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# Prometheus Unbound: What Makes Fintech Grow?

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**Prometheus Unbound: What Makes Fintech Grow?****Prepared by Serhan Cevik<sup>1</sup>**

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**Abstract**

The rise of financial technologies—fintech—could have transformative effects on the financial landscape, expanding the reach of services beyond the confines of geography and creating new competitive sources of finance for households and firms. But what makes fintech grow? Why do some countries have more financial innovation than others? In this paper, I use a comprehensive dataset to investigate the emergence and spread of fintech in a diverse panel of 98 countries over the period 2012–2020. This empirical analysis helps ascertain economic, demographic, technological and institutional factors that enable the development of fintech. The magnitude and statistical significance of these factors vary according to the type of fintech instrument and the level of economic development (advanced economies vs. developing countries). Finally, these findings reveal that policies and structural reforms can help promote financial innovation and cultivate fintech ventures—particularly by strengthening technological and institutional infrastructures and reducing cybersecurity threats.

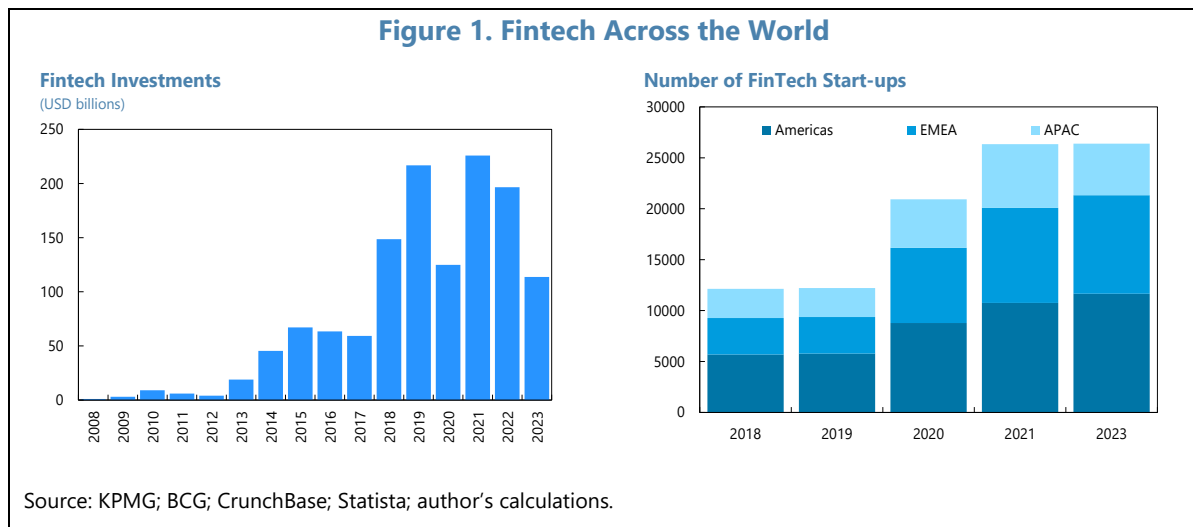
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## I. INTRODUCTION

The development of technology-enabled innovation in financial services—fintech—could have transformative effects on the financial landscape, expanding the reach of services beyond the confines of geography and creating new competitive sources of finance for households and firms.<sup>2</sup> 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). But there is still significant variation in the development of fintech ventures across countries, especially with respect to the level of income, as shown in Figure 2. What makes fintech grow? Why do some countries have more financial innovation than others? In this context, fintech is similar to the development and diffusion of new technologies, which depend on an array of enabling factors including economic development as measured by income per capita, consumer price inflation, trade openness, financial development, demographic characteristics such as population growth, urbanization, the age composition and educational attainments, technological infrastructure, and institutional features such as bureaucratic quality and government stability (Landes, 1969; Rosenberg, 1972; Rogers, 1995; Hargittai, 1999; Caselli and Coleman, 2001; Kiiski and Pojola, 2002; Comin and Hobijn, 2004; Erumban and de Jong, 2006; Chin and Fairlie, 2007; Wunnava and Leiter, 2009; Guerrieri, Luciani, and Meliciani, 2011; Lee *et al.*, 2016; Rath, 2016; Hooks *et al.*, 2022; Rath, Panda, and Akram, 2023).

