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Towards an economic geography of FinTech

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Abstract

In this paper, we identify the ways in which the existing literature has examined financial technology (FinTech). Using the frame of the ‘FinTech Cube’, we examine how FinTech unfolds through the intersections of key actors, technologies and institutions. We demonstrate the relevance of FinTech for two areas of geographical enquiry: i) the reshaping of global production and financial networks, and ii) financial inclusion and poverty reduction in poorer countries. In doing so, we accord particular attention to the significance of FinTech for theoretical and empirical research in economic geography.

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Towards an economic geography of FinTech

I. Introduction

The geographies of finance have been the subject of considerable attention since the 1990s, yet what is now called ‘FinTech’ (a short-hand for ‘financial technology’) is only beginning to attract critical social scientific scrutiny. While this may owe to the newness of FinTech, with the term in use only since 2014 by global consultancy firms in industry reports, the limited critical scholarly attention also stems from the unwieldy and confusing nature of FinTech insofar as it encompasses a vast array of financial and technological innovations. In fact, FinTech seems to have acquired the characteristics of a ‘chaotic concept’ (Sayer, 1984), or a ‘portmanteau’ (Shim and Shin, 2016). FinTech operates at the intersections of the finance and technology sectors where technology-focused start-ups and new market entrants are creating new platforms, products, and services beyond those currently provided by the traditional finance industry. These FinTech entities are changing how businesses and consumers make payments, lend, borrow, and invest, and are heralded as being particularly innovative and disruptive to existing financial practices and industry dynamics.

FinTech is significant for at least four reasons. First, it grew very rapidly during the 2010s; between 2010 and 2018, global venture capital investment in FinTech increased from about US\$1.8 billion to US\$56 billion (Accenture, 2019).¹ Second, FinTech is being actively promoted by governments and private actors in major international financial centers (IFCs) as an opportunity for capturing new markets and developing new capabilities that would bolster their IFC status. Third, FinTech appears to ‘disrupt’ (or at least reconfigure) existing financial institutions and market segments through promises of lower costs, higher efficiency, greater convenience, and product customization that better suit customer profiles and needs. Fourth, FinTech has significant implications for reshaping *inter alia* global production and financial networks, and ‘development’ in poorer countries.

In light of FinTech’s polymorphic qualities and its potential for economic and social change, we present the idea of a ‘FinTech Cube’ for conceptualizing the intersections of key actors, technologies, and institutions. We then review the emerging academic literature on FinTech, and highlight two research themes for geographical enquiry: i) the reshaping of global production and financial networks, and ii) the implications of FinTech for ‘financial

¹ The calculation of this figure is admittedly murky since the scope of FinTech is never defined. Other reports provide substantially different figures (see e.g. KPMG, 2019).

inclusion' and 'development' in the global south. In doing so, we accord particular attention to the significance of FinTech for theoretical and empirical research in economic geography.

II. Making sense of FinTech

While money and finance have always involved technology, no financial innovation has thus far involved the combination of digital re-intermediation, artificial intelligence (AI), blockchains, and mobile technologies. Although FinTech is often associated with 'financial disintermediation', as financial services are being offered by other entities without the need for banks, or even physical commodities (such as cash or cheques), 're-intermediation' might be more appropriate as the relationships between finance and technology firms are constantly evolving (French and Leyshon, 2004). Arner et al. (2015) trace the origins of the term 'FinTech' to the early 1990s and the Citigroup-initiated 'Financial Services Technology Consortium', even though the term did not gain traction until the 2010s. They define FinTech simply as "...the use of technology to deliver financial solutions" (p. 3). Schueffel (2016) views FinTech "...as a new financial industry that applies technology to improve financial activities" (p. 45). 'To deliver' and 'to improve' may have very different connotations, depending on whether one interprets '*to improve*' as normative or focused on firms' search for greater productivity, cost savings, or new markets. The FSB (2017) describes FinTech as "technologically enabled financial innovation [that] is giving rise to new business models, applications, processes and products" (p. 7). The vagueness of these definitions reflects the difficulties of delineating exactly where FinTech might begin and end. Many FinTech products and services are being offered by technology companies (ranging from start-ups to large multinational corporations) but banks are also important investors in FinTech systems and applications. The participation of large numbers of investors in crowdfunding and the use of social media are prominent in some FinTech segments but not important elsewhere (Langley and Leyshon, 2017a). Definitions of FinTech therefore depend on particular industry segments, participants, and analytical concerns of specific studies.

Instead of generating a list or table of different categories or applications of FinTech, we prefer the idea of a 'FinTech Cube', which comprises i) financial products and services, ii) technologies, and iii) key actors that intersect in various ways to provide technologically mediated or enabled financial solutions (Figure 1). The multiple axes offer broad coverage and flexibility in capturing the principal dimensions of FinTech. Each area inside the cube can be examined in relation to the three dimensions and their properties. While FinTech could be analyzed from the perspective of a financial product, some FinTech applications

might involve multiple technologies and actors. For instance, financing could be offered by both banks and technology companies involving blockchains, ‘big data’ analytics and P2P technology through crowdfunding. For investments, assets could be managed through algorithm-based and automated advice (‘robo-advising’) using AI and ‘big data’. In terms of key actors, technology firms, banks, and non-bank financial institutions (e.g. insurance companies) are prominent but regulators and central banks are increasingly important in reshaping the regulatory and policy landscapes of FinTech, by using such technologies to improve regulatory processes (e.g. RegTech) and even the potential issuance of central bank cryptocurrencies (Bech and Garratt, 2017). Over time, new technologies, financial products and services, and other institutions may enter the FinTech space to create new ‘segments’ in the Cube, as indicated by the dotted arrows of the three axes. The ways in which new segments appear and how they intersect have important implications for how we analyze and consider key research themes in economic geography, which we will discuss in greater detail later in this paper. For the moment, we turn to examine the ways in which it has been conceptualized in the scholarly literature.

