



# Financial Geography I: Exploring FinTech – Maps and concepts

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## Abstract

In the first of two reports on FinTech, I review definitions, roots and taxonomies of FinTech, survey studies charting FinTech development, and theoretical approaches to FinTech. Emerging empirical research shows a dynamic growth of FinTech characterized by heterogeneity and diversity. Ecosystems, financial ecologies, and digital platform economies are the most popular approaches to FinTech, and I argue that they can be used fruitfully in combination with more established concepts, such as networks and agglomeration. Overall, I show that FinTech research is in a state of flux concerning concepts and empirics, and highlight the potential of geography to tame the beast.

## Keywords

ecosystems, financial geography, financial technology, FinTech, platform economy

## I Introduction

The news is full of stories about FinTech. A company indexing FinTech development claims that ‘one fintech success story can do more to transform a local economy, or help an entire nation re-define itself in the eyes of its citizens and trading partners, than any other industry’ (Findexable, 2019: 8). No other sector has more private companies valued above US\$1bn (CB Insights, 2020). The Governor of the Bank of England and countless commentators have referred to a ‘FinTech revolution’, debating its promises and threats (Carney, 2017). As I am writing this report in a locked-down Britain, insiders promote FinTech as a champion of post-pandemic recovery (Kehinde and Eksin, 2020).

I have chosen FinTech as the subject of the first two progress reports on financial geography

I was commissioned to write. In doing so, I hope to complement the work of my predecessors, noting that since Leyshon’s reports in 1997 and 1998, which included discussions on technology in finance, the word technology has only been mentioned once (Christophers, 2014). Scholarship on FinTech is young and booming, with hundreds of works, including numerous literature reviews (e.g. Millian et al., 2019; Sangwan et al., 2019; Gai et al., 2018) and books (Blakstad and Allen, 2018; Gupta and Tham, 2018; Rubini, 2017). Business, economics, management, computer science and law are the main disciplinary

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homes of this emerging literature. With few exceptions (Goldstein et al., 2019), mainstream finance journals have been slow at engaging with the topic, highlighting once again a gulf between theories and practices of finance. Meanwhile, there is a small but vibrant body of research on FinTech emerging in geography and social sciences.

In the first report, I start by reviewing definitions, roots and taxonomies of FinTech, studies mapping it around the world, as well as theoretical approaches to conceptualizing FinTech. The second report will survey research examining the impacts of FinTech on financial sector and centres, regulation and stability, inclusion and governance. It should become apparent that scholarship on FinTech is in a state of flux, with considerable uncertainty concerning concepts and empirics, even before we get to the more obviously controversial questions about its implications for economy and society. As I offer a tentative route through these interdisciplinary exchanges, I suggest that these fluidities, uncertainties and controversies reflect the significance of the FinTech phenomenon and highlight potential for geography and geographers to be central to understanding it.

## **II Definitions, roots and taxonomies of FinTech**

Arguably, finance has always been an early adopter and intensive user of technology, and the combination of finance and technology an enabler of globalization (Arner et al., 2016; Milian et al., 2019; Warf, 1989). It was only a matter of time when the two words would come together. Some trace the contraction to a project run by Citigroup in the early 1990s (Arner et al., 2016; Langley and Leyshon, 2020). Millian et al. (2019), however, find the first use of the portmanteau in a 1972 article by the executive of Manufacturers Hanover Trust bank (Bettinger, 1972). While in quotes I preserve whatever form is used by the author/s, otherwise I use the

form FinTech, as it appears most popular and highlights the combination of fin and tech better than fintech or Fintech.

The Financial Stability Board defines FinTech as ‘technology-enabled innovation in financial services’ (Andresen, 2017: 1). Arner et al. (2016: 22) refer to FinTech as ‘the use of technology to deliver financial solutions’. They distinguish three eras of FinTech development. The era of analogue finance started with the transatlantic telegraph in the 1860s. The second, with the first computers, automated teller machines and electronic payment systems emerging in the 1960s, started a gradual shift to digital finance. Arner et al. (2016) see 2008 as the start of the current FinTech era, distinctive in terms of who is providing financial services and the pace of innovation. While previously technology was used by financial firms to help deliver services, now such services are also provided by start-ups and established firms in the technology sector (see also Brummer and Yadav, 2018). In the USA for example, 58 per cent of FinTech patents come from outside of the financial services industry (Chen et al., 2019). The catalysts for FinTech development since 2008 can be found on both fin and tech sides. The financial crisis had shaken the financial sector, and tarnished the reputation of banks, while the advent of smartphones and application programming interfaces (APIs), which allow computer applications to talk to each other over a network, opened new avenues for financial innovation. Bitcoin, the first application of blockchain (aka distributed ledger technology), was also introduced in 2008 (Fernandez-Vazquez et al., 2019; Lansiti and Lakhani, 2017). Low interest rates since 2008 have helped the FinTech investment boom (Dermine, 2017).

