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Is Schumpeter Right? Fintech and Economic Growth

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Abstract

The rise of fintech is revolutionizing the financial landscape, with products and companies advancing innovative technologies to improve and automate financial services. In this paper, I use a novel dataset and implement a dynamic modelling to investigate the relationship between fintech and economic growth in a panel of 198 countries over the period 2012–2020. This cross-country approach—utilizing direct measures of fintech and dealing with potential endogeneity—provides interesting empirical insights. First, the impact magnitude and statistical significance of fintech on real GDP per capita growth depend on the type of instrument (digital lending *vs*. digital capital raising). While digital lending has a statistically significant positive effect on economic growth, digital capital raising has a large but insignificant effect. Second, the overall impact of fintech including all instruments is positive and statistically significant because of the overwhelming share of digital lending in total. Finally, while the positive relationship between fintech and growth is stronger in magnitude in advanced economies, the statistical significance of this effect is higher in developing countries. Taken as a whole, these results confirm Schumpeter's prediction that financial innovation can promote growth, but not every type of fintech becomes an accelerator.

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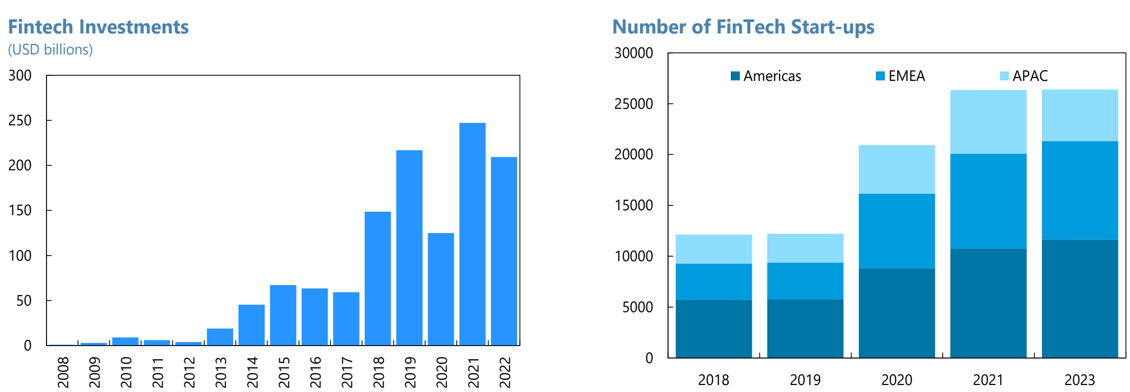
I. INTRODUCTION

The rise of fintech is revolutionizing the financial landscape across the globe, with products and companies advancing innovative technologies to improve and automate traditional financial services. The total value of start-up investments into fintech worldwide increased from US$1 billion in 2008 to US$247 billion in 2022 (Figure 1). There is no doubt that fintech has the transformative power to make financial systems more efficient and broaden financial inclusion to the under-served populations. Fintech can therefore boost economic growth through technological and financial innovation that reduce the cost of financial services, moderate risks associated with financial transactions, and thereby increase financial intermediation.

There is a large literature that explores how financial development and innovation affects economic growth, going back to the pioneering work of Schumpeter (1912) followed by Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), King and Levine (1993a, 1993b) and Rajan and Zingales (1998). Instead of reexamining each aspect of this literature in detail, it is more effective to feature key contributions that are particularly pertinent to the analysis presented in this paper. Fisman and Love (2007) point out that industries with higher growth opportunities grow faster in countries with higher levels of financial development. Likewise, Laeven, Levine, and Michalopoulos (2015) show that financial innovation boosts economic growth, specifically through better utilization of growth opportunities. However, it is important to emphasize that not all episodes of financial development and innovation promote economic growth. Excessive credit growth and new financial products can instigate financial instability, especially when banks and investors accumulate too much leverage and neglect tail risks (Allen and Carletti, 2006; Rajan, 2006; Shleifer and Vishny, 2010; Gennaioli, Shleifer, and Vishny, 2012; Thakor, 2012; Beck *et al*., 2016). Another strand of the literature in this context focuses on whether there is a nonlinear relationship between financial development and economic growth and finds that more finance could be associated with less growth (Rousseau and Wachtel, 2011; Cecchetti and Kharroubi, 2012; Law and Singh, 2014; Arcand, Berkes, and Panizza, 2015; Swamy and Dharani, 2019; Zhu, Asimakopoulos, and Kim, 2020).