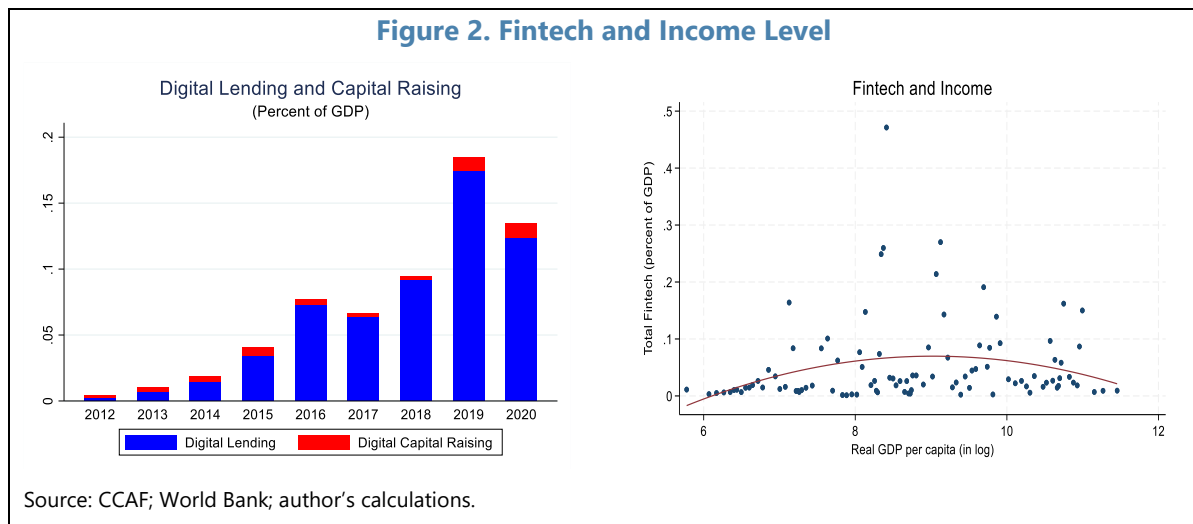
Fintech draws significant attention, but there is so far a handful of studies focusing on enabling factors for its development (Schindler, 2017; Claessens *et al.*, 2018; Gomber *et al.*, 2018; Haddad and Hornuf, 2019; Frost, 2020; Chen, Yan, and Chen, 2022; Didier Brandao *et al.*, 2022; Kowalweski and Pisany, 2023). Similarly, there is a nascent literature on how fintech affects economic and financial developments across countries and over time. With regards to financial stability, for example, studies obtain mixed results on whether it presents a threat or opportunity



<sup>2</sup> The Financial Stability Board defines fintech 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.”

(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 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 economic 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, it is important not to ignore the effect of fintech on financial stability, which in turn may have adverse consequences for economic 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; 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. Using direct measures of fintech, Cevik (2024c) finds that fintech ventures may have so far failed to promote financial inclusion across all countries but helped expand financial inclusion to a certain extent in developing countries.

Using direct measures of fintech, this study explores factors explaining variation in the development of fintech across countries and over time. With a large and diverse set of countries, the empirical analysis helps ascertain an array of enabling economic, demographic, technological and institutional factors, the magnitude and statistical significance of which vary according to the type of fintech instrument and the level of economic development (advanced economies vs. developing countries). 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. First, macroeconomic factors play a significant role in creating a conducive environment for fintech endeavors. Second, financial factors—ranging from overall financial development to the prevalence of ATMs and commercial bank branches and the availability of credit registry—tend to be associated with higher levels of fintech. Third, demographic forces including population growth, urbanization and a young population composition make a significant contribution to the development of fintech. Fourth, the technological infrastructure—as measured by mobile phone and broadband internet subscriptions and the number of secure internet servers—is positively and decisively associated with faster-growing fintech, which tends to be more dependent on information and telecommunication technologies and also vulnerable to cybersecurity risks. Finally, institutional and political factors are found to foster the expansion of fintech, but the extent of these effects depends on the type of instrument as well as country characteristics.