*** Figure 1 around here ***

III. Emerging academic literature on FinTech

Our review of FinTech studies has identified four main perspectives (some of these will be discussed further in our thematic sections). The first seeks to explain the *longue durée* growth and emergence of Fintech. Arner et al. (2015) trace its beginnings to the 19th century and label the period of FinTech since 2008 as ‘FinTech 3.0’. In this latter period, financial products and services are distinguishable from previous eras by their providers—who are increasingly *not* traditional banking and financial institutions. Some of the explanations for this growth include changing public perceptions of banking and finance, technological innovation, the lay-off of financial workers and their re-allocation to start-ups, more challenging regulation for conventional banks, inadequate bank finance, and distrust of state-supported ‘too-big-to-fail banks’ after the 2008 global financial crisis. Indeed, Bitcoin and other cryptocurrencies have strong roots in an anti-statist techno-libertarianism (e.g. Zook and Blankenship, 2018).

Yet, these reasons (and their temporal framing) may be ‘global-north-centric’ since mobile financial services (MFS) such as the ubiquitous M-PESA in Kenya grew partly out of quite different rationale, namely addressing poverty and financial exclusion in poorer

countries (Maurer, 2012; Gabor and Brooks, 2017). As in the FinTech cube, this rationale has brought together firms, institutions, and customers in the creation of Fintech products (Maurer, 2012). From the perspective of consumers specifically in Africa, Johnson (2016) argues (albeit with some contentions) that most Kenyans perceive the industry dominant Safaricom and the internationally funded MPESA (operated by the former) to be more stable and ‘neutral’ than conventional banks in a time of political volatility, and therefore less likely to collapse. For China, Shim and Shin (2016) conceptualize the growth of FinTech using actor-network theory and Callon’s concept of ‘translation’. Their analysis of how on-line payment systems have emerged in China relies on understanding how a network is established through problematization, *interessement*, enrollment, and mobilization. Chen (2016) refers to the growth of FinTech in poorer countries as the consequence of ‘last-mover advantage’. In other words, poorer countries are a financial *tabula rasa* (institutionally and digitally-speaking), in which the comparative paucity of existing banks and financial institutions (especially in rural areas), combined with rapid economic development and growing middle class, such as in China, India, and sub-Saharan Africa, have led to a more rapid adoption of MFS than in many richer countries.

A second perspective centers on firm strategies and inter-firm relationships of FinTech (e.g. Hendrikse et al., 2018; Shim and Shin, 2016; Zalan and Toufaily, 2017). Studies examine the intersections of market participants, FinTech infrastructure and financial ecologies or eco-systems through changing power dynamics between large financial institutions (‘incumbents’) and Fin-Tech start-ups (‘disruptors’) (Lai, forthcoming). For example, Hendrikse et al. (2018) examine inter-firm relationships to evaluate the common notion that FinTech ‘start-ups’ threaten traditional ‘incumbent financial institutions’. They argue that FinTech firms are following Apple’s business model with the embrace, capture, and internalization of disruptive FinTech companies as start-ups could compete ‘freely’ while being locked into a particular platform for distribution and customer access. Large technology firms thus use their competitive advantages in data and algorithms to accrue and analyze user data in order to extract value (Langley and Leyshon, 2017b). At the same time, financial incumbents are themselves embracing technological change. However, Zalan and Toufaily (2017) note that in the Gulf Cooperation Countries (aside from Bahrain and UAE) and North Africa, incumbents do not seem to be so easily threatened by FinTech start-ups because of an ill-equipped regulatory landscape for innovative start-ups.

A third literature focuses on blockchain technology. This is at the moment mainly a speculative literature (and usually of a technical or applied nature) that began in the 2010s

and mostly focuses on the ‘global north’. A full review of the literature is beyond the scope of this paper (see, for example, Casino *et al.*, 2019; Wang *et al.*, 2019; Zook and Blankenship, 2019). However, there are some pertinent insights for global production and development issues. According to Wang *et al.* (2019) blockchain technology is likely to shape future supply chain practices due to four key advantages: extended visibility and traceability, digitization and disintermediation, improved data security and smart contracts. Though they recognize that blockchain technology creates challenges such as issues of governance, ethics, corporate power, intellectual piracy, automation-induced unemployment, and technical vulnerability issues. For poorer countries, Kshetri (2017) argues that blockchains could increase efficiency and reduce transaction costs, which in turn could lead to improvements in the costs and bureaucratic complexity of property registration, reduction of fraud and corruption, empowerment of donors in ensuring that funds are channeled to intended programs and recipients, and improving trade and business financing. However, various challenges remain, such as lagging infrastructure, high energy consumption, regulatory uncertainties, and lack of standardization.

A fourth perspective on FinTech provides a relatively more sanguine discussion of regulation and market-making support, while recognizing the regulatory challenge of balancing innovation with risk (Arner *et al.*, 2015; Maurer, 2012; Shim and Shin, 2016; Tsai and Peng, 2017). Financial regulators are concerned with a number of different objectives, such as ensuring financial stability, prudential regulation, conduct and fairness, and competition and market development (Tsai and Peng, 2017: 111). Regarding China, Shim and Shin (2016) point to two different regulatory or market-making strategies since 2008: techno-globalism and pragmatic techno-nationalism. They contend that the growth of FinTech is strongly tied to Chinese government policies, in which the Chinese government uses a techno-globalist strategy to improve competitiveness of FinTech firms, while using a techno-nationalist strategy to create ‘national champions’ and shield domestically-owned firms from foreign companies (see also Wójcik and Camilleri, 2015). Despite the significance of (national forms of) territoriality and regulation, FinTech in the 21st century may not be controlled by national regulators in a world of international non-bank providers (Arner *et al.*, 2015).

In sum, while some economic geographers have started to research various aspects of FinTech (e.g. Haberley *et al.*, 2019; Hendriske *et al.*, 2018; Langley and Leyshon, 2017a), most of the other social science research lacks spatial, and often critical and theoretical, perspectives in unpacking the evolving relationships and uneven spatial impacts. In the next

sections, we address this deficiency by exploring two themes common to the study of economic geography.