Figure 1. Fintech Across the World

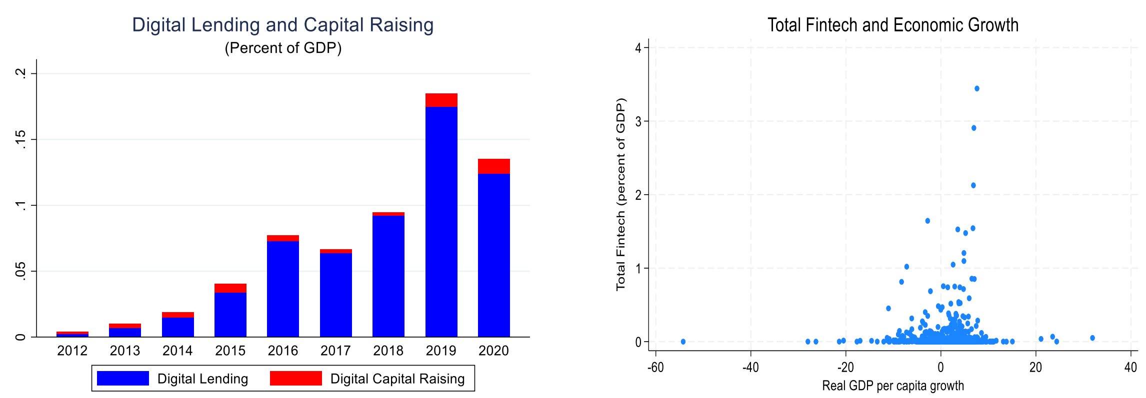


Source: KPMG; BCG; CrunchBase; Statista; author's calculations.

But is fintech really an engine of growth as Schumpeter argued? Studies focusing on the empirical links between fintech and economic growth remain scarce, mainly because of cross-country data constraints. Measuring the contribution of fintech indirectly by the number of automated teller machines (ATMs) and mobile phone subscriptions, Kanga *et al*. (2021) find a positive effect on per capita income growth in a panel of 137 countries during the period 1991–2015. Other studies, using mostly subnational data on fintech transactions in China, find a statistically significant 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). While financial deepening and 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 economic growth.[2]

This study contributes to the literature by using a novel dataset of direct measures of fintech and implementing a dynamic modelling to investigate the empirical relationship between fintech and economic growth in a panel of 198 countries over the period 2012–2020. Dealing with potential endogeneity, the dynamic analysis via the system generalized method of moments (GMM) approach provides interesting insights into the relationship between fintech and economic growth across countries and over time. First, the impact magnitude and statistical significance of fintech on real GDP per capita growth depend on the type of instrument (digital lending *vs*. digital capital raising). While digital lending as a share of GDP has a statistically significant positive effect on economic growth, digital capital raising as a share of GDP has a large but statistically insignificant effect. Second, the overall impact of fintech including all instruments is positive and statistically significant because of the overwhelming share of digital lending in total.

Figure 2. Fintech and Economic Growth



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

[2] There is also a small but growing literature on the effect of fintech on financial stability, with mixed results whether it is a threat or opportunity (Minto, Voelkerling, and Wulff, 2017; Pantielieieva *et al*., 2018; Fung *et al*., 2020; Pierri and Timmer, 2020; Vucinic, 2020; Feyen *et al*., 2021; Daud *et al*., 2022; Nguyen and Dang, 2022; Cevik, 2023).

