Impact of Digital Finance on Financial Inclusion and Stability

Peterson Kitakogelu Ozili

University of Essex

8 January 2018

Impact of Digital Finance on Financial Inclusion and Stability

Peterson K Ozili

2018

Abstract

This article provides a discussion on some issues associated with digital finance – an area which has not been critically addressed in the literature. Digital finance and financial inclusion has several benefits to financial services users, digital finance providers, governments and the economy; notwithstanding, a number of issues still persist which if addressed can make digital finance work better for individuals, businesses and governments. The digital finance issues discussed in this article are relevant for the on-going debate and country-level projects directed at greater financial inclusion via digital finance in developing and emerging economies.

Keywords: Financial Inclusion, Fintech, Digital Finance, Financial Stability, Financial Risk, Financial Institutions

1. Introduction

This study examines the impact of digital finance for financial inclusion and financial system stability. Focussing on digital finance, this article provides a discussion on digital finance and explores the impact of digital finance for financial inclusion and financial system stability - an issue which has not been addressed in the literature. At a conceptual level, the discussions also address the benefits and risks of digital finance, digital financial inclusion and financial inclusion.

Since 2010, the G-20 and the World Bank have led the initiative for increased financial inclusion in developing countries to help reduce poverty levels in developing and emerging economies (GPFI, 2010). Today, the relevance of digital finance and financial inclusion for poverty reduction and economic growth is attracting the attention of policy makers and academics, largely because of the number of issues that persist which if addressed can make digital finance work better for individuals, businesses, governments and the economy. Digital finance and financial inclusion have several benefits to financial services users, digital finance providers, governments and the economy such as increasing access to finance among poor individuals, reducing the cost of financial intermediation for banks and Fintech providers, and increasing aggregate expenditure for governments.

Notwithstanding its benefits, digital finance and financial inclusion have not adequately permeated vast segments of the population (G20 Summit, 2013), which suggests an existing gap between the availability of finance, its accessibility and use. One area where the disparity is quite pervasive and is receiving increased attention particularly among Fintech providers is digital financial inclusion, financial data inclusion and digital finance. The relationship between these, and the issues they pose for financial inclusion have received very little attention in the literature. Also, Fintech providers can promote economic growth during good economic times by increasing the volume of financial transactions in the financial system, although, it is still unknown whether Fintech providers and their activities can exacerbate economic crises during bad economic times. This issue is also discussed in this article.

The discussion in this article contributes to the on-going debate led by the World Bank in support of financial inclusion as an effective solution for poverty reduction in developing and poverty-stricken countries. Insights from this article can provide national and global policy makers with an understanding of the issues associated with the rapid development of digital financial services, its delivery to the poor and the risks involved in digital financial inclusion. Two, for academics and researchers, the discussion in this article adds to the emerging financial inclusion literature that attempt to proffer solutions to achieve sustainable financial inclusion particularly in poor economies. The ideas in this article calls for more collaborative research to better understand the relationship

between digital finance, financial inclusion and digital financial inclusion as well as the risks and alternative models and perspectives in this area. The discussion in this article also contributes to the few and emerging studies that examine the role of financial innovation for banking and financial system stability. Insights from this article can improve our understanding of the functions of Fintech companies, and can also help regulators understand the link between Fintech, financial inclusion and financial system stability.

The remainder of the article is structured as follows. Section 2 presents the conceptual framework or foundations for digital finance, Fintech and financial inclusion. Section 3 discusses the issues associated with digital finance. Section 4 provides the summary of the pros and cons of digital finance. Section 5 concludes.

2. Foundations

2.1. Digital Finance: Concept and Benefits

2.1.1. Concept

From a practitioner's viewpoint, digital finance is financial services delivered through mobile phones, personal computers, the internet or cards linked to a reliable digital payment system. Similarly, a McKinsey report identify digital finance as "financial services delivered via mobile phones, the internet or cards" (see Manyika et al, 2016: p.4). According to Gomber et al (2017), digital finance encompasses a magnitude of new financial products, financial businesses, finance-related software, and novel forms of customer communication and interaction - delivered by FinTech companies and innovative financial service providers. While there is no standard definition of digital finance, there is some consensus that digital finance encompasses all products, services, technology and/or infrastructure that enable individuals and companies to have access to payments, savings, and credit facilities via the internet (online) without the need to visit a bank branch or without dealing directly with the financial service provider. In Europe, the internet has emerged as a widely recognised distribution channel for the banking industry, and all traditional banks as well as new players, are discovering its effectiveness compared with other channels (Barbesino, Camerani and Gaudino, 2005).

The goal of financial services made available via digital platforms is to contribute to poverty reduction and to contribute to the financial inclusion objectives of developing economies (United Nations, 2016). Ideally, there are three key components of any digital financial service: a digital

transactional platform, retail agents, and the use by customers and agents of a device – most commonly a mobile phone – to transact via the digital platform (CGAP, 2015). To use digital financial services (DFS), the DFS user will have an existing bank account which they own (or third-party accounts with approved permission to use them) and should have available funds (or overdraft) in their accounts to make cash payments (outflows) or to receive revenue (cash inflow) via digital platforms including mobile devices, personal computers or the internet.

2.1.2. Benefits

Digital finance has some benefits. For instance, digital finance can lead to greater financial inclusion, expansion of financial services to non-financial sectors, and the expansion of basic services to individuals since nearly 50% of people in the developing world already own a mobile phone (World Bank, 2014).

Two, digital finance has the potential to provide affordable, convenient and secure banking service to poor individuals in developing countries (CGAP). Recent improvement in the accessibility and affordability of digital financial services around the world can help millions of poor customers move from cash-based transactions to formal digital financial transactions on secured digital platforms (CGAP).

Three, digital finance promises to boost the gross domestic product (GDP) of digitalised economies by providing convenient access to diverse range of financial products and services (and credit facilities) for individuals as well as small, medium and large businesses, which can boost aggregate expenditure thereby improving GDP levels. Digital finance can also lead to greater economic stability and increased financial intermediation, both for customers and for the economy where they and their families reside.

Four, innovation in digital finance can have long-term positive effects for banking performance. Scott, Van Reenen and Zachariadis (2017) examine the impact on bank performance of the adoption of SWIFT, a network-based technological infrastructure and set of standards for worldwide interbank telecommunication. They examine 6848 banks in 29 countries in Europe and the U.S. They Find that the adoption of SWIFT (i) has large effects on profitability in the long-term; (ii) these profitability effects are greater for small banks than for large banks; and (iii) exhibits significant network effects on performance.

Five, digital finance also benefits governments by providing a platform to facilitate increase in aggregate expenditure which subsequently generates higher tax revenue arising from increase in the volume of financial transactions (Manyika et al, 2016). Six, digital finance has benefits to financial

and monetary system regulators because full-scale digital finance adoption can significantly reduce the circulation of bad (or fake) money, etc. Other benefits of digital finance to customers includes greater control of customers' personal finance, quick financial decision making, and the ability to make and receive payments within seconds.