IV. Economic geographies of FinTech: two themes

Given the significance of FinTech as discussed above, we argue that economic geographers should consider how the intersections of financial products and services, technologies, and institutions (Figure 1) are reshaping economic activities and their uneven outcomes. To illustrate these transformations, we focus on two areas: global production and financial networks, and ‘financial inclusion’ and poverty reduction.

Reconfiguring global production and financial networks

FinTech is creating new growth opportunities for both technology firms and financial institutions, although there is also uncertainty about whether future production and financial networks would be characterized by ruptures (due to displacement or obsolescence) or redistribution (as existing players grow and enrich the market or acquire new FinTech firms and technologies). The development of FinTech has important implications into how the territorial and relational dimension of global production networks (GPNs) and global financial networks (GFNs) might change, and their impacts on local and regional development.

In terms of production networks, we identify emerging developments relating to financing, new actors in financial intermediation, and changes in lead firm-supplier relationships. FinTech is changing the traditional reliance of firms on bank financing, debt issuance and capital markets for financing needs. This is especially pertinent for small and medium-sized enterprises (SMEs) that are accessing alternative financing via online platforms, and as production companies themselves engage in financial intermediation. Tsai and Peng (2017), for example, identify new models of online ‘supply-chain financing’ with e-commerce platforms (e.g. Alibaba) providing loans online, while some commercial banks are also collaborating with e-commerce platforms to offer bank-based funding and financial services. These new forms of supply chain financing enable more favorable lending terms to SMEs, which were previously unbanked or had to accept financing on less favorable terms compared to larger firms. Owing to factors such as low transaction volumes, limited collateral and short operating history, SMEs often do not meet the credit criteria according to banks’ internal procedures. E-commerce platforms, on the other hand, have proprietary information on transactional data, such as volume, service reliability, product quality, reviews

of users/buyers, that could be used in place of (or in conjunction with) limited credit data to evaluate these firms (Aitken, 2017). This is significant as better access to financing could reshape firms' attitudes towards risks associated with co-development of products and technologies with other firms, and their modes of strategic coupling with particular firms and localities (Yeung, 2016).

The boundary between 'production' and 'finance' is increasingly blurred with the entrance of new technology firms or financial divisions of manufacturing companies into financial services. Foxconn, the world's largest contract manufacturer of consumer electronics, is reshaping inter-firm networks and power relations via its e-commerce platform, which is also being used for providing loans and financial guarantees (Tsai and Peng, 2017). By leveraging on its business relationships and close knowledge of suppliers' business operations and financial status, Foxconn is able to lower credit risks as firms already have to meet strict criteria to become its qualified suppliers. Foxconn's business model of online supply-chain financing raises the issue of financial re-intermediation or shadow banking as it increasingly acts as a non-bank credit intermediary. The integration of supply chain financing and B2B transactions via e-commerce platform is also increasing the power of Foxconn in shaping supplier networks. FinTech is therefore reshaping bargaining power and strategic coupling between firms. Rather than focusing on how firms create or enhance value through improving manufacturing processes, labor efficiencies, acquiring new technologies or generate cost savings through changing supplier networks (Coe and Yeung, 2015), firms are developing new forms of competitive advantage, for example, in financing or data intelligence. Online transactions are producing massive amounts of data for algorithmic analysis, which are being mobilized by technology firms or divisions to generate fine-grained information for new products and market segments (Gabor and Brooks, 2017; Langevin, 2019). As seen in the Foxconn example, firms are becoming financial actors as well as 'productive' ones through the development of new FinTech solutions. We could therefore see the insertion of new actors in the FinTech Cube (Figure 1), such as manufacturing firms, in providing financing, payments or credit solutions through data analytics. This goes beyond the pursuit of new forms of revenue through providing additional services, but has the effect of 'locking-in' users by providing a growing ecosystem of business and financial services for Foxconn's suppliers, which in turn bolsters the network power and market position of Foxconn. FinTech thus presents new opportunities for reconceptualizing new modes of value creation, value enhancement and firm upgrading in GPN analysis.

Other than reworking the boundary between finance and production, Fintech entities are also shifting industry boundaries. The ways in which technology firms are moving into other sectors through advantages in data analytics, AI and platform technologies are reshaping their 'lead firm' positions in GPNs. For instance, China's second largest e-commerce firm, JD.com (whose parent company is FinTech conglomerate Tencent) provides Internet-based financial products and services via its e-commerce platform that includes online payments, supply chain financing, P2P lending and crowdfunding. Based on its success with online payments, data analytics, and heavy investments in AI and robotics for logistics operations, JD has ventured into the offline retail space by opening supermarkets (7fresh). Customers in stores use smart shopping carts that collect data for analyzing movement and buying preferences and cashless payments are made via JD accounts (Tang, 2018). This follows a similar strategy by Alibaba and its Hema supermarkets, where payments are handled through the already popular Alipay (owned by Alibaba's Ant Financial), and data collected from transactions within the store and across Alibaba's other consumer platforms is used to personalize recommendations (Chou 2018). Through data and technological assets, these FinTech firms are influencing consumer preferences and behavior, and carving out new positions within and across industry sectors.