In other words, an increase in fintech is associated with an increase in economic growth, after controlling for other factors including the lagged dependent variable. This pattern of findings remains intact when I estimate the model separately for advanced economies and developing countries, albeit at varying degrees of significance. While the positive relationship between fintech and economic growth is stronger in magnitude in advanced economies, the statistical significance of this effect is higher in developing countries. Taken as a whole, these results confirm the Schumpeterian prediction that financial innovation can promote economic growth by increasing financial intermediation and providing financial resources for fixed capital formation, but not every type of fintech becomes an accelerator.

Fintech is still small compared to traditional financial institutions, but the analysis presented in this paper finds that fintech could have significant effects on economic growth. While the magnitude of this effect depends on the type of fintech instrument, the overall impact still appears to be statistically significant, even at this stage with the average volume of fintech instruments amounting to 0.1 percent of GDP, compared to 55 percent of GDP in domestic credit to the private sector. Looking forward, therefore, fast-growing and evolving fintech should have a greater effect on economic growth, especially with increasing adaptation by large established institutions and big-tech companies. In this context, maintaining financial stability is *sine qua non* for sustainable growth and that requires strong regulatory institutions, better use of technology in regulation, 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 198 countries over the period 2012–2020. The dependent variable is economic growth as measured by annual real GDP per capita growth rate and gross fixed capital formation as a share of GDP, which are drawn from the World Bank's World Development Indicators (WDI) database. 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) 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). 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 and automate traditional financial products and processes. In this paper, however, I use measures of alternative finance from the CCAF dataset, which consist of financial channels and instruments outside of the traditional finance system as described in detail at https://ccaf.io/. 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.[3]

To control for the influence of other demographic and economic variables associated with economic development, I introduce an array of 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, government size measured by government spending as a share of GDP, population growth, and educational attainments as measured by the share of labor force with basic education, which are obtained from the WDI database. Institutional and political factors are also found to be critical for growth dynamics and thereby I include government stability and bureaucratic quality as measured by composite indices constructed by the International Country Risk Guide (ICRG) as additional control variables.

Descriptive statistics for the variables used in the empirical analysis are provided in Table 1. There is a great degree of dispersion across countries and over time in terms of economic growth. The mean value of real GDP per capita growth is 2.2 percent over the sample period, but it shows significant variation from a minimum of -54 percent to a maximum of 87 percent. To mitigate the effects of extreme outliers, the dataset is winsorized at 5th and 95th percentiles. The main

Table 1. Summary Statistics

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Real GDP growth	1,738	2.2	5.9	-54.2	86.8
Gross fixed capital formation	1,485	23.1	8.0	1.4	78.0
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
Government spending	1,517	17.1	8.6	3.6	84.2
Population growth	1,773	1.3	1.4	-6.9	11.8
Educational attainments	944	47.8	17.0	12.6	100.0
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; World Bank; author's calculations.

[3] The CCAF dataset excludes mobile money and internet banking, which are also operated by traditional financial institutions.

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 transactions, the mean value of digital lending is 0.1 percent of GDP with a minimum of nil and a maximum of 3.4 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 economic growth in a large panel of 198 countries over the period 2012–2020. Taking advantage of the panel structure in the data, I estimate the following baseline specification:

$$y_{it} = \beta_1 + \beta_2 fintech_{it} + \beta_3 X_{it} + \eta_i + \mu_t + \varepsilon_{it}$$

where y_{it} denotes real GDP per capita growth or gross fixed capital formation as share of GDP 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 the logarithm of real GDP per capita at time t-1, consumer price inflation, trade openness, domestic credit to the private sector, government size, population growth, 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 is an important concern in this context. That is, there might be greater demand for fintech in fast-growing economies, potentially causing reverse causality, which makes the parameter estimates biased and inconsistent. Although the best approach to alleviate this concern is to use the instrumental variable (IV) estimation, identifying a suitable time-varying IV for various fintech instruments is not feasible. Therefore, to ensure the robustness of the empirical analysis, I implement the system GMM approach proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which allows for the inclusion of the lagged dependent variable as a regressor and controls for potential endogeneity of all explanatory variables, including fintech measures.