In conclusion, digital finance should improve the welfare of individuals and businesses that have formal bank accounts and have funds in their bank accounts to complete multiple financial transactions. However, the expected benefits of digital finance can only be fully realised if the cost of providing digital financial services is negligible or zero.

2.2. Digital Financial Inclusion: Concept and Benefits

2.2.1. Concept

The CGAP defines digital financial inclusion as "digital access to, and the use of, formal financial services by the excluded and underserved population" (CGAP, 2015). Currently, innovative digital financial services via mobile phones and similar devices have been launched in at least 80 countries (GSMA, 2014), to encourage millions of poor customers to exclusively use digital financial services rather than cash-based transactions.

The process of digital financial inclusion begins with the assumption that the excluded and/or underserved population have some sort of formal bank accounts and need digital access to enable them to carry out basic financial transactions remotely. If the excluded and underserved population understand and can be persuaded about the intended benefits of digital financial inclusion, an effective digital financial inclusion program should be suited to meet needs of the excluded and underserved population and should be delivered responsibly at a cost that is sustainable to providers and affordable to customers.

2.2.2. Benefits

Digital financial inclusion has some benefits. Digital financial inclusion promises to help banks lower costs by reducing queuing lines in banking halls, reduce manual paperwork and documentation and to maintain fewer bank branches (IFC, 2017; Manyika et al, 2016). With digital financial inclusion, large number of depositors can easily switch banks within minutes; forcing banks to provide quality services or risk losing depositors to rival banks. For financial and monetary system regulators, digital financial inclusion also helps to reduce the amount of physical cash in circulation and is instrumental in reducing high inflation levels in developing and poor countries (GPFI, 2016). Digital financial inclusion can improve the welfare of individuals and businesses that have a reliable digital platform with which to access funds in their bank accounts to carry out financial transactions (CGAP, 2015).

The expected benefits of digital financial inclusion can be fully realised if the cost of obtaining a digital transactional platform by poor individuals is negligible or low, where a digital transactional platform refers to mobile phones, personal computers and related devices.

2.3. Financial Inclusion: Concept and Benefits

2.3.1. Concept

According to a United Nations Report, financial inclusion is the sustainable provision of affordable financial services that bring the poor into the formal economy (United Nations, 2016). Financial inclusion may also be defined as the use of formal financial services by the poor (Beck, Demirgüc-Kunt & Levine, 2007; Bruhn and Love, 2014). Financial inclusion involves increasing the number of (mostly poor) individuals that have access to formal financial services mainly through having formal bank accounts, which contributes to poverty reduction and economic growth. With greater financial inclusion, individuals who were previously financially excluded will be able to invest in education, save and launch businesses, and this contributes to poverty reduction and economic growth (Beck, Demirgüc-Kunt, and Levine, 2007; Bruhn and Love, 2014). An inclusive financial system should provide opportunities for all people, particularly the poor, to access and move funds, grow capital, and reduce risk.

2.3.2. Benefits

Financial inclusion has several benefits for poor households. It provides low-income individuals with the possibility to save for the future which fosters stability in personal finance, and a high level of use of bank deposits which contributes to securing a more stable deposit base for banks distressed times (Han and Melecky, 2013). Greater financial inclusion can also provide poor households with opportunities to build savings, make investments and access credit (Ellis, Lemma, and Rud 2010). Financial inclusion also enables them to handle income shocks over unforeseen emergencies such as illness or loss of employment (Collins et al., 2009). Also, financial inclusion has positive effects for financial stability by reducing procyclicality risk; a substantial increase in the number of small savers via greater financial inclusion would increase both the size and stability of the deposit base of banks which would reduce banks' dependence on "non-core" financing, which tend to be more volatile during a crisis (Khan, 2011), thus improving banking system stability. Also, low-income groups are relatively immune to fluctuation in economic cycles and including them in the financial sector will improve the stability of the deposit and loan bases in the financial system. Hannig and Jansen (2010) show that financial institutions catering to the lower end individuals tend to survive through macro-crises well and help sustain local economic activity. Additionally, Prasad (2010) also observes that

the lack of adequate access to credit for small and medium-size enterprises and small-scale entrepreneurs has adverse effects on overall employment growth since these enterprises tend to be much more labour intensive in their operations. Also, greater levels of financial inclusion can facilitate increased participation by different sectors of the economy in the formal financial system because, as the share of the formal financial sector increases, it strengthens the case for the use of interest rate as a key policy tool for macroeconomic stability, which has positive effects for economic growth (Cecchetti and Kharroubi, 2012). According to Dev (2006), financial inclusion can be viewed both as a business opportunity and social responsibility when self-help group movements and microfinance institutions participate in inclusion programs, because these two agents are important to improve financial inclusion.

2.4. Fintech Providers: Concept and Benefits

2.4.1. Concept

The term 'Fintech' denotes 'financial technology' and is defined as the delivery of financial and banking services through modern technological innovation led by computer programs and algorithms. A Fintech provider, on the other hand, is defined as an individual or company that uses a technology platform, whether online or offline, to provide new financial services or to improve the delivery of existing financial services. Ideally, a provider would qualify to be termed a Fintech provider if it uses technology (whether online or offline) to provide, or to improve, the delivery of financial services such that the number of hurdles between requesting for a financial service and receiving the financial service is significantly reduced for users of financial services. However, and in practice, the technology adopted by some self-identifying Fintech providers do not significantly reduce the hurdles that customers must go through between requesting for a financial service and receiving the financial service, which then cast doubts on whether these individuals or companies should be termed 'Fintech', and the debate about whether to de-classify such companies as 'Fintech' is still on-going in some countries.

Fintech companies play an important role in the digital finance economy. Fintech providers are emerging in the financial services sector to either compete with banks or to complement the functions of banks to their customers. In the real world, some Fintech companies provide financial services at a higher cost while the cost of obtaining financial services from banks is relatively lower but the lengthy process of waiting to obtain a loan from regulated banks is making customers turn away from bank providers to non-bank providers. For instance, a customer that walks into a bank on Monday requesting for £70,000 loan is not likely to obtain the full loan amount requested for on Monday, and this phenomenon is attributed to the fact that bank regulators and banks' internal risk

management procedures require banks to spend a considerable amount of time to assess whether an individual qualify to receive a loan or not.

Despite the high cost of obtaining financial services from nonbank providers, individuals and companies with low and/or volatile income still prefer to use the services of non-bank providers, many of whom are not currently regulated in emerging countries and in most African countries. Finally, Fintech companies are diverse, and their diversity largely depends on available technology whether online or offline. Examples of Fintech businesses are those that engage in quick check-cashing services, payday lending, and related services. Finally, the activities of Fintech providers can have implications for financial inclusion and stability.