Fintech has the potential to revolutionize financial services and create new sources of finance for households and firms. However, the amount of fintech transactions remains small relative to credit provided by traditional financial institutions. The analysis presented in this paper indicates that policies and structural reforms can help promote financial innovation and cultivate fintech ventures—particularly by strengthening technological and institutional infrastructures and reducing cybersecurity threats. Policymakers should also acknowledge potential risks and threats associated with fintech and develop an adequate regulatory framework that fosters innovation for growth and ensures sustainable and inclusive financial development. Particularly, empirical findings show that the advancement of information and telecommunication networks holds a key role in realizing the full potential of digital technologies and financial innovation.

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

## II. DATA OVERVIEW

The empirical analysis presented in this paper is based on a panel dataset of annual observations covering 98 countries over the period 2012–2020.<sup>3</sup> The dependent variable is the amount of fintech transactions (excluding cryptocurrencies) as a share of GDP. The primary fintech data is obtained from the Cambridge Centre for Alternative Finance (CCAF) database that covers more than 4,400 fintech entities across the world and divides fintech developments into two main categories: (i) digital lending and (ii) digital capital raising (CCAF, 2021; Ran, Rau, and Ziegler, 2022). In general, fintech refers to the use of technology to deliver financial services and products, encompassing a wide range of innovations and business models that aim to improve

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<sup>3</sup> The CCAF covers 198 countries, but the dataset is unbalanced. Consequently, fintech variables are not consistently available for all countries. For example, there are 594 observations for digital lending, but 1,093 observations for digital capital raising. This is also the case for control variables, the coverage of which varies from country to country.

and automate traditional financial products and processes. In this paper, I rely on the CCAF dataset that consists of alternative financial channels and instruments outside of the traditional finance system (as described in detail at <https://ccaf.io/>). The CCAF dataset excludes mobile money and internet banking, which are also operated by traditional financial institutions.

- Digital lending is the amount of loans issued 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 amount 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.
- For a broad measure of fintech activity, 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.

As explanatory factors, I introduce an array of economic, demographic, technological 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, the share of adult population covered by public credit registry, the number of automated teller machines (ATMs) per 100,000 adults, the number of commercial bank branches per 100,000 adults, educational attainments as measured by the share of labor force with basic education, population growth,

**Table 1. Descriptive Statistics**

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Fintech					
Digital lending	594	0.1	0.3	0.0	3.4
Digital capital raising	1,093	0.0	0.0	0.0	0.5
Total	1,118	0.1	0.2	0.0	3.4
Real GDP per capita	1,738	13,706	18,765	263	167,809
Inflation	1,620	5.3	21.1	-4.3	557.2
Trade openness	1,581	90.9	58.4	10.0	442.6
Domestic credit to the private sector	1,528	55.0	43.5	1.1	258.9
Public credit registry	1,492	12.6	23.0	0.0	100.0
ATMs	1,557	50.0	47.8	0.1	324.2
Bank branches	1,576	17.8	18.5	0.4	218.1
Population growth	1,773	1.3	1.4	-6.9	11.8
Urbanization	1,764	58.7	23.3	11.2	100.0
Old-age dependency	1,773	8.5	6.1	0.3	29.6
Educational attainments	944	47.8	17.0	12.6	100.0
Mobile phone subscriptions	1,744	105.9	41.1	7.4	420.9
Fixed broadband subscriptions	1,693	13.0	13.5	0.0	61.3
Secure internet servers	1,745	5,140.6	19,054.7	0.0	277,330.6
Government stability	1,242	7.1	1.1	4.0	11.0
Bureaucratic quality	1,242	2.2	1.1	0.0	4.0

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

the share of urban population, the share of population over 65 years of age, the number of mobile phone subscriptions per 100 people, the number of fixed broadband subscriptions per 100 people, the number of secure internet servers per 1 million people, and composite measures of government stability and bureaucratic quality, which are obtained from the World Bank and the International Country Risk Guide (ICRG).