The system GMM method involves constructing two sets of equations, one with first differences of the endogenous and pre-determined variables instrumented by suitable lags of their own levels, and one with the levels of the endogenous and pre-determined variables instrumented with suitable lags of their own first differences. I apply the one-step version of the system GMM estimator to ensure the robustness of the results, as the standard errors from the two-step variant of the system GMM method are shown to have a downward bias in the panels with small number of time-series observations.

The use of all available lagged levels of the variables in the system GMM estimation leads to a proliferation in the number of instruments, which reduces the efficiency of the estimator in finite samples, and potentially leads to over-fitting. A further issue is that the use of a large number of instruments significantly weakens the Hansen *J*-test of over-identifying restrictions, and so the detection of over-identification is hardest when it is most needed. Conversely, however, restricting the instrument set too much results in a loss of information that leads to imprecisely estimated coefficients. Estimation of such models therefore involves a delicate balance between maximizing the information extracted from the data on the one hand and guarding against over-identification on the other. I follow the strategy suggested by Roodman (2009) to deal with the problem of weak and excessively numerous instruments. The system GMM identification assumptions are also validated by applying a second-order serial correlation test for the residuals and the Hansen *J*-test for the overidentifying restrictions. The values reported for AR(1) and AR(2) are the *p*-values for first- and second-order autocorrelated disturbances in the first-differenced equation. As expected, I find that there is high first-order autocorrelation, but no evidence for significant second-order autocorrelation. Similarly, the Hansen *J*-test result indicate the validity of internal instruments used in the dynamic model estimated via the system GMM approach.[4]

The empirical analysis provides interesting insights into the relationship between fintech and economic growth across countries and over time. The static estimations, presented in Table 2, show that the magnitude and statistical significance of fintech 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. To obtain a better understanding of how the level of economic development influences the impact of fintech on real GDP per capita growth, I also estimate the model separately for different income groups—advanced economies and developing countries.[5] Even with a lower number of observations in country subsamples, this disaggregation reveals important differences in how fintech developments affect economic growth in advanced and developing economies. First, the estimated coefficient on the volume of digital lending as a share of GDP in column [1] has a statistically and economically significant positive effect (at the 10 percent level) on economic growth in advanced economies, whereas it remains much smaller and statistically insignificant in developing countries. As a result, the growth impact of fintech turns out to be negligible for the sample as a whole at conventional levels. Second, the estimated coefficient on the volume of digital capital raising as a share of GDP in column [2] is much greater in magnitude, but statistically still insignificant. Interestingly, this impact of digital capital raising on economic growth is positive in advanced economies, but negative in the case of developing countries. Finally, the static estimations presented in Table 2

[4] All variables except the lagged dependent variable are treated as exogenous. The lagged dependent variable is specified as an instrument due to a potential endogeneity issue, with all available lags used as instruments.

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

show that the overall effect of fintech (including all instruments) remains statistically insignificant across all specifications.

However, as discussed above, the static estimations in this context are vulnerable to endogeneity. The dynamic estimations via the system GMM approach, presented in Table 3, reveal striking differences in how fintech affects economic growth. First, for the sample as a whole, the estimated coefficient on digital lending as a share of GDP in column [1] has a statistically and economically significant positive effect (at the 1 percent level) on real GDP per capita growth. In other words, an increase in digital lending is associated with an increase in economic growth, after controlling for other factors including the lagged dependent variable. Second, the estimated coefficient on digital capital raising as a share of GDP in column [2] is substantially greater in magnitude, but it remains statistically insignificant. Third, the overall impact of fintech including all instruments in column [3] is positive and statistically significant, thanks to the overwhelming share of digital lending in the total amount of fintech instruments. This pattern of empirical findings remains intact when I estimate the dynamic model separately for advanced economies and developing countries. While the positive relationship between fintech and economic growth is stronger in magnitude in advanced economies, the statistical significance of this effect is higher in developing countries.