While the above examples of FinTech developments come from both technology and manufacturing firms, they have a common strategy of mobilizing key advantages in digital intermediation and platform organization. A 'lead firm' then could position itself as a platform-based intermediary, with competitive advantages and assets in data and algorithms rather than as an owner of capital or employer of labor. This becomes more obvious if we focus on the leading FinTech giants commonly referred to as GAFA (Google, Apple, Facebook and Amazon) and BAT (Baidu, Alibaba and Tencent). These BigTech firms act as platforms, a distinctive mode of capitalist enterprise that use digital infrastructures to accrue and analyze user data in order to extract value from intermediation (Srnicek, 2016; Langley and Leyshon, 2017b). Financial reintermediation from these firms involves not just the reduction of transaction costs but also the monetization of transaction data itself that could be used by the firm (or sold to others) for purposes such as supply chain management, market segmentation and credit risk analysis. If the 'platform' is becoming an increasingly important business model, we need to consider its impacts on firm and consumer behavior, labor markets, the organization of global production, and the winners and losers of such a process. Contrary to expectations of the 'disruptive' potential of FinTech startups for financial services, a more likely scenario is that of growth and consolidation as successful platform

businesses grow ever larger and monopolize new market structures of finance and production through capturing the ever-expanding value created by user activities and interactions across their platforms (Haberly et al., 2019). For leading technology firms such as GAFAs and BATs, their ever-growing size, user-capture, and data expertise are positioning them as central actors in mainstream corporate landscapes rather than niche players in technology, finance, or retail. This generates different modes of cultivating and capturing ‘value’ compared to current GPN analysis. As more actors, technologies and financial services are involved in FinTech, there is a need to address the new spatialities that create and are created by the reconfiguration of business orientation, labor markets and broader production networks.

In the remaining section on GFNs, we point to two main issues: the increasing importance of technology firms and clusters, and the role of regulatory actors. The conceptualization of GFNs needs rethinking in terms of who counts as significant *financial* actors and whether new spatialities of finance are emerging from the growth of FinTech. While Coe et al. (2014) identify finance and advanced business service firms (e.g. law and accounting firms) as vital actors in GFNs, technology firms are playing increasingly important roles in these interlocking FinTech ecologies (Lai, forthcoming). In addition to IFCs and offshore jurisdictions, we need to reconsider the role of technology clusters in the reconfiguration of financial centers and networks. Research by Haberly et al. (2019), for instance, demonstrates how data centers, high-tech clusters and back office operations are now integral components of GFNs for conceptualizing the organizational and geographic logic of the digital platform economy in finance. By examining the locational decisions of FinTech firms, how they intersect with knowledge networks in IFCs and innovative clusters, and the types of capital, regulatory and organizational structures required, we can improve contemporary understanding of how new FinTech processes and relationships are shaping local and regional development. While financial geography and urban studies literatures have rich accounts of financial center development and their roles in wider economic networks (Cassis and Wojcik, 2018; Taylor and Derudder, 2015), research on FinTech could reshape some of those conceptualizations. Research on high-tech development and learning regions have also largely treated technology clusters as a separate analytical category rather than consider their intersections with finance (Cooke and de Laurentis, 2010; Shearmur et al. 2016). Even as FinTech innovations are emerging from technology firms, banks and financial institutions are also creating technological incubators and accelerator programs; these developments have spatial implications for financial innovation as FinTech could reshape the growth trajectories of IFCs and high-tech clusters. For instance, FinTech could present new

opportunities for smaller financial centers to develop specific expertise or increase their significance within GFNs. San Francisco, Boston and Stockholm are relatively small financial centers in terms of conventional capital markets, financial services and commercial activities, but they could carve out new roles as FinTech centers due to their established high-tech economies and start-up culture, strong venture capital markets and financial actors who are familiar with the opportunities and limitations of conventional finance industry offerings amidst technological change. There is growing industry interest around a Nordic FinTech cluster led by innovation ‘hotspots’ in Sweden, Denmark and Finland for similar reasons (Turula, 2016). These developments could stimulate new debates in evolutionary economic geography (Boschma and Frenken, 2011; Hassink et al. 2014).

State-sponsored investments (often as joint development with private sectors) in technology clusters and incubators might have more significant impact on financial products and services than currently acknowledged in the academic literature. Given that the role of the state has been relatively underappreciated in the conceptualization of GFNs (for some exceptions, see Wojcik and Camilleri, 2015; Lai, 2018b), this calls for greater consideration of state actors and regulators in not only enabling FinTech growth through regulatory adjustments and risk management but also strengthening IFC competitiveness in entrepreneurial ways. FinTech is being actively promoted in a number of leading IFCs, such as London, New York, Luxembourg, Singapore, and Hong Kong, as vital for capturing new markets and developing new capabilities that would build upon and bolster their IFC prominence. State initiatives include creating FinTech divisions and leadership in their respective regulatory bodies, setting up special ‘sandbox’ environments to enable pilot trials, attracting inward FDI and overseas investments in FinTech firms, and signing Memorandum of Understanding (MOU) with other countries to facilitate knowledge exchange and collaboration in FinTech activities (Lai, 2018a). Hendrikse et al. (2019), for instance, highlight the challenges posed by FinTech to establish IFCs in the age of digital finance. Their detailed study of Brussels points to the emergence of a ‘Fin-Tech-State triangle’ with the strategic coupling of big financial institutions with small tech startups through specific actions of Belgian entrepreneurs and state actors. While this creates new opportunities for second-tier financial centers like Brussels, it also has the tendency to favor incumbent financial actors in colonizing the emerging FinTech space. Haberly et al. (2019) also shows how digital asset management platforms (comprising index funds and exchange-traded funds, robo-advising, and analytics services) are developed through in-house innovations by major financial firms rather than from external technology companies, which has reinforced the

position of incumbent banks and fund managers. This has also bolstered the power of New York as a leading asset management center instead of San Francisco, despite its key role in spearheading robo-advising, as pioneering startups are increasingly out-competed or purchased by established financial giants.