Table 1 provides a detailed description of the variables that are used in the empirical analysis. There is a great degree of dispersion across countries and over time in fintech activity measured by (i) digital lending as a share of GDP, (ii) digital capital raising as a share of GDP, 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 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 amount 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.<sup>4</sup> Explanatory variables also show patterns of substantial variation across countries, highlighting the potential importance of economic, demographic, technological and institutional differences.

### III. CONCEPTUAL FRAMEWORK AND ECONOMETRIC STRATEGY

Fintech, a form of financial innovation, is akin to the development and diffusion of new technologies, aiming to address adverse selection and agency problems and information asymmetries, reduce verification and transaction costs, enhance credit issuance and availability, transfer and share risks, respond to economic and regulatory changes, and take advantage of technological developments (Kane, 1986; Miller, 1986; Smith, Smithson, and Wilford, 1990; Allen and Gale, 1994; White, 2000; Berger, 2003; Frame and White, 2009; Frame, Wall, and White, 2019). History shows that financial innovation has been a critical and persistent factor in advancing economic growth and enhancing social welfare, but also a destructive force during periods of crisis (Merton, 1992; Levine, 1997; Shiller, 2012; Boz and Mendoza, 2014; Hausman and Johnston, 2014; Cevik, 2024a).

There is not an overarching theory to describe the development of fintech, but its emergence and diffusion can be traced within a conceptual framework. On the one hand, demand-side factors such as income growth and demographic changes stimulate the development of fintech. On the other, supply-oriented factors such as technological advancements and regulatory underpinnings promote the emergence and diffusion of fintech. The salient point here is that financial innovation is a complex and intricate process manifesting a plethora of demand-and supply-side drivers at the same time.

Accordingly, the empirical objective of this paper is to explore factors contributing to the development of fintech (excluding cryptocurrencies) in a large panel of countries over the period

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<sup>4</sup> The results remain similar when the dataset is winsorized at 5<sup>th</sup> and 95<sup>th</sup> percentiles of the distribution.

2012–2020. Taking advantage of the panel structure in the data, I estimate the following baseline specification:

$$fintech_{it} = \alpha + \beta X_{it} + \eta_i + \mu_t + \varepsilon_{it}$$

where  $fintech_{it}$  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 in country  $i$  and time  $t$ ;  $X_{it}$  represents a vector of explanatory variables including real GDP per capita, inflation, trade openness, financial development, credit registry coverage, the number of ATMs, the number of commercial bank branches, educational attainments, population growth, urbanization, old-age dependency, mobile phone subscriptions, fixed broadband subscriptions, secure internet servers, and composite measures of government stability and bureaucratic quality. The  $\eta_i$  and  $\mu_t$  coefficients denote the time-invariant country-specific effects and the time effects controlling for common shocks that may affect growth across all countries in a given year, respectively.  $\varepsilon_{it}$  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.

#### IV. EMPIRICAL EVIDENCE

In Table 2, I present the baseline results on the impact of explanatory variables on alternative measures of fintech, with country and time fixed effects. The analysis provides interesting insights into how economic, demographic, technological and institutional factors contribute to the development of fintech. The magnitude and statistical significance of these factors on fintech vary according to the type of instrument (digital lending, digital capital raising and total amount of fintech activity) when the model is estimated for the entire sample of countries. The level of real GDP per capita is positively and significantly correlated with digital lending, displayed in column [1]. The income effect, however, becomes statistically insignificant for digital capital raising and the total amount of fintech across all countries, displayed in column [2] and column [3], respectively. Inflation also appears to have a positive association with the development of fintech. Although the magnitude of this effect is small, it indicates that higher inflation may encourage financial innovation by entrepreneurs and adoption by consumers.