Table 2. Fintech and Economic Growth: Static Estimations

	All			AE			EM		
	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]
Digital lending	0.406			1.943*			0.100		
	[0.329]			[1.391]			[0.427]		
Digital capital raising		9.805			17.515			-33.076	
		[8.621]			[11.700]			[29.223]	
Total fintech			0.789			1.308			0.453
			[0.323]			[0.796]			[0.376]
Real GDP per capita $_{t-1}$	-12.802**	-9.936***	-9.539***	-9.148	-10.427	-7.193	-18.120***	-9.563***	-10.252***
	[4.121]	[3.803]	[3.783]	[4.514]	[4.130]	[4.951]	[4.469]	[2.540]	[2.631]
Inflation	-0.047	-0.077***	-0.076***	0.031	0.159	0.070	-0.132***	-0.061***	-0.062***
	[0.041]	[0.006]	[0.006]	[0.173]	[0.081]	[0.133]	[0.021]	[0.005]	[0.005]
Trade openness	0.054	0.063*	0.059*	0.027	0.019	0.023	0.121**	0.105***	0.100***
	[0.030]	[0.023]	[0.022]	[0.019]	[0.014]	[0.011]	[0.040]	[0.030]	[0.031]
Financial development	-0.022	-0.009	-0.015	-0.011	-0.004	-0.009	-0.070**	-0.037	-0.037
	[0.008]	[0.005]	[0.006]	[0.009]	[0.003]	[0.006]	[0.023]	[0.016]	[0.019]
Government spending	-1.525***	-1.015***	-0.989***	-1.667***	-1.573***	-1.556***	-1.283***	-0.613***	-0.622***
	[0.180]	[0.219]	[0.225]	[0.157]	[0.181]	[0.218]	[0.305]	[0.170]	[0.174]
Population growth	1.765***	0.630***	0.609***	1.053***	0.883***	0.822**	2.440**	0.407***	0.422***
	[0.442]	[0.082]	[0.091]	[0.209]	[0.247]	[0.235]	[0.321]	[0.118]	[0.128]
Educational attainments	0.022	0.007	0.007	0.005	0.013	0.006	0.060	0.011	0.006
	[0.012]	[0.019]	[0.020]	[0.009]	[0.021]	[0.016]	[0.028]	[0.024]	[0.021]
Government stability	0.136	0.149	0.144	0.090	0.075	0.102	0.258	0.222	0.208
	[0.080]	[0.090]	[0.091]	[0.095]	[0.061]	[0.066]	[0.151]	[0.130]	[0.127]
Bureaucratic quality	0.254	1.295	1.271	0.980	0.587	1.353	0.032	1.107	1.021
	[0.665]	[0.642]	[0.686]	[1.596]	[1.588]	[1.658]	[0.509]	[0.631]	[0.610]
Number of observations	358	519	530	32	218	223	174	301	307
Number of countries	84	99	100	32	33	33	52	66	67
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.49	0.39	0.38	0.58	0.57	0.52	0.48	0.36	0.36

Note: The dependent variable is real GDP per capita growth. Driscoll-Kraay standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

With regards to control variables, I obtain consistent and intuitive estimation results. The level of real GDP per capita is inversely correlated with economic growth, confirming the income convergence hypothesis. Inflation appears to have a negative association with growth, especially in 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. Government size as measured by government spending as a share of GDP, on the other hand, has a statistically significant negative effect on growth in developing countries. Demographic factors, as proxied by population growth and educational attainments, make positive contributions to real GDP per capita growth, while institutional and political variables have the expected effects on economic growth, but not in a statistically significant way.