Our final point concerns regulation and GFNs. Conventional financial services are organized through centralized infrastructures and national governance systems, while FinTech operates through a more distributed decentralized governance structure with information flowing more directly between producers and consumers of finance (Knight and Wójcik, 2017). This creates new regulatory challenges in the technical (scalability, IT security) and non-technical (legal, tax treatment) domains that are difficult to tackle and resolve within existing centralized regulatory frameworks (Gomber et al., 2018), not least because the data-centric domains of the leading FinTech conglomerates lie outside current banking and finance regulation. The actions and attitudes of regulators is vital in shaping business and financial practices as well as impact on the trajectories of financial centers. New regulation such as Revised Payment Service Directive (PSD2) in Europe is expected to provide reintermediation opportunities for FinTech firms (Capgemini, 2017). Such regulatory changes are particularly important in the face of decline in traditional banking activities and increase in shadow banking, especially after the 2008 global financial crisis with increasing regulatory burden, heightened legal scrutiny and larger capital requirements (Buchak *et al.*, 2017). While FinTech could replace existing financial markets and banking institutions with new platformed arrangements (World Economic Forum, 2017), it could also reinforce the incumbent positions of large financial institutions who are able to absorb startups and new technologies with deeper pockets, and have large customer base, existing regulatory relationships and stronger branding (Hendrikse et al., 2019). These scenarios would present different regulatory challenges. The prioritization of market expansion in order to generate and capture value from digital intermediation points to the likelihood of consolidation that favor large technology firms or incumbent banks, with monopolistic and oligopolistic tendencies. This should caution against the problematic assumption that FinTech would enhance competition and provide greater choice and efficiencies. Instead more attention should be directed at scrutinizing the role of BigTech and BigBanks in the evolving FinTech Cube. There are signs of growing unease about the power of BigTech platforms, such as the controversy around Facebook's plan to launch its cryptocurrency 'Libra' and the role of Sesame Credit (part of the Alibaba conglomerate) in China's emerging social credit system, which point to increased scrutiny as they enter the regulatory space for new financial

products and services. The economic power of US-based conglomerates like GAFAM vis-à-vis the globalizing Chinese BAT technology firms could also present future challenges if these BigTech firms become caught up in various sanctions and regulatory restrictions resulting from US and China trade wars or other political disputes, which is already evident in the case of Google in China and Huawei in the US. The growing significance of FinTech should prompt renewed research interest into the political economy of money and finance, specifically the geographical and structural shifts in power between states, between states and markets, and between groups of social and economic actors; this was prominent in early financial geography research in the 1990s (Leyshon, 1995) but faded in comparison to a cultural economy approach (Hall, 2011), and resurfaced more recently following the 2008 financial crisis (Christophers et al., 2017).

While GPN and financial geography literatures have provided rich analyses and explanations of firms' geographical strategies, state-firm relationships, strategic nodes and networks, and financial center development, these processes and outcomes are experiencing substantive changes with FinTech. With the blurring of boundaries between financial and non-financial firms and activities, FinTech should prompt geographers to re-examine the relationships between finance and production, inter-firm relationships, new modes of value capture and creation, and the spatial impacts of reconfigured production networks.

FinTech and 'development' in poorer countries: last-mover advantage?

In this section, we examine the three axes in Figure 1 with respect to mobile financial services (MFS), which are a chief element of FinTech in poorer countries. MFS include micro-payments, electronic money, and mobile banking channels (Duncombe and Boateng, 2009). We focus on two dimensions: the extent to which MFS lead to greater 'financial inclusion' and poverty reduction; and the ways in which MFS in poorer countries are produced through 'northern' corporations, businesses, policies and practices, often in conjunction with 'southern' businesses, entrepreneurs, and political elites. Our aim is to offer some empirical suggestions for how we might build an economic geography of MFS, and to outline some theoretical implications of MFS for debates in economic geography. While much of our discussion pertains to 'developmental' issues in the 'global south', they are by no means absent in the 'global north', and we reject such a rigid binary while pointing to the complex flows and relationships that connect them.

Many scholars argue that MFS "help improve financial access and universal inclusion" in poorer regions of the world (Tsai and Peng, 2017: 2; see also Donner and Telez,

2008; Jack and Suri, 2014, 2016; Demirgüç-Kunt et al., 2017); lead to inclusive growth (e.g. Alampay et al., 2017), or “...unlock significant economic opportunity and accelerate social development” (Ding et al., 2018: 20). Similarly, Manacorda and Tesei (2016) refer to mobile phones as ‘liberation technologies’ and ‘mobile money’ has been labelled a ‘revolution’ (Burns, 2018; Jack and Suri, 2014) – what Maurer (2012) calls an ‘empowerment narrative’. According to the World Bank (2017), greater access to ‘digital financial services’ can increase ‘income earning potential’ and contribute to poverty reduction by allowing people to manage financial risk, receive payments at lower cost, increase savings and reduce government corruption. Likewise, Alampay et al. (2017) argue that MFS facilitates access to lower-cost credit, which could reduce income inequality and facilitate economic activity.

By some definitions and measures, the growth of MFS in poorer countries exceeds those of wealthier countries (World Bank, 2017). Chen (2016) refers to this as ‘last mover advantage’ but this is more than a simple observation; it is a normative statement that needs critical discussion (which we return to at the end of the section). ‘Financial access’ is determined by access to accounts and how people borrow, make payments, manage risks, and save. Account ownership can be defined as a singly or jointly owned account either through a financial institution or a mobile money provider (typically mobile-phone based and not associated with a financial institution), to store money, to send money (e.g. bill payment to the government or on-line shopping) or to receive money (e.g. remittances and other private cash transfers) (World Bank, 2017). Definitions of ‘financial inclusion’ vary, such as expanding the ratio of the population that has access to *formal* financial services (Burns, 2018), delivering sustainable and useful financial services at affordable costs to disadvantaged and low-income people (Kim et al., 2018), or even the broader condition of financial regulations to ensure customers’ finances are adequately protected against risk (World Bank, 2017).

To examine financial access or financial inclusion, we rely mainly on the World Bank’s 2017 ‘Global Findex’ which attempts to measure ‘financial access’ for some 140 countries². We acknowledge the methodologically nationalist character of this data, which obscures sub-national differences and, in many cases, social or ‘intersectional’ differences in MFS’ adoption, but we nonetheless proceed with these caveats in mind. We supplement this review of the largely adulatory quantitative data with more critical, qualitative studies.