Trade openness does not have a notable effect on fintech, but there is a significant positive relationship between overall financial development and all types of fintech activity. In other words, countries with greater financial development—as measured by domestic credit to the private sector as a share of GDP—tend to have higher levels of fintech. In this context, it is interesting to discern that a greater presence of banks, as measured by the prevalence of ATMs and commercial bank branches, correlates with reduced fintech activity. The estimated coefficients for these variables are consistently negative and statistically highly significant, indicating that fintech grows faster in countries with less developed physical financial infrastructure. This raises questions about whether conventional banks may be more inclined to participate in mobile money and internet banking activities but to refrain from digital lending and capital raising. This may also reflect the possibility that fintech reaches the underserved



**Table 2. Development of Fintech: Baseline Estimations**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	All			AE			EM		
	Digital lending	Digital capital raising	Total fintech	Digital lending	Digital capital raising	Total fintech	Digital lending	Digital capital raising	Total fintech
Real GDP per capita	0.267*** [0.084]	0.004 [0.002]	0.034 [0.034]	0.962*** [0.250]	0.009 [0.009]	0.146 [0.093]	0.001 [0.056]	0.004 [0.004]	0.046 [0.034]
Inflation	0.003*** [0.001]	0.000*** [0.000]	0.000*** [0.000]	0.002 [0.007]	0.000 [0.001]	0.000 [0.004]	0.002 [0.001]	0.000* [0.000]	0.000*** [0.000]
Trade openness	0.001 [0.000]	0.000 [0.000]	0.000 [0.000]	0.002*** [0.000]	0.000 [0.000]	0.000 [0.000]	0.001 [0.001]	0.000 [0.000]	0.000 [0.000]
Financial development	0.001*** [0.000]	0.001*** [0.000]	0.029*** [0.003]	0.001 [0.001]	0.000*** [0.000]	0.000*** [0.000]	0.003 [0.001]	0.000** [0.000]	0.001 [0.000]
ATMs	-0.042 [0.027]	-0.003** [0.001]	-0.029*** [0.003]	-0.033 [0.033]	-0.007** [0.002]	-0.010 [0.011]	-0.049 [0.025]	-0.000 [0.001]	-0.031*** [0.006]
Commercial bank branches	-0.125*** [0.011]	-0.005*** [0.000]	-0.054*** [0.007]	-0.103*** [0.020]	-0.006*** [0.000]	-0.074*** [0.017]	-0.001 [0.049]	-0.005 [0.003]	-0.034** [0.010]
Credit registry coverage	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.001 [0.000]	0.000 [0.000]	0.000 [0.000]	0.001 [0.000]	0.000 [0.000]	0.001** [0.000]
Population growth	0.040*** [0.006]	0.000 [0.000]	0.004 [0.002]	0.022 [0.016]	0.000 [0.000]	0.016 [0.006]	0.029*** [0.006]	0.001 [0.000]	0.022** [0.007]
Urbanization	0.014 [0.008]	0.001 [0.000]	0.002 [0.002]	0.031 [0.013]	0.002*** [0.000]	0.011 [0.009]	0.005 [0.003]	0.001 [0.000]	0.004*** [0.001]
Old-age dependency	-0.150 [0.073]	-0.027*** [0.003]	-0.141*** [0.040]	-0.239 [0.344]	-0.027*** [0.008]	-0.210 [0.181]	-0.022 [0.075]	-0.026*** [0.004]	-0.095** [0.032]
Educational attainments	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.001 [0.001]	0.000 [0.000]	0.000 [0.000]	0.001 [0.000]	0.000 [0.000]	0.000 [0.000]
Mobile phone subscriptions	0.093** [0.030]	0.003 [0.001]	0.030 [0.018]	0.015 [0.051]	0.001 [0.003]	0.116 [0.046]	0.143*** [0.034]	0.001 [0.001]	0.064 [0.025]
Broadband internet subscriptions	0.011 [0.008]	0.001*** [0.000]	0.001 [0.003]	0.352** [0.113]	0.013*** [0.003]	0.189*** [0.052]	0.035*** [0.004]	0.002*** [0.000]	0.001*** [0.000]
Secure internet servers	0.010*** [0.001]	0.008*** [0.001]	0.004*** [0.000]	0.009 [0.011]	0.000 [0.000]	0.005 [0.004]	0.010*** [0.002]	0.005*** [0.000]	0.003*** [0.000]
Bureaucratic quality	0.039 [0.026]	0.001 [0.001]	0.030*** [0.005]	2.949** [0.910]	0.010* [0.003]	0.071 [0.059]	0.051*** [0.026]	0.002*** [0.001]	0.030*** [0.005]
Government stability	0.005 [0.005]	0.000 [0.000]	0.000 [0.001]	0.004 [0.003]	0.001* [0.000]	0.002 [0.003]	0.011* [0.004]	0.000 [0.000]	0.002 [0.001]
Number of observations	291	451	457	150	186	192	141	265	265
Number of countries	81	97	98	31	32	32	50	65	66
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.44	0.21	0.38	0.53	0.26	0.48	0.50	0.28	0.40