Recognizing the distinctiveness of the finance-technology nexus since around 2008 leads to narrower definitions. Chen et al. (2019) define FinTech as ‘the set of recently developed digital computing technologies that

have been applied – or that will likely be applied in the future – to financial services’ (p. 2066). For Schueffel (2016) it is ‘a new financial industry that applies technology to improve financial activities’ (p. 45). I propose to define FinTech as a set of innovations and an economic sector that focus on the application of recently developed digital technologies to financial services. What justifies the term sector is that there are possibly over 10,000 firms globally (Langley and Leyshon, 2020) that identify themselves as FinTechs, while FinTech innovations can also be led by public and non-profit organizations, e.g. central bank digital currencies or charitable crowdfunding (Gomber et al., 2018). Reference to innovations stresses that FinTech activities can be performed by organizations whose main sectoral affiliation is elsewhere, e.g. in finance or technology. Emphasis on recent means that electronic, digital and internet finance predate FinTech, even though the recent innovations in these areas belong to it (Gomber et al., 2017). While such terms are sometimes used interchangeably with FinTech, they understate the role of technology in the fin and tech combination. The definition also acknowledges that many recent digital technologies applied to finance can be applied elsewhere, e.g. blockchain in supply chain management or artificial intelligence (AI) in transport.

To tame the beast, much research has offered FinTech taxonomies. Gomber et al. (2017) suggest three taxonomic dimensions: functions, technologies, and institutions. FinTech functions cover the whole spectrum of financial needs: payments, savings, borrowing, risk management, and advisory (IMF, 2019; Gimpel et al., 2018; Buchanan and Cao, 2018). Key technologies include: AI, big data, machine learning, blockchain (including cryptoassets and cryptocurrencies), and Internet of Things (IoT) (Sangwan et al., 2019; Chen et al., 2019). Key institutions are financial services firms, technology firms, and FinTech firms (Gomber et al., 2017). Distinctions are also

made between business-to-business, business-to-customer and customer-to-customer FinTech (Wójcik and Cojoianu, 2018), as well as between intra- and interorganizational applications (Puschmann, 2017). To date, two areas of FinTech that have attracted most research are broadly defined crowdfunding (including peer-to-peer lending) and blockchain (including cryptocurrencies) (Cai, 2018; Xu et al., 2019). Data is a challenge, since financial technology does not exist as a category in official statistics. Ironically, ISIC – the most influential international industrial classification – separated information technology from financial and business services in 2008 (Wójcik, 2020). The relative novelty, broad scope and hybrid nature make FinTech a fuzzy concept, but one really worth studying.

### **III Mapping FinTech around the world**

At a global level, we can distinguish between FinTech in developed and developing markets. While in developed markets new digital technologies arrived on the scene when the global financial crisis disrupted the financial sector (releasing thousands of professionals and much capital seeking new opportunities), in developing markets they arrived on the scene of underdeveloped banking and finance (Arner et al., 2016). Borrowing from Langley and Leyshon (2020), FinTech focuses on ‘transforming banking’ in the Global North and ‘banking the unbanked’ in the Global South. Though detailed studies on the evolution of FinTech innovations are hard to find, research suggests parallel roots centred on the USA and the UK in developed markets, and Kenya in developing markets (Arner et al., 2016; Ndung’u, 2018). Whereas in Africa the sector has focused on mobile money, in East and South Asia we see an intertwining of African-style ‘bottom-of-the-pyramid’ retail FinTech and Western-style B2B innovation (Arner et al., 2016). The Middle

East, Western and Central Asia, and Latin America are considered late starters of FinTech (Bassens, 2020; IMF, 2019; Zalan and Toufaily, 2017). According to CCAF (2020), out of \$305bn raised by FinTech (covering crowd-funding, P2P lending and related capital raising) in 2018, 70 per cent was in China, followed by the USA (\$61bn), the UK (\$10bn), and five more countries surpassing \$1bn (the Netherlands, Indonesia, Germany, Australia, and Japan). In per capita terms, the top five countries were: the USA, the UK, Latvia, Estonia and the Netherlands.