Finally, to explore the mechanisms through which fintech contributes to economic growth, I estimate the dynamic model via the system GMM approach for gross fixed capital formation as a share of GDP. These results, presented in Table 4, show that the total volume of fintech

Table 3. Fintech and Economic Growth: Dynamic Estimations

	All			AE			EM		
	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]
Real GDP per capita growth $_{t-1}$	0.354***	0.429***	0.439***	0.237***	0.308***	0.300***	0.184***	0.394*	0.416**
	[0.039]	[0.095]	[0.099]	[0.054]	[0.091]	[0.084]	[0.061]	[0.144]	[0.145]
Digital lending	0.849***			1.909*			0.796***		
	[0.176]			[0.785]			[0.213]		
Digital capital raising		17.610			14.627			41.307	
		[9.039]			[9.074]			[26.942]	
Total fintech			0.718***			2.089**			0.582***
			[0.183]			[0.690]			[0.172]
Real GDP per capita $_{t-1}$	-0.459***	-0.358*	-0.379*	-0.484	-1.095	-0.939	-0.824*	-0.325	-0.396
	[0.074]	[0.148]	[0.148]	[0.780]	[0.528]	[0.499]	[0.074]	[0.195]	[0.186]
Inflation	-0.112**	-0.049***	-0.049***	-0.266	-0.275	-0.296*	-0.086	-0.049***	-0.049***
	[0.038]	[0.007]	[0.007]	[0.137]	[0.129]	[0.110]	[0.035]	[0.005]	[0.005]
Trade openness	0.002	0.002	0.002	0.002	0.003	0.003	0.011	0.011*	0.010*
	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]	[0.006]	[0.004]	[0.004]
Financial development	-0.003	-0.002	-0.003	-0.005	-0.003	-0.003	-0.001	-0.002	-0.002
	[0.004]	[0.004]	[0.003]	[0.006]	[0.005]	[0.005]	[0.006]	[0.004]	[0.004]
Government spending	-0.094	-0.080	-0.078	-0.066	-0.052	-0.042	-0.225**	-0.175***	-0.166***
	[0.040]	[0.033]	[0.032]	[0.055]	[0.046]	[0.049]	[0.071]	[0.052]	[0.050]
Population growth	0.138***	0.158*	0.176*	0.668**	0.592**	0.613**	0.029	0.168	0.184
	[0.114]	[0.065]	[0.072]	[0.217]	[0.202]	[0.182]	[0.144]	[0.070]	[0.075]
Educational attainments	0.017	0.013	0.012	0.002	0.009	0.010	0.033**	0.021*	0.021*
	[0.008]	[0.007]	[0.007]	[0.007]	[0.011]	[0.011]	[0.011]	[0.008]	[0.008]
Government stability	0.145	0.234***	0.221***	0.127	0.189	0.186	0.028	0.219	0.205
	[0.091]	[0.067]	[0.068]	[0.093]	[0.080]	[0.081]	[0.163]	[0.099]	[0.097]
Bureaucratic quality	0.385	0.251	0.324	0.011	0.383	0.398	0.231	0.050	0.001
	[0.195]	[0.159]	[0.156]	[0.344]	[0.323]	[0.299]	[0.265]	[0.192]	[0.189]
Number of observations	352	510	518	182	214	218	170	296	300
Number of countries	84	99	100	32	33	33	52	66	67
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spefication tests (*p* values)									
AR(1)	0.005	0.000	0.000	0.003	0.004	0.001	0.004	0.000	0.000
AR(2)	0.217	0.425	0.317	0.614	0.342	0.291	0.209	0.735	0.686
Hansen J-test	0.267	0.369	0.363	0.992	0.849	0.802	0.285	0.599	0.467

Note: The dependent variable is real GDP per capita growth. Robust standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

transactions, similar to financial development in general, affects growth through its contribution to physical capital accumulation. Fintech has a statistically significant positive association with gross fixed capital formation, but the direction of this effect varies when I estimate the model separately for income groups. While its impact is positive in advanced economies, it appears to be negative in developing countries, which may reflect the infancy and volatility of fintech at this stage of its development.