Note: The dependent variable is the volume of fintech transactions (excluding cryptocurrencies) as a share of GDP. Driscoll-Kraay standard errors are reported in brackets. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

segments of the population and thereby enhance financial inclusion, especially in developing countries, as shown by Cevik (2024c). On the other hand, the availability of public credit registry has a positive but not statistically significant effect on the spread of fintech across all countries in the sample.

Demographic forces play a key role in the development of fintech. The estimated coefficients on population growth and urbanization are positive and usually statistically significant, depending on the type of fintech instrument. The old-age dependency ratio, on the other hand, tends to have a significant negative association with fintech, suggesting that countries with higher share of population over 65 years of age experience a slower rate development in fintech activity. I also find that human capital as measured by educational attainments make a positive contribution to fintech growth, but the magnitude and statistical significance of this effect are negligible (possibly due to the fact that educational attainments as measured by the share of labor force with basic education fails to capture the impact of advanced skills required for fintech ventures).

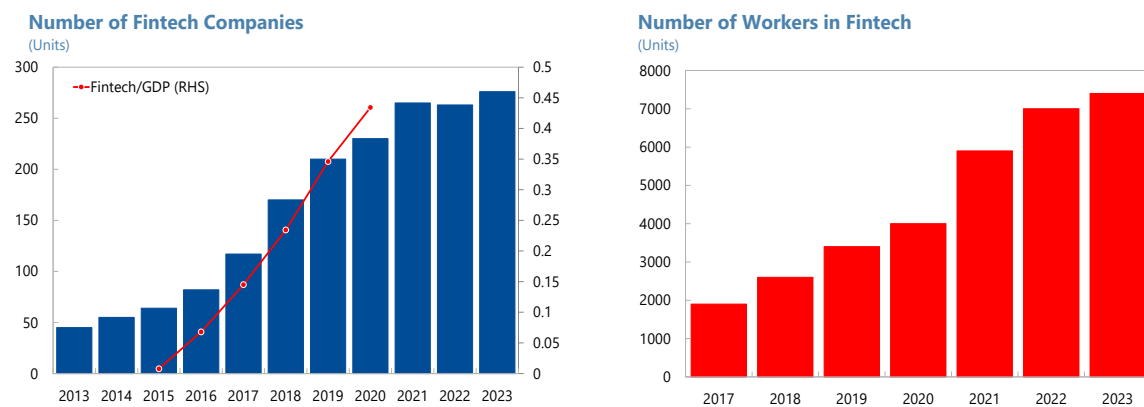
### Box 1. An Example of Fast-Growing Fintech Hub: Lithuania

Lithuania—a country of 2.8 million people in the Baltics—has emerged a leading hub for fintech companies in Europe. The number of fintech enterprises in Lithuania has increased from 45 in 2013 to 276 by the end of 2023, creating a thriving innovation ecosystem and a growing number of high-paying jobs (Figure 3). According to the CCAF dataset, the total amount of fintech transactions excluding mobile money and internet banking in Lithuania increased by 5,567 percent from less than 0.01 percent of GDP in 2015 to over 0.43 percent of GDP in 2020. More than half of fintech firms are licensed as electronic money institutions, payment institutions, or specialized banks—the highest in the EU.

