 276–288.
- Sahay, R., U. von Allmen, A. Lahreche, P. Khera, S. Ogawa, M. Bazarbash, and K. Beaton (2020). "The Promise of Fintech: Financial Inclusion in the Post COVID-19 Era," IMF Departmental Paper No. 20/9 (Washington, DC: International Monetary Fund).
- Schumpeter, J. (1912). *The Theory of Economic Development* (Cambridge, MA: Harvard University Press).
- Shleifer, A., and R. Vishny (2010). "Unstable Banking," *Journal of Financial Economics*, Vol. 97, pp. 306–318.
- Song, N., and I. Appiah-Otoo (2022). "The Impact of Fintech on Economic Growth: Evidence from China," *Sustainability*, Vol. 14, 6211.
- Swamy, V., and M. Dharani (2019). "The Dynamics of Finance-Growth Nexus in Advanced Economies," *International Review of Economics and Finance*, Vol. 64, pp. 122–146.
- Thakor, A. (2012). "Incentives to Innovate and Finance Crises," *Journal of Financial Economics*, Vol. 103, pp. 130–148.
- Tok, Y., and D. Heng (2022). "Fintech: Financial Inclusion or Exclusion?" IMF Working Paper No. 22/80 (Washington, DC: International Monetary Fund).
- Vucinic, M. (2020). "Potential Influence of Fintech on Financial Stability: Risks and Benefits," *Journal of Central Banking Theory and Practice*, Vol. 9, pp. 43–66.
- Wang, R., J. Liu, and H. Luo (2021). "Fintech Development and Bank Risk Taking in China," *European Journal of Finance*, Vol. 27, pp. 397–418.
- Yang, T., and X. Zhang (2022). "FinTech Adoption and Financial Inclusion: Evidence from Household Consumption in China," *Journal of Banking and Finance*, Vol. 145, 106668.
- Zhang, X., J. Zhang, G. Wan, and Z. Lou (2020). "Fintech, Growth and Inequality: Evidence from China's Household Survey Data" *Singapore Economic Review*, Vol. 65, pp. 75–93.
- Zhu, X., S. Asimakopoulous, and J. Kim (2020). "Financial Development and Innovation-Led Growth: Is Too Much Finance Better?" *Journal of International Money and Finance*, Vol. 100, 102083.