2.4.2. Benefits

There are benefits of doing business with Fintech providers. There are reasons why individuals would rely on Fintech providers even though federally insured banks can provide the same financial services to customers at lower costs than Fintech providers. One, Fintech providers can provide quicker financial services with a seamless process, making it easier for low income individuals to manage their financial obligations on a day to day basis.

Two, Fintech providers do not handle deposits like banks which implies that Fintech providers will face fewer regulations (or will be unregulated in some countries) and the low regulatory burden they face makes it easier for Fintech providers to focus on improving their financial technology and intermediation function while reducing, where possible, to serve customers better.

Three, Fintech providers can partner with traditional lending institutions which can help them reduce operational costs and improve the quality of their intermediation activities. Partnering with traditional lending institutions can help Fintech providers become sustainable over time, while the financial technology of Fintech providers can add value to the activities of the traditional lending institutions they partner with, particularly in ‘process improvement’ for their online lending business.

Four, some Fintech providers have superior ability to provide instant emergency funds or loans in small amounts to individuals with low and poor incomes compared to banks and other lending institutions. This is because conventional banks and other lending institutions are not obliged to provide emergency funds to anyone, and any request for emergency funding at a conventional bank or lending institution must go through the usual credit risk assessment processes which may be too lengthy for individuals that need instant emergency funds. This puts some Fintech providers in a

better position to provide emergency funds in small amounts at higher interest rates to individuals with middle and low incomes.

Five, there is the potential for technology to provide convenience. Fintech providers that operate via online platforms can electronically provide increased convenience to users by providing access to such services and making it available always from any location where the user or consumer can access the Internet. This enables Fintech providers to help customers to avoid having to travel to a banking hall to undertake financial transactions.

3. Some Issues

3.1. Digital Finance and Financial Inclusion

3.1.1. Positive Relationship

The theoretical underpinning for the relationship between digital finance and financial inclusion begins with the premise that a large amount of the excluded population owns (or have) a mobile phone, and that the provision of financial services via mobile phones and related devices can improve access to finance for the excluded population (World Bank, 2016). Provided that the excluded population have a mobile phone and affordable internet connectivity, greater supply of digital finance is often predicted to have positive effects for financial inclusion, all other things being equal; implying a positive correlation between the use of digital finance and access to formal financial services.

The positive effects of digital finance for financial inclusion are varied. Greater digital finance when applied to the lives of low-income and poor people can improve their access to basic services, thereby leading to greater financial inclusion in rural areas. Two, greater digital financial services channelled to rural and poor communities can improve access to finance for bank customers in rural and poor communities who cannot conveniently access banks located in the formal sector due to poor transportation networks and long queuing hours in banking halls, and will reduce bank customers' presence in bank branches and reduce cost because bank would cost-efficiently maintain fewer branches, and the lower costs would have positive effects for bank profitability and financial inclusion in rural and poor communities. Three, easy-to-use digital finance can provide a more convenient platform for individuals to carry out basic financial transactions including payments for electricity, water supply, money transfer to family and friends etc. If digital finance platforms are easy-to-use, users of digital financial services can help inform and persuade their peers in the formal

and informal (rural) sector to take advantage of digital financial services, leading to greater number of individuals using digital finance thereby leading to greater financial inclusion. One caveat worth-noting here is that while there may be a positive relationship between easy-to-use digital finance and financial inclusion, it is needful to stress that the implied positive relationship is stronger for high-and-middle income users of digital finance while the relationship may be non-linear or negative for low-income and poor users of digital finance because digital finance users in indigenous and poor communities despite persuasion can refuse to use digital finance services due to (i) superstitious and religious beliefs they have about technological advancements and innovation, or (ii) unaffordable fees charged by digital financial services providers, or (iii) financial illiteracy and (iv) other reasons.

3.1.2. Negative Effect

On the other hand, digital finance can have negative effects for financial inclusion. Providers of digital finance services are profit-seeking corporations that use digital finance to maximise their profitability or to maximise the profitable opportunities of businesses affiliated with digital finance providers namely banks, financial and non-financial institutions. Corporate providers of digital finance services can discriminately use a more aggressive marketing tactic to persuade high-and-middle income customers to use a new or existing digital finance platform or infrastructure and use a less-aggressive marketing tactic to persuade low-income and poor customers to use new or existing digital platforms or infrastructure if they believe the latter cannot afford the associated fees, thereby leading to lower financial inclusion for poor and low-income customers since the net monetary pay-off to digital finance providers is higher with high-and-middle income customers than with low-income and poor customers.

Two, bias in the provision of digital finance can be geographical because digital finance providers, based on their own internal risk assessment which may change from time to time, can choose to withdraw or discontinue the provision of specific digital finance services to high-risk rural areas or communities that do not have the supporting infrastructure to sustain specific digital finance services, thereby leading to lower financial inclusion. Some supporting infrastructure needed to make DFS work efficiently may include mobile phones that have modern (and up-to-date) operating software systems and applications that support digital finance services.

Three, educational bias can be introduced in the provision of digital financial services. If the net monetary value of providing digital finance to poor communities is very negligible, digital finance providers, based on their profitability assessment, can choose to focus less on the delivery of digital finance to poor and uneducated communities that do not have the basic financial literacy to use and understand digital finance.

3.1.3. Two-Way Causality

Moreover, there is a two-way causality between financial inclusion and digital finance. In other words, does increase in digital finance lead to greater (or lower) financial inclusion? Or, does greater financial inclusion lead to greater digital finance?

On one hand, greater digital finance can lead to greater financial inclusion if high, middle and low-income users of digital financial services are able to persuade their family and friends in poor communities (and in the informal sector) to open a bank account and to use digital finance for their convenience. This kind of testimonial (and personal) persuasion works better in communities where there are cultural or religious beliefs that are hostile towards embracing technology in finance. Individuals in the informal sector and in poor communities often do not trust bankers or bank marketers who come to their homes to persuade them to use digital finance services, rather they are more likely to trust the recommendation they receive from friends and family members who are already users of digital finance platforms. Upon persuasion, such excluded individuals will open a formal bank account to take advantage of digital financial services. When this is the case, greater digital finance will lead to greater financial inclusion.

On the other hand, financial inclusion can lead to greater digital finance usage, because greater financial inclusion would increase a bank account holder's awareness of new and existing digital finance platforms which they can use for their own convenience. Greater financial inclusion can lead to greater digital finance if increasing the number of poor or low-income individuals that have a saving or checking account at a formal banking institution makes it easier for banks to inform or persuade new and existing accountholders about available digital finance products and services which they can use for their own convenience. When this is the case, greater financial inclusion (proxy by increase in number of bank account holders) will lead to greater usage of digital finance.