²For other surveys of the use of MFS, see e.g. Alampay et al., 2017; Jack and Suri, 2016; IDRC, 2018; IMF, 2018; Kim et al., 2018; Lenka and Barek, 2018; and Ouma et al., 2017). To avoid the problems of triangulation, including different survey periods, we rely principally on the World Bank 2017 Global Findex.

According to the World Bank (2017), financial inclusion *is* increasing in the global south based on ownership of mobile money accounts. This is especially the case in sub-Saharan Africa (SSA) where account ownership grew from 11% in 2014 to 21% in 2017, although there are national differences *within* SSA: those having a mobile money account ranged from about 15% in the Central African Republic to 73% in Kenya. Regardless of these national differences, account ownership is far higher in SSA than in other ‘macro-regions’³ such as Latin America or North Africa (World Bank, 2017). Even in such self-described FinTech and blockchain ‘nodes’ as Dubai, MFS are far less developed (Zalan and Toufaily, 2017). In any case, of those 21% who owned a mobile account in SSA, about half already had an account with a financial institution, while the other half had opened a mobile-only account (World Bank, 2017). This points to an important distinction in the literature between ‘additive’ (adding a mobile account to an already existing ‘bricks and mortar’ account) and ‘transformational’ mobile financial services (‘banking the unbanked’) (Porteous, 2006). This in turn raises an important question: the extent to which the uptake of MFS may be encapsulated by the idea of ‘digitalization’ rather than by ‘financialization’. We return to this question subsequently.

Beyond these macro-regional or nationally aggregated statistics are social differences, with men continuing to outnumber women in the adoption of mobile accounts (a gap of 9% in 2017), though here too there are differences by country. Likewise, there are differences by income, education, and employment condition, with poorer households having 13% less accounts than richer households. The ‘less-educated’ and informally employed also have a lower adoption than the more formally educated and formally employed (World Bank, 2017).

Studies indicate that MFS have led to higher volumes of remittances than for non-users of mobile accounts, and the percentage of people using a mobile account to pay for agricultural products reached some 40% in Ghana, Kenya, and Zambia, and this in turn led to the increased sale of crops and greater household income (Alampay et al., 2017; World Bank, 2017). In contrast, while MFS may have increased savings, Alampay et al. (2017) argue that this has not been statistically significant. Concerning the broad claim that MFS reduces poverty, Jack and Suri’s (2016) research on the MPESA network in Kenya shows that MFS brought 194,000 people (or 2% of Kenyan households) out of ‘extreme poverty’ and “induced 185,000 women to switch into business or retail as their main occupation” (p.

³ As with the problems of ‘methodological nationalism’, such ‘macro-regions’ are theoretically underspecified spatial metaphors, and they may or may not have any analytical value. The available data is nonetheless aggregated as such.

1289), although strong reservations have been expressed concerning their methodology (see Bateman et al., 2019).

Beyond SSA, Ant Financial in China handles digital payments and loans through Taobao, an e-commerce platform.⁴ Alibaba calls this its Taobao Strategy, a program to bring financial services to rural areas that are ‘underserved’ by Chinese banks. This combines digital payments with village stores (Taobao service centers) which provide a range of consumer goods. In essence, the program works like a ‘digital company store’, providing digital access and loans to villages, but it also entails selling agricultural products to cities, enabling new forms of rural-based entrepreneurship. Ding et al. (2018) argue that Taobao is bringing rural people back to villages through the creation of rural employment and slowing or even halting the massive internal migration that was common in the 2000s.

In contrast to such studies of MFS and their positive implications for financial inclusion and poverty reduction, a handful of studies and NGO-based accounts have pointed to at least five related problems. First is the problem of individual indebtedness associated with borrowing (Bateman et al., 2019; Bernards, 2019a, 2019b; CGAP, 2018; Fick and Mohammed, 2018). In some cases, gambling addiction has driven borrowing and vice versa, and the former is widespread in many sub-Saharan countries. In the case of M-PESA, borrowing involves formal lending through Safaricom’s partner M-Shwara, and informal lending through one’s peers within the M-PESA network. A loan from anywhere between \$5 and \$500 can be obtained instantly and with little scrutiny (Bateman et al., 2019). Surveys in Kenya and Tanzania found that roughly half of the borrowers in both countries re-paid their loans late, and about 12% and 31% respectively defaulted on their loans (CGAP, 2018). Additionally, 20% reduced their food purchases in Kenya to cover repayment of their loans, and 16% borrowed more money from friends and relatives for repayment of bank loans.

A second and related problem is firm bankruptcies (or at least market exit) of small or micro-firms, stemming from inadequate demand for goods and services, and from the competitive pressures created by new micro-entrepreneurs. Consequently, argue Bateman et al. (2019), the net contribution of jobs is likely to be near or close to zero in especially highly localized markets. A third issue is the percentage of loans that are spent on individual consumption (including gambling) rather than productive consumption (CGAP, 2018),

⁴ There are macro-regional differences in the way in which for example electronic payments are processed in China and SSA. As the World Bank (2017) notes, there is a ‘Chinese model’ using third party payment services such as Alibaba or WeChat, and a Kenyan model in which mobile network operators offer MFS, which need not be linked to any financial institution.

calling into question the entrepreneurial and productive promise of MFS. A fourth problem is fraud, which seems to be growing in countries such as Ghana and South Africa (Shukla, 2018). A fifth challenge is the constant problems of unreliable or expensive batteries for cell-phones, the serial use of replacement phones with more learning time required, and the lack of time to use mobile phones, especially given domestic demands, all of which disadvantages women users of MFS (Wyche and Olsen, 2018). In outlining the above problems, we would reiterate that there are very few critical studies that examine the personal, group-based, or business/entrepreneurial risks associated with MFS, such as loan defaults and bankruptcies. However, such critical studies do suggest that the celebration of MFS as a solution to financial exclusion and poverty in the global south (the empowerment narrative of ‘last mover advantage’) is premature.