Table 4. Fintech and Fixed Investment: Dynamic Estimations

	All	**AE**	**EM**
	[1]	[2]	[3]
Gross fixed capital formation $_{t-1}$	0.854***	0.700***	0.790***
	[0.145]	[0.136]	[0.134]
Total fintech	0.322***	0.566***	-0.680***
	[0.091]	[0.115]	[0.204]
Real GDP per capita $_{t-1}$	-0.019*	0.560	-0.124
	[0.006]	[0.977]	[0.340]
Inflation	-0.051**	0.169	-0.052**
	[0.018]	[0.125]	[0.018]
Trade openness	0.001	-0.002	0.005
	[0.002]	[0.003]	[0.007]
Financial development	0.004	-0.007	0.004
	[0.003]	[0.006]	[0.003]
Government spending	-0.025	-0.060	-0.055
	[0.041]	[0.078]	[0.066]
Population growth	0.085*	0.077	0.168*
	[0.017]	[0.104]	[0.035]
Educational attainments	0.009	0.001	0.014
	[0.011]	[0.001]	[0.016]
Government stability	0.022***	0.059	0.100***
	[0.007]	[0.126]	[0.015]
Bureaucratic quality	0.369*	0.085	0.261*
	[0.137]	[0.596]	[0.032]
Number of observations	533	228	305
Number of countries	96	32	64
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Spefication tests (*p* values)			
AR(1)	0.002	0.003	0.005
AR(2)	0.335	0.225	0.584
Hansen J-test	0.474	0.931	0.348

Note: The dependent variable is gross fixed capital formation as a share of GDP. Robust standard errors are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

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 become an engine of economic growth as Schumpeter predicted in 1912? There is a large literature that explores how financial development and innovation affects economic growth, but it should also be noted that excessive credit growth and new financial products can instigate financial instability and consequently undermine growth dynamics. Furthermore, studies focusing on the relationship between fintech and economic growth remain scarce, mainly because of cross-country data constraints.

This study uses a novel dataset of direct measures of fintech and implements a dynamic modelling to analyze the empirical relationship between fintech and real GDP per capita growth rates in a panel of 198 countries over the period 2012–2020. Dealing with potential endogeneity, the dynamic analysis based on the system GMM method provides interesting insights into the links between fintech and economic growth across countries and over time. First, the impact magnitude and statistical significance of fintech on real GDP per capita growth depend on the type of instrument (digital lending *vs*. digital capital raising). While digital lending as a share of GDP has a statistically significant positive effect on economic growth, digital capital raising as a share of GDP has a large but statistically insignificant effect. Second, the overall impact of fintech including all instruments is positive and statistically significant because of the overwhelming share of digital lending in total. In other words, an increase in fintech is associated with an increase in economic growth, after controlling for other factors including the lagged dependent variable. This pattern of findings remains intact when I estimate the model separately for advanced economies and developing countries, albeit at varying degrees of significance. While the positive relationship between fintech and economic growth is stronger in magnitude in advanced economies, the statistical significance of this effect is higher in developing countries. Taken as a whole, these results confirm the Schumpeterian prediction that financial innovation can promote economic growth by increasing financial intermediation and providing financial resources for fixed capital formation, but not every type of fintech becomes an accelerator.

Fintech remains small compared to traditional financial institutions, but the analysis presented in this paper shows that fintech can still have significant growth effects. While the magnitude of this effect depends on the type of fintech instrument, the overall impact is statistically significant, even at this stage with the average volume of fintech instruments amounting to 0.1 percent of GDP, compared to 55 percent of GDP in domestic credit to the private sector. Looking forward, therefore, fast-growing fintech is likely to have a greater effect on economic growth. In this context, maintaining financial stability is *sine qua non* for sustainable growth and that requires strong regulatory institutions, better use of technology in regulation, 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.

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