3.2. Financial Data Inclusion Is Not the Same as Financial Inclusion

3.2.1. A Framework

Financial inclusion is one strategy to eliminate or reduce poverty, but it is not the only strategy. Other strategies to tackle poverty include direct government intervention through the provision of welfare benefits and unemployment benefits; or through direct or indirect intervention by foreign governments, generous aids by philanthropists and charity organisations, among others. Poverty reduction via greater financial inclusion can be led by the public sector or the private sector or via joint coordination by the private and public sector.

The private sector offers digital finance as a solution for greater financial inclusion. Private sector players such as Fintech and financial services companies can offer digital finance products and services to the poor and excluded population, to encourage them to participate in the formal financial sector via digital channels from their mobile phones. If the excluded population have digital banking credentials (such as online banking login password and other forms of digital access credentials), they can link their bank accounts to digital payment channels to perform basic financial transactions. Moreover, if the cost for access to digital finance is cheap, low-income and poor individuals will participate in the digital financial system, thereby having positive effects for financial inclusion.

Figure 1. Framework to illustrate the role of government, FinTech, and banks in digital finance and financial inclusion.

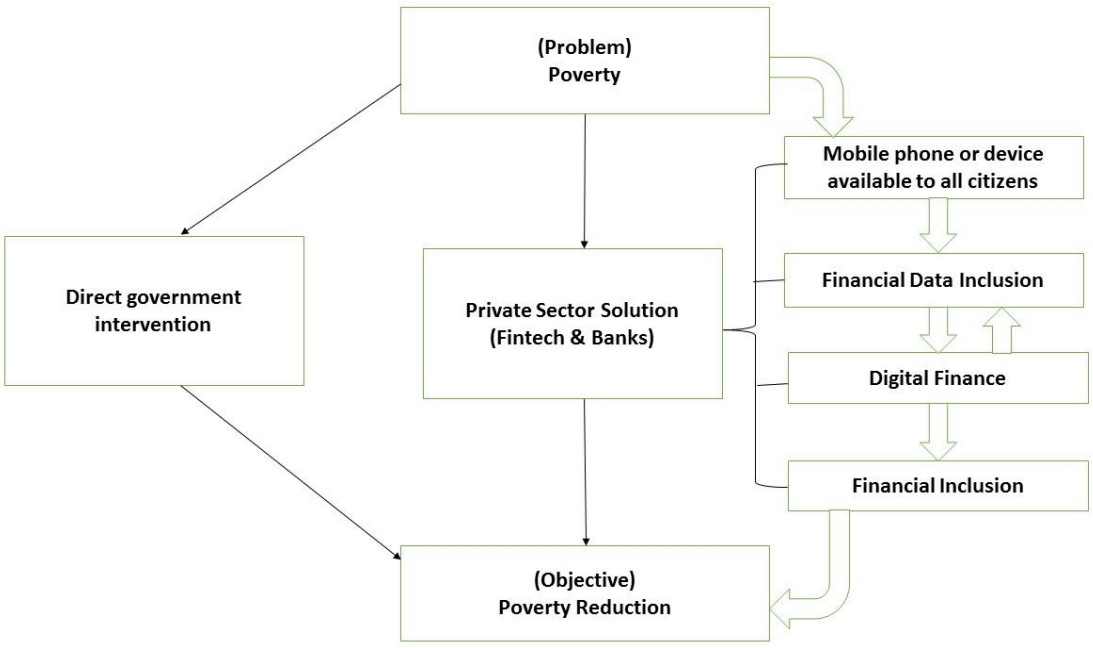

Figure 1 Source: Author – the Ozili Framework of Financial Inclusion

Figure 1 shows the important role that the government, FinTech, and banks play in financial inclusion and poverty reduction. While there is no clear-cut theoretical framework underlying the distinction between financial data inclusion and financial inclusion, the idea underlying the differentiation of financial data inclusion and financial inclusion in Figure 1 is that full-scale financial data inclusion is needed for digital finance to achieve its full potential to achieve financial inclusion.

Financial data inclusion involves merging the entire population's biometric information to their bank accounts while financial inclusion on the other hand involves increasing the number of (mostly poor) individuals that have access to formal financial services mainly via having formal bank accounts. Financial data inclusion is easier to achieve than financial inclusion, from a policy perspective. Merging individuals' biometric information to their bank accounts can achieve two objectives: it permits financial transactions via digital channels that can be verified and traced to individuals or firms, and it can help to monitor the income and demographic characteristics of users of digital financial services.

If the excluded population are willing to actively participate in financial data inclusion by obtaining online banking login and other forms of digital access credentials, they will be able to use digital channels to carry out basic financial services, thereby leading to greater financial inclusion. If the excluded population do not wish to participate in financial data inclusion by refusing to have online banking login or other forms of digital access credentials, they will not be able to use digital channels to carry out basic financial services, thereby reducing financial inclusion. In this sense, full-scale financial data inclusion and the willingness of the population to participate in the digital space is essential for digital finance to achieve greater financial inclusion.

3.2.2. Criticism

The World Bank holds the view that greater use of digital finance contributes to greater financial inclusion. However, in practice, greater use of digital finance may not lead to greater financial inclusion but rather can lead to greater financial data inclusion (ITU, 2016; Malady, 2016; ADB, 2016), bearing in mind that financial data inclusion is not the same as financial inclusion. Financial data inclusion involves merging individuals' biometric information to their bank accounts to permit financial transactions that can be verified and traced to the individual or firm while financial inclusion on the other hand involves increasing the number of (mostly poor) individuals that have access to formal financial services mainly via having formal bank accounts.

The ITU (2016) Focus Group report show that despite the benefits of digital financial services many countries in the developing world still face considerable challenges in attaining merchant acceptance of digital payments. Small businesses in urban and rural areas in the developing world do not accept digital payments due to high bank fees and high set-up costs, and consequently, poor individuals that have digital banking credentials are not able to make payments for services from businesses that do not accept digital payments. In these situations, the increase in financial data inclusion does not improve financial inclusion if poor individuals participate in the digital system but cannot make

payments for basic expenses from nearby small businesses who find it too costly to use digital payment devices such as point-of-sale (POS) devices in developing countries.

Moreover, Malady (2016) also argue that although consumers may have digital banking credentials to access the digital financial system, consumers in many emerging markets are not active users of the digital channels due to lack of consumer trust and confidence in the new channels. The lack of trust in digital finance channels by customers has negative effect for a digital-finance-led financial inclusion program in emerging and developing countries, and this problem is greater in countries that lack strong consumer protection institutions and frameworks. The implication is that having greater financial data inclusion (or having digital banking credentials) does not necessarily improve access to finance for poor individuals if individuals do not trust digital channels.