FinTech in China stands out in terms of size but also its history and qualitative features. Quantitatively, it took off in 2013–14 with a meteoric growth of P2P lending platforms (Chen, 2016). These numbered nearly 6000 by 2016, but by the end of 2017 an absolute majority went bankrupt, with many turning out to be digitally-enhanced Ponzi schemes (Buchanan and Cao, 2018; Xiang et al., 2017). As a result, capital raised by FinTechs in China declined from \$358bn in 2017 to \$215bn in 2018, while in the rest of the world it grew from \$60bn to \$89bn (CCAF, 2020). Meanwhile, the Chinese big tech firms, with Alibaba and Tencent in the lead, have developed formidable FinTech activities, arguably making big tech more central to FinTech in China than anywhere else in the world (Shim and Shin, 2016; Gruin, 2019). Partly, this is due to the Chinese state-controlled banking sector neglecting the needs of retail customers and SMEs. But it is also underpinned by a special relationship between FinTech and the state. As Gruin and Knaack (2020) stress, the Chinese government promotes FinTech as infrastructure that helps economic development, while at the same time ensuring it does not undermine Party control. This is achieved through such means as ownership stakes and Party committees in leading FinTech and big tech firms, and the social credit system under development. As the internet market in China functions behind a ‘great firewall’, with

limited access to foreign companies, the international expansion of Chinese FinTech, led by their big tech firms, is likely to become a politically sensitive topic (Kenney and Zysman, 2020; Lai and Samers, 2020).

Emerging econometric analyses examine factors that affect the distribution of FinTech by country. Claessens et al. (2018) and Rau (2019) find that the FinTech credit market is larger in countries with higher income per capita and a less competitive financial sector. Haddad and Hornuf (2019) show that besides the general level of economic development, FinTech start-up formation is positively affected by the availability of venture capital and the quality of (internet and mobile phone) infrastructure. Laidroo and Avarmaa (2019) throw in a positive impact of tertiary education, university-industry collaborations, and crisis experience. Results on the influence of the regulatory environment are mixed. While Rau (2019) and Laidroo and Avarmaa (2019) find that regulatory quality and rule of law positively affect FinTech, according to Claessens et al. (2018) the stringency of banking regulation is a drawback. Laidroo and Avarmaa (2019) also indicate that the presence of strong ICT industry clusters in a country has a stronger positive effect on FinTech than the presence of financial services clusters. In the only econometric study conducted at subnational level, Cojoianu et al. (2020) show that knowledge and productivity in the technology sector of a region may matter more for FinTech formation than those in the financial sector.

The map of FinTech is spiky within and across countries, so it is unsurprising to see attempts to rank FinTech centres. First off the blocks was the CCAF (2018) report ranking 30 cities into: global (Beijing, San Francisco, New York, London, Shanghai, Hangzhou, Shenzhen, in descending order); regional (e.g. São Paulo, Bangalore, Sydney, Paris, Berlin); and emerging (e.g. Melbourne, Vilnius, Mexico City, Nairobi) FinTech hubs. Their ranking has three

components: industry, consumer experience, and ecosystem. GFCI (Z/Yen and CDI, 2020) started ranking FinTech centres in September 2019, as part of the general Global Financial Centre Index. Their top five in March 2020 were: New York, Beijing, Shanghai, London and Singapore. Findexable (2019), the most recent and ambitious addition, is a company employing an algorithm to rank cities and countries in real time, based on the criteria of: quantity, quality, and the environment. Their top five FinTech hubs, in descending order, were San Francisco, London, New York, Singapore, and São Paulo. There was no city in the PR of China in the top 20. Findexable (2019: 95) explained this apparent bias against China with their focus on the variety and number of FinTech firms rather than their size. They took pride in the fact that almost half of top 100 FinTech hubs were in emerging markets, and many were not major financial centres. They claim that FinTech breaks the link between the financial wealth of a city and its commercial power; is a leveler, with smaller cities and remote regions able to punch above their weight; and that FinTech success for a country or city takes focus – it is not just an extension of start-up success. While Findexable has a commercial interest in making the geography of FinTech look as distinctive as possible, these claims represent important hypotheses for future research.