One of the key factors contributing to the rise of fintech in Lithuania is the availability of skilled workers who specialize in areas critical for fintech such as software development, data analytics, and cybersecurity. Another important factor is the country’s supportive regulatory environment that promotes innovation and fosters the development of fintech startups. The Bank of Lithuania has adopted a “sandbox” facility that allows fintech companies test new products and services under regulatory supervision before the full-scale introduction. There is also a one-stop-shop program for new market entrants to provide guidance on legal and regulatory matters and feasibility analysis for various business models during the preapplication phase. While maintaining one of the lowest-risk jurisdiction for money laundering in the world<sup>5</sup>, financial regulators in Lithuania also process license applications for electronic payment institutions faster than other countries and provide a specialized banking license for fintech ventures looking to expand deposit and credit portfolios.

The fintech ecosystem in Lithuania serves a wider audience throughout Europe, but the growing interest domestic customers show in new financial products and services should also accelerate digital transformation and stimulate the growth of fintech in Lithuania. Moreover, the rise of fintech ventures is prompting traditional banks—still the most important financial intermediaries in the country—to innovate and provide comparable products and services. Hence, the success of fintech in Lithuania illustrates many of the possibilities financial innovation offers in other countries.

Figure 3. Fintech in Lithuania



Source: Invest Lithuania; CCAF; author’s calculations.

<sup>5</sup> The Basel AML Index ranks Lithuania as the 9<sup>th</sup> lowest-risk country in 2023, ahead of France as 12<sup>th</sup>, the UK as 13<sup>th</sup>, Germany as 32<sup>nd</sup>, and the US as 33<sup>th</sup> in the world.

The technological infrastructure has a decisive effect on the expansion of fintech, which is consistent with the fact that financial products and services offered by fintech ventures are almost exclusively based on information and telecommunication technologies and provided via online platforms. Both mobile phone and broadband internet subscriptions are positively associated with fintech across all countries, but the magnitude and statistical significance of these effects vary with the type of fintech instrument. The number of secure internet servers, however, appears to be the most crucial factor aiding the development of fintech, which tends to be more vulnerable to cybersecurity threats. Accordingly, countries with more developed technological infrastructure and greater capacity for digitization have faster-growing fintech.

Institutional and political factors as measured by bureaucratic quality and government stability foster fintech growth, but the extent of these effects depends on the type of instrument as well as country characteristics. Hence, to obtain a better understanding of how fintech grows faster, I also estimate the model separately for different income groups—advanced economies and developing countries. Even with a lower number of observations in country subsamples, this disaggregation reveals significant differences in the impact of various enabling factors on the amount of fintech. First, among macroeconomic factors, while the level of per capita income and financial development are important for fintech endeavors in advanced economies, inflation matters more for fintech adoption in developing countries where higher inflation is a greater obstacle to financial inclusion through conventional banks. Second, the financial infrastructure is equally important for the development of fintech in advanced and developing countries. Third, demographics play a more critical role in expanding fintech in developing countries than in high-income countries, reflecting a combination of faster population growth and urbanization and a younger population composition. Fourth, technological factors—including mobile phone and broadband internet subscriptions and the number of secure internet servers—have almost similar effects in advanced economies and developing countries in the sample. Finally, the fostering effect of institutional and political variables on fintech matters across all countries, but more consistently in emerging market economies.

Endogeneity might be a concern in this context. A variable is considered to be endogenous in the econometric model when it is correlated with the error term, so that the key OLS identification assumption fails. Endogeneity may arise from various sources, but the two most common are omitted variables and reverse causality. In other words, fintech may contribute to economic growth and overall financial development, potentially creating reverse causality that would make the parameter estimates biased and inconsistent.<sup>5</sup> Although the best approach to alleviate this concern is to use the IV estimation, identifying a suitable time-varying IV for economic growth and financial development is not feasible for a heterogeneous sample of countries. Accordingly, to alleviate potential endogeneity, I estimate the model with the 2SLS-IV via the generalized method of moments (GMM) approach and use the lagged values of real GDP per capita growth and domestic credit to the private sector as instruments, which are

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<sup>5</sup> Cevik (2024b) finds evidence that an increase in fintech is associated with an increase in economic growth, after controlling for other factors including the lagged dependent variable.

uncorrelated with the error term. These results, presented in Appendix Table A1, confirm the baseline results.