ADB (2016) show that the low level of financial literacy and low awareness of digital finance channels can reduce customers' patronage of digital financial channels to perform basic financial platforms. The implication is that individuals with low income and those who are worried about the state of their personal finance will have little incentive to use digital channels which (i) they do not understand, (ii) do not have the financial literacy to understand how it works, (iii) and if they are unaware of existing digital finance infrastructure.

Overall, an unintended consequence of a digital-finance-led financial inclusion program is that it can lead to greater financial data inclusion but not increase financial inclusion.

3.2.3. Regulatory Concern / Data Security

Regulators and customers both have concerns about data security. The wide use of digital technologies has increased the pervasiveness and scale of cyber-attacks that pose significant threat to the security and privacy of customers' data on digital channels; and regulators' awareness of cyber risks could prompt regulators to rethink the trade-off between efficiency and security in financial services (Caruana, 2016). Furthermore, the cost of securing customers' data on digital finance channels can exceed the cost of offering digital financial services and can have serious implications for the efficiency and profitability of for-profit digital finance providers, and this further poses a major challenge to regulators on the trade-off between efficiency and security for-profit digital finance providers.

Similarly, customers' awareness that their data is prone to cyber-attacks can make customers loose trust in digital channels, or they may avoid using digital channels to perform important financial transactions until strong customer protection frameworks are in place. The existence of strong consumer protection frameworks which apply to digital financial services will be critical in building

the necessary trust and confidence that customers need (Malady, 2016), and this can also help reduce the level of voluntary financial exclusion - the excluded population who do not want to participate in digital finance because they have ex-post data security concerns. Also, financial and banking reforms can help provide better, secure and innovative digital finance to users. Shaikh, Glavee-Geo and Karjaluoto (2017) find some link between the financial and banking sector reforms and the stimulation of financial innovation; the promotion of digital banking culture; and the infusion of financial inclusion in Pakistan. Therefore, emerging digital financial services (DFS) regulations should address the efficiency issues associated with DFS security which DFS providers want, and the data security concerns that customers have.

3.3. Forced Financial Inclusion

The expected benefits of financial inclusion and digital finance have led the government of several developed countries via their financial system regulator to use ultimatums to compel individuals, businesses and bank account holders to use digital financial services; and they do this by setting limits on daily cash withdrawals, charging high fees for cash withdrawals beyond a certain amount, etc.

Compelling individuals, businesses and bank account holders to go 'digital' may improve the welfare of bank account holders but not the welfare of individuals without a formal bank account (i.e., the unbanked population), which justify concerns that digital finance does not necessarily lead to greater financial inclusion but can rather lead to greater financial data inclusion, and bearing in mind that, financial data inclusion is not the same as financial inclusion. Financial data inclusion involves merging individuals' biometric information to their bank account so that all financial transactions can be traced to individuals, while financial inclusion involves increasing the number of (mostly poor) individuals that have access to formal financial services.

While financial system regulators can use their legal powers to force financial inclusion on the population, the consequence of such action is that the population may register on a digital finance platform but may refuse to use it to perform basic transactions, which then creates a new problem for digital finance providers that hope to make profit from large volumes of financial transaction via digital Fintech platforms. Moreover, smart individuals and businesses can suspect that there are ulterior motives behind "forced inclusion" because they know that inclusion should be voluntary. It is still unknown whether forced inclusion will be effective. Assuming forced financial inclusion can be imposed on the 'banked' population by enforcing financial ultimatums, the enforcer will sooner to later realise that ultimatums only works for the population that have formal bank accounts, not for

the unbanked population. What about the unbanked population that do not have formal bank accounts, and those outside the formal banking system?

3.4. The 'Voluntary Financial Exclusion' Problem

Another reason why the poor are excluded from the formal financial system in some developing countries is the problem of voluntary financial exclusion. Some poor individuals in the unbanked population may voluntarily refuse to participate in the formal financial system either because (i) they voluntarily do not want to deal directly with banks or internet companies, or (ii) their lack of awareness of the benefits of digital financial services, or (iii) they do not have a good credit score to obtain a loan or credit facilities at low interest rate from banks and credit institutions in the formal financial sector, or (iv) their lack of education about how to use digital finance platforms and their lack of education about the benefits and risks of digital finance services; these individuals will not use a system, product or service they do not understand. Whichever is the case, financial system regulators in developing countries need to find ways to solve the 'voluntary financial exclusion' problem. Voluntary financial exclusion occurs when poor individuals voluntarily do not want to participate in the formal sector even though they are aware of the economic benefits and convenience it brings to them.

In developed economies, voluntary financial exclusion often manifests as voluntary digital financial exclusion – the unwillingness or reluctance to use online, fintech, plastic or virtual cards to perform basic financial transactions, towards a preference for cash transactions due to people's strong affinity to have "cash-in-hand" always. In the UK, for instance, many individuals in previous years did not extensively use online Fintech platforms or bank cards for basic transactions but rather prefer to use their available cash to physically make payments for whatever they want. A British Retail Consortium annual payment survey show that the average transaction value of a cash purchase in the UK grew to £9.87 ($13.32) in 2016, up from £9.21 in 2015; although 2016 was the first year for which the share of debit card purchases (42.6%) narrowly surpassed cash (42.3%) for all retail transactions in the UK (BRC, 2017). In the US, the U.S. Consumer Payments Outlook Through 2020 study show that 79 percent of consumers made monthly cash payments despite the wide range of plastic cards and virtual alternatives in 2016. (TSYS, 2016; Research and Markets, 2017).

Several factors contribute to voluntary financial exclusion such as religion, culture and lifestyle. The voluntary financial exclusion problem can be greater in religious countries where religious teachings discourage followers from adapting to technological changes in their environment. In some countries, the voluntary financial exclusion problem may be caused by strong culture. Some communities have cultural values that promote the circulation of money only among members of

the community and impose heavy penalties on individuals that send money outside the community through banks and related financial providers since banks collects funds and redistribute them to heterogenous borrowers. Individuals in such communities will have little or no incentive to participate in the formal financial system via banks due to strong cultural and communal ties they have with members of their own community. Similarly, certain lifestyle choices and habits can make individuals unwilling to participate in the formal financial system.

In other countries, voluntary financial exclusion may be caused by existing market failures, structural and nonmarket barriers that prevent access to a wide range of financial services in the country. As individuals and existing customers become aware of the structural, non-market and market barriers that prevent them from using digital finance to their own advantage, they can voluntarily choose not to participate in digital-led or non-digital financial inclusion programs.

Finally, the voluntary financial (or digital financial) exclusion problem can be greater in countries that experience frequent banking crises, and in countries that experience frequent incidence of economic and financial fraud, particularly online fraud. When poor individuals lack trust in the stability of the financial system, they will have little incentive to participate in the formal financial system, much less the digital financial system.