Geography of FinTech is subject to considerable heterogeneity and diversity in terms of histories, products and services, investors, and governance. Institutional investors are the dominant source of FinTech funding in the USA, while in China individuals prevail (CCAF, 2018; Claeasens et al., 2018). New York, San Francisco and London are believed to have built their FinTech sectors on the sophisticated demand from financial institutions, the tech sector, and regulatory innovation, respectively (CCAF, 2018). FinTech development in Brussels is based on banking and financial infrastructure companies (Hendrikse et al., 2020).

Nairobi and Johannesburg specialize in payments technology (Findexable, 2019). Zook and Grote (2020) discuss the shift of initial coin offerings for cryptocurrencies from centres in the USA and Switzerland to offshore jurisdictions like the Cayman and British Virgin Islands. Sohns and Wójcik (2020) show the overwhelming concentration of British FinTech in London, and examine the potential impact of Brexit on the sector. Bhagat and Roderick (2020) uncover differences in access to FinTech services in Kenyan refugee camps. Hasan et al. (2020) remind us how much FinTech in China is conditioned by uneven access to the internet. There is enormous potential for studying the geographical patterns of FinTech production and consumption, and emerging data sources to facilitate such research.

#### **IV Theoretical approaches to FinTech**

Defining FinTech as a set of innovations and an economic sector keeps room open to different theorizations of the phenomenon. Although most research on the topic is empirical rather than theoretical (Gomber et al., 2017), broad contours of the conceptual side of the debate can be sketched. Geographers have made contributions to this debate by elaborating on the concepts of ecosystems and financial ecologies, the geographical nature of digital platform economies, global production and financial networks (GPNs and GFNs) in relation to FinTech, as well as the crucial role of scale in analysing this phenomenon.

Ecosystem is probably the most popular concept applied to FinTech in academic literature, and reigns supreme in grey literature (Leyshon, 2020). Consultants, think tanks, and FinTech professionals seem fluent in ecosystem language (Hendrikse et al., 2020), not least because it is more fashionable than terms like industry and evokes associations with symbiotic relationships and natural, benign impacts (Lee and

Shin, 2018). An ecosystem can be understood as ‘a group of interdependent actors that jointly develop a set of complementary assets’ (Grabher and König, 2020: 104). For Lai (2020) the FinTech ecosystem is made of banks and non-bank financial institutions, big tech firms, FinTech start-ups, and state entities as the main actors, while Lai and Samers (2020) also discuss the potential of manufacturing firms to enter the FinTech arena. Literature varies in emphasis placed on different actors. Sohns and Wójcik (2020), for example, use the theory of entrepreneurial ecosystems, which focuses on FinTech start-ups. Hendrikse, van Meeteren and Bassens (2020) propose the concept of the Fin-Tech-State triangle. Groups of FinTech innovations are referred to as ecosystems in their own right, e.g. blockchain (Rauchs et al., 2019); and RegTech (regulatory technology) (CCAF and EY, 2019).

Closely related to ecosystems is the concept of financial ecologies (Leyshon et al., 2004; Leyshon, 2020), which ‘recasts the financial system as a coalition of smaller constitutive ecologies, such that distinctive groupings of financial knowledge and practices emerge in different places with uneven connectivity and material outcomes’ (Lai, 2016: 28). Building on Langley (2016), Langley and Leyshon (2017) distinguish between five financial ecologies in crowdfunding. While donation and rewards ecologies are driven by motives of charity, fandom, and affect, equity, fixed income and P2P lending follow more closely the financial logic. As such, the concept helps examine the variegated and uneven nature of FinTech.

FinTech is undeniably part of the digital platform economy (DPE). Approaching it as such stresses its novel and transformative character, but one that can be reconciled with the notion of ecosystems. Digital platforms are defined as ‘programmable digital infrastructures controlled by platform operators who, as non-neutral intermediaries, curate the interactions