We argue then that critically inclined economic/development geographers can contribute to examining financial inclusion and poverty reduction through MFS in at least two related ways. Firstly, Bernards (2019b) argues that the roll-out of MFS involves a market segmentation - a ‘cherry-picking’ of the ‘urban less-poor’ in terms of financial initiatives. We are not necessarily contesting this claim and in fact, we applaud an analysis that moves beyond broad, methodological nationalist assertions. However, this is not only an assertion from the perspective of MFS *providers*, but both ‘urban’ and ‘less poor’ are particular socio-spatial categories that may require even more socio-spatial sensitivity. The concept of ‘urban’ is hardly clear, as fifty years of urban studies have shown, and there is a need to develop more creative spatial metaphors that account for spatially fluid financial networks that avoid vague (and sometimes paradoxically rigid) metaphors such as ‘urban’ and ‘rural’. Secondly, the idea of the ‘less poor’ does not account for other ‘intersectionalities’ and their recursive relationship to MFS. By this, we do not mean thinking *strictly* in terms of conventional social differences or subjectivities such as class, ethnicity gender, and so on (after all, the salience of the ‘western’ concept of ‘class’, for example, is by no means uncontested across the global south). Rather, we have in mind how MFS creates new, or reinforces/(re-)combines existing social configurations that shape the spatial contours of MFS. As Kusimba (2018) notes, “The practices of digital finance in Kenya rest less on household budgets and bargaining power with husbands than on a distribution of debt and credit relations across diverse financial circuits including kin, friends, community and financial providers” (p. 248). Consider for example, the use of MFS within women-specific Accumulating or Rotating Credit and Savings Associations or other social networks in Kenya (Johnson, 2016; Kusimba, 2018). Since there is no financial product available to suit the needs of such money-pooling groups,

group members use a combination of other digital apps and a Safaricom Paybill number (otherwise designed for commercial/retail payments) to collect ‘digital donations’ for raising funds for anything from airline tickets to tuition, or weddings. The result is that Safaricom now advertises its own ‘Paybill numbers’ as a response to the use of such numbers in group/fiduciary-based fundraising (Kusimba, 2018). This in turn raises questions about the methodological individualism of some assessments of MFS and demonstrates how providers reinforce the social and community dynamics of finance. In short, economic/development geographers can develop socio-spatial analyses that do not draw only on methodological nationalism or individualism, and in so doing may be better equipped to understand the spatialized segmentation of markets for MFS from the standpoint of both the providers and users of MFS. This in turn might shed greater light on the consequences for financial inclusion and related issues of debt, bankruptcies, and poverty.

Whatever the advantages or disadvantages of MFS growth, governments are central to their promotion across the global south (Burns, 2018; Ding et al., 2018; Lenka and Barik, 2018; Shim and Shin, 2016; Zalan, 2018). Gabor and Brooks (2017) show that MFS is orchestrated by a combination of public, private, and philanthropic agencies in a “fast evolving fintech–philanthropy–development (FPD) complex” (p. 424). This involves networks of policy-makers, international financial organizations, FinTech companies, and ‘philanthropic investment firms’ (see also Bateman et al., 2019; Mawdsley, 2018; Singh, 2019; Stolz and Lai, 2020). Their ostensible mission is financial inclusion, and this might be viewed as part of a wider move towards ‘post-aid’ (Mawdsley, 2015) or post-micro-finance-led growth (Bernards, 2019a) in poorer countries. Among the many organizations with the goal of financial inclusion in poorer countries is the Omidyar network – a philanthropic investment organization that invests in FinTech start-ups and partners with private firms. Credit scores are generated using the pattern of calls and text messages from people without credit history. Other companies create digital footprints by inviting potential ‘thin file’ customers to participate in online games and quizzes to create behavior and risk data, which in turn generates ‘predictive algorithms’. Such data and algorithms become central “to pushing the risk frontier in low-income countries” (Gabor and Brooks, 2017: 429), which means that institutions which encourage FinTech, embrace, whether wittingly or not, a form of ‘nudging’ associated with behavioral economics (see also Berndt, 2015). Thus, for Gabor and Brooks (2017): “Poverty is understood as a new frontier for profit-making and accumulation” (p. 424). This production of ‘unbanked’ financial subjects is occurring as

development discourses and practices have shifted from correcting market failures to producing particular subjects.

Gabor and Brooks' critical exposition raises a number of theoretical or conceptual questions for economic/'development' geographers. The first concerns the centrality of MFS in the broader 'digitalization' of the world, which refers to computational technologies (such as AI) and the changing experience of space and time through digital systems and digital discourses (Ash et al., 2018). In this vein, we argue that research needs to delve further into both 'additive' dimensions of MFS (recall Porteous, 2006) and more transformational accounts, to scrutinize how processes of digitalization and financialization are intertwined in complex ways in shaping 'development'.

Our second question then, is the extent to which MFS signals a new *hegemonic* form of financialization in poorer countries, and specifically a new financial governmentality (itself coupled with digitalization). Financialization is no doubt a contested and multifarious concept (Christophers, 2015; Hall, 2011; Pike and Pollard, 2010), but for our purposes, we modify French et al.'s (2011) more Foucauldian definition of financialization as "the processes and particular effects of the growing power of financial values and technologies" (p. 779) on individuals, households, *and groups*. Are there limits to the creation of these new financial subjectivities? We have argued that group practices shape the contours of MFS, rather than simply the other way around. Perhaps more significantly, Bernards (2019a) has shown that the purchasing power of the global poor is limited by the informalization of labor, which constrains the success of FinTech's search for market expansion, the international agenda of financial inclusion, and ultimately we think, the limits of a new financial governmentality.

A third and related theoretical question is whether the rise of MFS represents the continuation of neoliberal colonialism (e.g. Manzo and Padfield, 2016; Postero, 2013) or whether (in the case of SSA) an indigenous and uneven 'AfricaCapitalism' has emerged (see e.g. Ouma, 2017: 504). Rather than assuming the economic power of northern-owned telecommunications and financial actors and asymmetrical power relations between the global north and south, indigenous elites and local politics also have important impacts on MFS landscapes. For example, in 2017, the political opposition in Kenya called for a boycott of Safaricom, and the company lost market share not to a northern-owned company but to Indian-owned Bharti-Airtel Kenya (*Reuters*, 2019).