3.5. Differences in income level

Differences in income level can lead to disproportionate benefits of financial inclusion across the population. Recent studies such as Demirgüc-Kunt and Klapper (2013) investigate financial inclusion, defined as the use of formal financial services, in 148 countries using the 2011 data from the World Bank's Global Findex database. In addition to average statistics, they examine individual and country characteristics associated with three indicators of financial inclusion: ownership of a bank account, savings on a bank account, and use of bank credit. They show that differences in income across countries and among individuals within countries influence the level of financial inclusion. Moreover, individuals with high income and higher education levels tend to benefit more from greater financial inclusion. For instance, Allen, Demirgüc-Kunt, Klapper, and Peria (2016) in their study focus on factors that influence the choice to own a bank account and savings account focussing on individual and country characteristics across 123 countries. They show that higher income level and higher education is positively associated with greater financial inclusion. The implication from these studies is that poor, low-income and illiterate individuals do not benefit proportionately from financial inclusion, and this pose a serious problem.

3.6. Underestimation of Risk

The overwhelming benefits of digital finance for financial inclusion can lead to the underestimation of the risks associated with digital financial inclusion. Digital financial inclusion is criticised because it does not benefit individuals without a formal bank account. This includes individuals outside the formal financial services sector. Digital financial inclusion also does not benefit individuals that do not use digital devices for financial decisions or transactions.

Two, digital financial inclusion is more likely to benefit individuals in the urban sectors that have higher income than those in the rural sectors. In a study using household survey data for transition economies, Beck and Brown (2011) show that banking services and its digital platforms are more likely to be used by households in urban areas, and those with greater income and wealth. The implication is that individuals with relatively high income in urban areas have greater incentive to participate in the digital financial system since the fees charged for transactions would be negligible to them, however, such fees may be substantial to poor individuals in rural areas, thereby, reducing their incentive to use digital finance platforms. Moreover, even if the poor are included in the digital finance system, they may lack the incentive to use the digital platform to engage in financial transactions that have little monetary value due to their low income. For instance, a poor individual that need to buy cereals that cost 59pence would rather walk to the nearby shop to get the snack than to make an online purchase for a 59p snack.

Three, non-market barriers to competition is a risk that needs to be addressed (Ketterer, 2017). If digital finance can be provided to the poor profitably by for-profit providers, there is the risk that existing players in the digital finance space can use non-market actions to fight off any competitive threat from new-entrants seeking to enter the digital finance space. Banks and investment firms affiliated with existing Fintech businesses can refuse funding to new entrants to compel new entrants to merge with existing players or acquisitions, and this is a major reason why Fintech start-ups often rely on venture capital funding rather than bank loans at the early stage of their businesses. The implication of such non-market barrier is that poor individuals and customers will have fewer choices which can reduce their ability to access cheap funds across multiple digital finance providers.

Regulatory risk is also a major issue. It is difficult to develop a one-size-fit-all regulatory framework for digital finance to regulate all kinds of financial innovation in the online digital finance space. What we see in the real-world in recent years is the emergence of new and sophisticated Fintech businesses that use unconventional business models, and some of these models are designed in ways that help Fintech providers avoid all forms of banking and financial regulation. These unconventional business models will pose new challenges and risks to financial services regulators

which they need to address in a proper and timely fashion, as more and more Fintech firms continue to emerge.

Another risk to digital financial inclusion is the lack of good-quality and affordable digital connectivity (broadband access) available to most individuals and firms. This is often due to a deficient regulatory framework and insufficient infrastructure, which needs to be remedied (Ketterer, 2017). Quality and affordable access to digital connectivity is needed to ensure that poor and low-income individuals can have access to digital financial services from any location and at all time.

Unintended consequences should be anticipated and mitigated. There is the risk that digital financial inclusion if led by for-profit Fintech firms or traditional financial institutions may end up reshaping the financial services industry in ways that lead to outcomes opposite to the ones anticipated or wished for by agencies (World Bank and the CGAP) established to help reduce poverty foreseen (and wished for). For-profit banks and emerging Fintech providers are commonly considered to be efficient suppliers of digital financial services because of their technological superiority and their economies of scope and scale advantages; however, because these suppliers are mostly for-profit firms, there are concerns that for-profit firms can deliver digital financial services to the poor in ways that can create huge cost externalities which the government will have to fund particularly if the cost externalities become systemic. And this expectation can be understood from hindsight looking at the credit derivatives problem in 2008 – an instrument intended for risk-sharing which later led to outcomes that blew-up the global financial system. While the solution to this is not to advocate for digital finance delivery through not-for-profit firms or through government providers, there should be a robust regulatory system to monitor digital finance and its inclusion objectives to ensure that digital finance reshape the financial services industry and produce outcomes that were anticipated or wished for both by financial system regulators and the World Bank.

3.7. Agency Problem

Agency theory explains the principal-agent conflict that arises in the relationship between a principal and an agent in a business or economic activity due to unaligned goals of the principal and agent (Eisenhardt, 1989). In digital finance, the agency problem exists because of the profit maximisation objectives of for-profit DFS providers and the welfare maximisation objectives of DFS users. In the supply-side, private and public partnership in the provision of digital finance can play a crucial role to digitalise the economy of a country.

Private partnership in the provision of digital finance services is driven by profit maximisation incentives while public partnership in the provision of digital finance services is driven by welfare maximisation incentives, and this also gives rise to agency problems.

Digital finance providers can use their discretion to pursue strategies that enrich themselves at the expense of digital finance users by choosing to provide profit-maximising digital finance services rather than providing welfare-maximising digital finance services. Digital finance providers can make huge profits to increase their non-salary income for the services they offer. For instance, banks, non-bank financial institutions and Fintech firms (not the World Bank) are leading the push for digital financial inclusion in a bid to reach billions of new customers by offering digital financial services to the mobile (and digital) device of the excluded and underserved population in exchange for a fee.[1] This will raise questions about banks and Fintech providers profiting from the poor, and also raise questions about how digital finance can lead to greater financial inclusion for individuals outside the formal sector and for individuals who deliberately refuse to use digital devices for financial transactions.

However, the agency problem can be reduced if digital finance users are involved in the decision-making process regarding the kind of digital finance services they want and do not want. If digital finance users have the option to choose the kind of digital finance services they want and can easily switch between digital finance providers that do not offer the customized services they want, then the conflict of interest would shift from 'profit-maximising digital finance providers versus welfare-seeking digital finance users' and would shift towards 'competition among digital finance providers' collectively seeking to maximise the welfare of users at minimum cost. As the conflict of interest shift towards competition among digital finance providers, the top management of digital finance providers will have to make decisions, and take actions, that create better value for digital finance users. Moreover, digital finance users can also get better value for the provision of digital financial services if there are strong institutional and legal systems that protect customers from exploitation by digital finance providers. The presence of strong institutional and legal systems that protect digital customers can exert some monitoring to limit the ability of digital finance providers to pursue excessive self-interests aimed at maximising profit at the expense of digital finance users. Having such systems in place can lower the incentive of for-profit providers to seek massive profits from serving the poor and excluded population.