of interdependent complementors and users’ (Grabher and König, 2020: 103); ‘a new organisational form based on a relationship between the platform and the ecosystem of firms dependent on the platform and users who interact and transact through it’ (Kenney and Zysman, 2020: 1); and from a political economy perspective as ‘a distinct mode of capitalist enterprise that aggregates and analyses data and deploys digital infrastructures in order to extract value from intermediation’ (Langley and Leyshon, 2020: 7). Leaders of the DPE are the five US platform giants, Apple, Amazon, Facebook, Google and Microsoft, along with the Chinese firms Tencent and Alibaba, which in October 2019 constituted 7 of the 10 most valuable firms in the world (Kenney and Zysman, 2020). All of them have FinTech activities, focusing on digital payment platforms. Alibaba also developed an investment platform, which became the world’s largest money market fund (Wang and Doan, 2018). Facebook has launched Libra (Zook, 2020). Big tech ‘provides the highly centralised infrastructures upon which the “sectoral platforms” of FinTech are built and organised’ (Langley and Leyshon, 2020: 10). This does not imply, however, that big tech is bound to dominate the FinTech ecosystem. Arguably finance has always had a platform nature, which can now be complemented with new technologies (Hendrikse et al., 2018). Haberly et al. (2019), for example, show that in asset management DPE is driving more consolidation and concentration, with spectacular growth of firms like Blackrock.

There is much potential to apply the frameworks of GPNs and GFNs to analyse FinTech, though both need to be rethought in the light of FinTech. As Lai and Samers (2020: 6) argue, FinTech blurs the boundary between production and finance and ‘presents new opportunities for reconceptualizing new models of value creation, value enhancement and firm upgrading’. In this spirit, Haberly et al. (2019) propose a new typology of financial centres in GFNs that

accounts for the impacts of technology and DPE. Hendrikse, van Meeteren and Bassens (2020) talk about strategic coupling between fin and tech. Wójcik and Cojoianu (2018) discuss FinTech as convergence between fin and tech taking place at the level of business models, firms, sectors, as well as financial centres.

Due to preference for conceptual novelty, word clusters or agglomeration are rarely used in research on FinTech. Index providers seem to prefer the term FinTech hub rather than centre (CCAF, 2018; Findexable, 2019). This should not detract anyone, particularly geographers, from studying FinTech in relation to financial centres. Arguably, one obvious gap in FinTech scholarship concerns the location of FinTech start-ups and other actors in the ecosystem. I suspect that in many cities tech and FinTech firms and activities are crowding out more conventional financial activities, changing the economic and social fabric of cities, and the spatial organization of the economy in the process. If this reminds some readers of Vernon's product-life cycle theory, then perhaps it should. A lot of other concepts have been used to explore FinTech. Transaction costs (Pesch and Ishamaev, 2019), network effects (Zachariadis and Ozcan, 2017), and information asymmetries (Sangwan et al., 2019) in FinTech are studied in relation to DPE and on their own. Shim and Shin (2016) use Actor Network Theory, highlighting the role of non-human actors. Haberly et al. (2019) discuss centripetal and centrifugal forces operating in and on FinTech. There is a need for geographers engaging with FinTech to use both well-established theories and novel concepts.

FinTech is a fascinating topic at all scales of enquiry, from bodily to global. Bhagat and Roderick (2020) examine the role of racialized bodies in access to FinTech. Zalan (2018) highlights the 'born global' potential of FinTech start-ups. Wang and Doan (2018) show FinTech evolution at Alibaba. FinTech activities and their internationalization at large banks are illustrated through comparative cases studies by

Lai (2020) and Chen et al. (2017). Hendrikse, van Meeteren and Bassens (2020) elucidate the emergence of the FinTech ecosystem, including incubators and accelerators, in Brussels. Gruin (2019) and Gruin and Knaack (2020) illuminate the development of FinTech in China, focusing on the national scale. Zook and Blankenship (2018) examine Bitcoin in a global context, stressing the materiality of its practices, including hardware, energy, and human agency. With theoretical and methodological open-mindedness, geographers seem well-placed to make sense of FinTech in a multi-scalar framework (Knight and Wójcik, 2020).

## V Conclusion

In the first of two progress reports reviewing FinTech scholarship in and beyond geography, I have concentrated on maps and concepts, starting with definitions, roots and taxonomies, moving to empirical work charting the landscape of FinTech from global to local, and finishing with theoretical approaches to the topic. In other words, I have focused on the *what* and *where* of FinTech. In the second report, I will turn to the *so what* and *where* combination by reviewing work on the impacts of FinTech on the financial sector and centres, regulation and stability, inclusion and governance. My hope is to do some justice to the richness of emerging research on FinTech, and the significance of FinTech as a phenomenon. Kenney and Zysman (2020) claimed that economic geographers have underestimated the platform economy. Geographers, not only financial and economic, should certainly not underestimate FinTech. The good news is that given emerging geographical studies, and with FinTech proper having only over a decade of history, and research thereon merely five years or so, we have not missed the boat just yet.

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