The fourth question concerns the consequences of MFS for financial inclusion and poverty reduction, and thus development theory more broadly. Given the available evidence

(and methodological problems aside), financial inclusion *as defined by the World Bank* has increased in the global south. Whether this contributes to poverty reduction (the benefits of ‘last mover advantage’) in regions as diverse as western Tanzania or China, or whether it will exacerbate social/racial, international, or intra-national inequality, and ultimately calcify poverty in the global south, probably requires longer term studies to discern.

Conclusions

In this paper, we identified the ways in which the academic and grey literature has examined FinTech. What is particularly novel about FinTech is its use of AI, digital re-intermediation, the proliferation of blockchains, and mobile technologies. We framed our analysis through the ‘FinTech Cube’, to avoid technological determinism, and to underscore how FinTech unfolds through the intersections of technologies, actors (including consumers), institutions, and financial products and services.

We focused on two research themes in which FinTech matters for economic geography: global production and financial networks, and financial inclusion and poverty reduction in poorer countries. First, the operations of GPNs and GFNs need considerable re-thinking in light of FinTech. Who counts as a financial actor is changing as the boundary becomes blurred between technology firms and financial institutions in the provision of financial services. Data expertise and digital infrastructures are also enabling some manufacturing firms to develop new financial offerings while facilitating the crossover of some technology firms into retail and distribution markets, with growing power to reshape supplier relationships and broader production networks. These firms have common advantages and assets in data technologies and platform organization, enabling them to extract value from user data and the intermediation process in order to generate new products and services. Over time, could we perhaps consider a shift from GPNs as a form of capitalist organization and accumulation towards global production *platforms*, in which user-generated data, algorithmic framings of risks and markets, and digital intermediation become not only a key source of revenue but also significant modes of control of production and consumption? Such a substantive debate is beyond the current scope of this paper, but some scholars are starting to engage with the concept of platforms and consider their theoretical implications for issues of value, rent, modes of accumulation and governance (Haberly et al., 2019; Sadowski, 2020; Zook and Blankenship, 2018), which will shape scholarly thinking on the spatial organization and uneven outcomes of economic activities. Research on the growth and development of IFCs also needs to consider more seriously the locational decisions of

FinTech firms and institutions, how they intersect with networks of knowledge and clusters of innovation, and the forms of capital, regulatory and organizational structures that are integral to the evolution of IFCs. Instead of just focusing on financial centers and offshore jurisdictions in GFNs, a geographical analysis of FinTech needs to incorporate the broader economic system supporting innovation and start-ups (Haberly et al., 2019). These would include policies and key infrastructure (e.g. knowledge networks, IT systems and the built environment) for supporting technological innovation, the development of technology-based labor markets (not only relating to banking and finance), and the availability of venture capital and private equity (Pan et al., 2016).

In terms of financial inclusion and poverty reduction in poorer countries, the available empirical evidence on MFS seems to suggest more rather than less financial inclusion, at least as defined and measured by such institutions as the World Bank. There is also evidence to suggest that this leads to poverty reduction. However, equally compelling studies (see especially Bateman *et al*, 2019) raise piercing questions about empirical omissions and flawed methodologies, which render the empirical evidence suspect. What might be at stake from these findings for future empirical research and theory in economic geography? In terms of the former, spatially sensitive, critical scholars might contribute to future research by moving beyond methodological nationalism to develop new spatialities for exploring financial inclusion and poverty reduction, while attending to (emergent) intersectionalities with respect to the consequences of MFS, including but not limited to, new forms of fraud, indebtedness and personal and commercial bankruptcies. Theoretically, the study of MFS in terms of financial inclusion and poverty reduction opens up new questions about the relationship between digitalization and financialization; about (the limits of) a new and putatively hegemonic financial governmentality; whether MFS reflect an on-going neoliberal colonialism or a nascent (but contested) ‘AfricaCapitalism’ in the case of sub-Saharan Africa specifically; and lastly, whether MFS will ultimately contribute to more (or less) financial inclusion and poverty reduction in poorer countries.

While this paper has generally taken FinTech as ‘working’ on its own terms in the context of global production and financial networks and development issues, FinTech does not always fulfil its own claims (such as delivering financial services cheaply when and where they are needed) and research into FinTech failures are just as important as studying their success and limitations. Other than the potential impacts of FinTech mediated financial inclusion/exclusion, recent IPO flops such as from Uber, Latitude Financial and WeWork, and the 2018 cryptocurrencies crash raise important theoretical questions regarding crises of

overaccumulation, finance and the ‘real’ economy, the limitations of algorithmic governance, and the operations of code/space in economy and society (Zook and Blankenship, 2018). While our paper has focused on financial inclusion in the global south (noting complex relationships with global north finance and technology firms and institutions), issues of inequality and indebtedness through FinTech are also important in the global north. Indeed, research into the digital transformation of rental housing market as a new asset class in the USA (Fields, 2019) and the platform lending in the UK and USA (Anderson et al., 2020; Clarke, 2019) demonstrate the importance of new and reconfigured geographies of FinTech-enabled financial inclusion/exclusion that is not limited to poorer countries.

Likewise, FinTech is too important to be left to economic geography, and there is already work afoot in other areas of human geography and cognate social sciences, such as the growing engagement with FinTech in urban studies (especially related to the smart cities literature) and in labor geography (with particular concerns about the ‘gig economy’). Nonetheless, we hope that our focus on the economic geographies of FinTech, opens up new avenues for critically engaged and spatially aware research in economic geography, if not beyond.

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Figure 1. The FinTech Cube with intersecting dimensions of financial services, technologies and institutions (Based on: Gomber et al., 2017: 542)