## V. CONCLUSION

The rise of fintech across the world could have transformative effects on the financial system, expanding the reach of services beyond the confines of geography and creating new competitive sources of finance for households and firms. But what makes fintech grow? Why do some countries have more financial innovation than others? Conceptually, fintech, a form of innovation in the financial industry, is akin to the development and diffusion of new technologies, aiming to address adverse selection and agency problems and information asymmetries, reduce transaction costs, enhance credit issuance and availability, transfer and share risks, respond to economic and regulatory changes, and take advantage of technological developments. Although there is not an overarching theory to describe the development of fintech, its emergence and diffusion can be traced within a conceptual framework in which both demand- and supply-side factors stimulate the development of fintech. Accordingly, I use a comprehensive dataset to investigate the emergence and spread of fintech in a diverse panel of 98 countries over the period 2012–2020.

The empirical analysis presented in this paper helps discover a range of enabling economic, demographic, technological and institutional factors that contribute to the spread of fintech. First, macroeconomic developments play a significant role in creating a conducive environment for fintech endeavors. Second, financial factors—ranging from overall financial development to the prevalence of ATMs and commercial bank branches and the availability of credit registry—tend to be associated with higher levels of fintech. Third, demographic forces including population growth, urbanization and a young population composition make a significant contribution to the development of fintech. Fourth, the technological infrastructure—as measured by mobile phone and broadband internet subscriptions and the number of secure internet servers—is positively and decisively associated with faster-growing fintech, which tends to be more dependent on information and telecommunication technologies and also vulnerable to cybersecurity risks. Finally, institutional and political factors are found to foster the expansion of fintech, but the extent of these effects depends on the type of instrument as well as country characteristics.

Given these insights, policies and structural reforms can help promote financial innovation and cultivate fintech ventures—particularly by strengthening technological and institutional infrastructures and reducing cybersecurity threats—and successfully harness the benefits and opportunities of fintech as outlined in the Bali Fintech Agenda (IMF, 2018). Policymakers should also acknowledge potential risks and threats associated with fintech and develop an adequate regulatory framework that fosters innovation for growth and ensures sustainable and inclusive financial development. Particularly, empirical findings presented in this paper show that the advancement of information and telecommunication networks holds a key role in realizing the full potential of digital technologies and financial innovation.

Appendix Table A1. Development of Fintech: 2SLS-IV

	[1]	[2]	[3]
	<b>All</b>		
	Digital lending	Digital capital raising	Total fintech
Real GDP per capita $t_{-1}$	0.250 [0.116]	0.158 [0.089]	0.385 [0.121]
Inflation	0.004*** [0.001]	0.000*** [0.000]	0.001*** [0.000]
Trade openness	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Financial development $t_{-1}$	0.001** [0.000]	0.001*** [0.000]	0.001*** [0.000]
ATMs	-0.052 [0.024]	-0.002** [0.001]	-0.026*** [0.004]
Commercial bank branches	-0.138*** [0.014]	-0.005*** [0.000]	-0.055*** [0.008]
Credit registry coverage	0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]
Population growth	0.041*** [0.005]	0.000 [0.000]	0.005*** [0.001]
Urbanization	0.014 [0.008]	0.000 [0.000]	0.001 [0.001]
Old-age dependency	-0.024 [0.061]	-0.029*** [0.004]	-0.164*** [0.042]
Educational attainments	0.000 [0.001]	0.000 [0.000]	0.000 [0.000]
Mobile phone subscriptions	0.113** [0.022]	0.002 [0.001]	0.035** [0.006]
Broadband internet subscriptions	0.018* [0.007]	0.001** [0.000]	0.001** [0.000]
Secure internet servers	0.013*** [0.001]	0.018*** [0.001]	0.005*** [0.000]
Bureaucratic quality	0.032 [0.027]	0.001 [0.001]	0.029*** [0.005]
Government stability	0.007 [0.005]	0.000 [0.000]	0.000 [0.001]
Number of observations	282	440	442
Number of countries	81	98	99
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R <sup>2</sup>	0.43	0.21	0.37

Note: The dependent variable is the volume of fintech transactions (excluding cryptocurrencies) as a share of GDP. Driscoll-Kraay standard errors are reported in brackets. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

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