[1] Digital Financial Inclusion: Implications for Customers, Regulators, Supervisors, and Standard-Setting Bodies. CGAP Brief. Available at: https://www.cgap.org/sites/default/files/Brief-Digital-Financial-Inclusion-Feb-2015.pdf

3.8. Challenges of Fintech as a business model

One problem associated with Fintech platforms is that they often attract 'high-risk customers', that is, customers perceived to be highly risky by conventional banks. The credit score and/or credit risk assessment outcome of these customers makes them unlikely to receive loans from regulated conventional banks, which then makes Fintech providers the alternative lender that risky borrowers can resort to. Over time, excessive patronage of Fintech providers by large number of risky customers can threaten the stability of the financial intermediation process if massive defaults arise from such risky lending.

A second issue is that Fintech providers can help reduce the cost of financial intermediation, but the cost incurred in offering the financial service is not completely zero. This is because Fintech providers will normally incur some costs which may include the cost of adopting new technology, the cost of improving existing financial technologies, the cost of online security, as well as, regulatory costs in the country where the Fintech operate in, if they are regulated. These costs can affect the profitability of Fintech providers.

Another problem is that Fintech providers may not have a sustainable revenue base because they typically provide their service free of charge or for a negligible amount to attract new customers and to retain existing users; therefore, the sustainability of Fintech firms in the long run is an important issue for digital finance. To be sustainable, should Fintech providers merge with other Fintech providers? Or, should they merge with deposit-taking financial institutions? The latter is possible but could result in Fintech providers being heavily regulated due to their affiliation with regulated banking institutions.

Another important issue is that stress-tests have not been applied to Fintech providers, which suggests that their ability to survive a recession, high interest rates, financial crises, capital crunch, credit freeze, massive and unexpected loan defaults due to high unemployment, is almost unknown. Fintech became prominent just after the 2008 financial crisis which indicates that they have not being in operation through a full business cycle to see whether they can withstand adverse shocks that could adversely affect the delivery of their services.

Another issue is that most Fintech providers operate through an online platform which requires access to the internet to use financial services, and this has become the mainstream business model for most Fintech providers. However, the unhealthy reliance on the internet by modern Fintech

providers fail to take into account that access to the internet is not universal, and factors such as income, age, education, politics and geographical differences can influence the ability of individuals to access the internet.

Another issue is that the use of Fintech platforms does not necessarily eliminate the problem of discriminatory lending which is common among conventional lending institutions. Discriminatory lending occurs where lenders (or banks) are more likely to favourably grant loans to some group of individuals compared to other groups because they are from a privilege income level, credit quality, educational status or social status. Banks and other lending institutions continue to face criticism for engaging in discriminatory lending. We expect Fintech providers to incorporate machine learning into their online platforms to eliminate racial, political and other demographic bias in lending. While this is a good idea, it remains unclear how Fintech providers can successfully eliminate discriminatory lending practices if a user's demographic information is required as inputs for access to use their online platforms to engage in financial transactions.

3.9. Availability is not accessibility: Some precaution

There seem to be some implied confusion between greater 'digital financial inclusion' and 'access to finance'. To address this, we first need to understand that if digital finance is accessible to all and without bias, digital finance would improve the welfare of individuals that have formal bank accounts who wish to carry out basic financial services on their accounts via personal digital devices. But the availability of digital finance services is erroneously often equated to access to digital finance services, which is the case in some emerging countries. Because banks in emerging countries have online banking services does not necessarily mean that access to digital banking services is cheap for poor and low-income individuals. In fact, it is often the case that such individuals find it cheaper to walk into their banking halls to undertake some transactions than to use online digital finance platforms. This means that the availability of digital finance to the poor and low-income individuals does not mean that poor and low-income individuals have convenient access to it. Also, even if access to digital finance products is guaranteed to all, such access can only be convenient to low income individuals if it is cheaper to access digital finance products than to walking into a banking hall. However, this does not mean that Fintech and/or digital finance providers should not charge a price for their services even if it comes at a high cost for the poor. Rather, the point is that efficiency in the provision and use of digital financial services should be suited to customers' needs and delivered responsibly at a cost that is affordable to digital finance users (customers) and sustainable for digital finance providers.

4. Pros and Cons of Digital Finance

Below is a table showing the pros and cons of digital finance

Table 1: Pros and Cons of Digital Finance	
Pros	Expansion of financial services to non-financial sectors
	Convenient and secure banking services to poor individuals
	Boost the GDP of digitalised economies by increasing aggregate expenditure
	Reduce the circulation of bad/fake money
	Greater control of customers' personal finance
	Quick financial decision-making
	Ability to make and receive payments within seconds.
	Generates revenue to digital finance providers
Cons	Digital finance do not serve individuals that do not have mobile phone or digital devices
	It relies excessively on internet connectivity, which excludes individuals that do not have internet connectivity
	The way digital finance is introduced in a country (voluntarily or forced) can lead to voluntary financial exclusion if the population is not ready for it
	Digital data security breaches are common and can lower customers' trust in digital finance platforms
	Systemic black-swan risks, when they occur, can be fatal for digital financial services around the world
	Fee-based digital finance platforms will benefit high and medium income individuals at the expense of poor and low-income individuals who cannot afford the associated transaction costs.
	Many policy and regulatory environments are not enabling full-scale digital finance
*Black-swan risks are unfavourable events that have never occurred, whose solution is not known, which can have fatal consequences when they occur.	

5. Conclusion

This article provides a discussion on digital finance and its implication for financial inclusion and financial stability. Digital finance through Fintech providers has positive effects for financial inclusion in emerging and advanced economies, and the convenience that digital finance provides to individuals with low and variable income is often more valuable to them than the higher cost they will pay to obtain such services from conventional regulated banks. Despite the benefits of digital finance, this article has highlighted some challenge that digital finance pose for financial inclusion and financial stability. Finally, an interesting direction for future research would be to explore the relationship between digital finance and economic crises to determine whether digital finance helps to propagate financial contagion during a crisis.

Reference

ADB (2016) Accelerating Financial Inclusion in South-East Asia With Digital Finance. Technical report. Asian Development Bank. Available at: http://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/jan/Accelerating-financial-inclusion-in-south-east-asia.pdf Accessed on 14 November, 2017

Allen, F., Demirguc-Kunt, A., Klapper, L., & Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. Journal of Financial Intermediation, 27, 1-30.

Barbesino, P., Camerani, R., & Gaudino, A. (2005). Digital finance in Europe: Competitive dynamics and online behaviour. Journal of Financial Services Marketing, 9(4), 329-343.

Beck, T., Demirgüc-Kunt, A., Levine, R., (2007). Finance, inequality and the poor. Journal of Economic Growth, 12 (2007), pp. 27-49.

Beck, T., & Brown, M. (2011). Use of banking services in emerging markets-household-level evidence. CEPR Discussion Papers 8475. CEPR Discussion Papers.

BRC (2017). Debit Cards Overtake Cash to Become Number One Payment Method in the UK. The British Retail Consortium's (BRC) annual Payments Survey. Available at: https://brc.org.uk/news/2017/debit-cards-overtake-cash-to-become-number-one-payment-method-in-the-uk Accessed on 10 November 2017.

Bruhn, M., & Love, I. (2014). The real impact of improved access to finance: Evidence from Mexico. The Journal of Finance, 69(3), 1347-1376.

Caruana, J. (2016). Financial inclusion and the fintech revolution: implications for supervision and oversight. Conference Remarks at the Third GPFI-FSI Conference on Standard-Setting Bodies and Innovative Financial Inclusion - "New frontiers in the supervision and oversight of digital financial services". 26 October, Basel.

Cecchetti, S., and Kharroubi, E. (2012). Reassessing the impact of finance on growth. BIS Working Paper 381. BIS, Basel.

CGAP. Consultative Group to Assist the Poor. Available at: http://www.cgap.org/topics/digital-financial-services Accessed 9 November 2017.

CGAP (2015). What is Digital Financial Inclusion and Why Does it Matter? 10 March 2015. Available at: http://www.cgap.org/blog/what-digital-financial-inclusion-and-why-does-it-matter accessed 10 November 2017

Collins, D., Morduch, J., Rutherford, S., & Ruthven, O. (2009). Portfolios of the poor: how the world's poor live on $2 a day. Princeton University Press.

Demirgüç-Kunt, A., & Klapper, L. (2013). Measuring financial inclusion: Explaining variation in use of financial services across and within countries. Brookings Papers on Economic Activity, 2013(1), 279-340.

Dev, S. M. (2006). Financial inclusion: Issues and challenges. Economic and political weekly, 4310-4313.

Eisenhardt, K. (1989). Agency theory: An assessment and review. Academy of Management Review. 14 (1): 57-74.

Ellis, K., Lemma, A., and Rud, J.P. (2010). Financial inclusion, household investment and growth in Kenya and Tanzania. ODI Project Briefing No.43 Overseas Development Institute, London.

Gomber, P., Koch, J. A., & Siering, M. (2017). Digital Finance and FinTech: current research and future research directions. Journal of Business Economics, 67(5) 537–580.

GPFI (2010). G20 Principles for Innovative Financial Inclusion - Executive Brief. Available at: http://www.gpfi.org/publications/g20-principles-innovative-financial-inclusion-executive-brief Accessed on 21 July, 2017.

GPFI (2016). G20 High-Level Principles for Digital Financial Inclusion. Available at:

https://www.gpfi.org/sites/default/files/G20%20High%20Level%20Principles%20for%20Digital%20Financial%20Inclusion.pdf accessed on: 8th November 2017

GSMA. (2014). 2013 State of the Industry Report on Mobile Financial Services for the Unbanked.

G20 Summit (2013). G20 Leaders' Declaration. September, St Petersburg, Russia. Available: http://www.g20.utoronto.ca/2013/2013-0906-declaration.html Accessed on 09 November, 2017.

Han, R., & Melecky, M. (2013). Financial inclusion for financial stability: access to bank deposits and the growth of deposits in the global financial crisis. World Bank Policy Research Working Paper 6577, World Bank.

Hannig, A., & Jansen, S. (2010). Financial inclusion and financial stability: Current policy issues.

ITU (2016). The Digital Financial Services Ecosystem. ITU Focus Group Technical Report. May. Available at: https://www.itu.int/en/ITU-T/focusgroups/dfs/Documents/09_2016/FINAL%20ENDORSED%20ITU%20DFS%20Introduction%20Ecosystem%2028%20April%202016_formatted%20AM.pdf accessed on 14 November, 2017.

Ketterer, J.A. (2017). Digital Finance: New Times, New Challenges, New Opportunities. White Paper. Inter-American Development Bank. March. Available at: https://publications.iadb.org/handle/11319/8199 accessed on 14 November, 2017.

Khan, H. R. (2011). Financial inclusion and financial stability: are they two sides of the same coin. Speech at BANCON. BIS Working Paper. Available: http://www.bis.org/review/r111229f.pdf

Malady, L. (2016). Consumer Protection Issues for Digital Financial Services in Emerging Markets. Banking & Finance Law Review, 31(2), 389-401.

Manyika, J., Lund, S., Singer, M., White, O., & Berry, C. (2016). Digital Finance for All: Powering Inclusive Growth in Emerging Economies. McKinsey Global Institute. September. USA.

IFC (2017). Digital Financial Services: Challenges and Opportunities for Emerging Market Banks. EM Compass Report, No 42, August. International Finance Corporation, World Bank. Available: https://www.ifc.org/wps/wcm/connect/4e45d83f-e049-41d3-8378-2e388ffc1594/EMCompass+Note+42+DFS+Challenges+updated.pdf?MOD=AJPERES Accessed on 9 November 2017.

Prasad, E. S. (2010). Financial sector regulation and reforms in emerging markets: An overview (No. w16428). National Bureau of Economic Research.

Research and Markets (2016). U.S. Consumer Payments Outlook Through 2020. May. Available at: https://www.researchandmarkets.com/research/5dfd3s/u_s_consumer Accessed on 11 November 2017.

Scott, S. V., Van Reenen, J., & Zachariadis, M. (2017). The long-term effect of digital innovation on bank performance: an empirical study of SWIFT adoption in financial services. Research Policy, 46(5), 984-1004.

Shaikh, A. A., Glavee-Geo, R., & Karjaluoto, H. (2017). Exploring the nexus between financial sector reforms and the emergence of digital banking culture–Evidences from a developing country. Research in International Business and Finance, 42, 1030-1039.

TSYS (2016). 2016 U.S. Consumer Payment Study. Available at: https://www.tsys.com/Assets/TSYS/downloads/rs_2016-us-consumer-payment-study.pdf Accessed on 11 November 2017.

United Nations (2016). Digital Financial Inclusion. International Telecommunication Union (ITU), Issue Brief Series, Inter-agency Task Force on Financing for Development, July. United Nations. Available at: http://www.un.org/esa/ffd/wp-content/uploads/2016/01/Digital-Financial-Inclusion_ITU_IATF-Issue-Brief.pdf accessed on 10, November, 2017.

World Bank (2014) Digital Finance: Empowering the Poor via New Technologies, April 10. Available at: http://www.worldbank.org/en/news/feature/2014/04/10/digital-finance-empowering-poor-new-technologies Accessed on 10 November, 2017.