

# The Impact on Digitalization on Banking and Financial Stability



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## 1 The New Economy and Changes in Financial Intermediation

The digital revolution is dramatically changing the business environment and the financial services industry is no exception. Although a basic assumption of technology improvement is the ability to make things simpler, from a strategic point of view, many financial institutions are facing digitalization as a conundrum. There is a wide array of alternatives that can be chosen as new services or information processing channels.

This transformation has been around in some form for decades. Information processing systems and digital-related activities have been evolving intensively since the 1980s but they are now invading almost each and every single aspect of business and, in the next ten years we will be probably witness more innovations in financial services than in the previous fifty.

In the financial system and other sectors, the «new economy» also incorporates challenges for macroeconomic policy. As noted by Cecchetti (2002), the increased flexibility of the new environment argues against trying to use fiscal policy for stabilisation, and creates both immediate and long-term difficulties for monetary policy. In the macroeconomic arena, these difficulties entail the problems associated with estimating potential output when the productivity trend is shifting and all the related implications for jobs and wages. As far as the financial sector is concerned – and banks in particular – the new economy implies not only a transformation in banking employment and services but also new challenges for regulators and supervisors if financial stability is to be preserved. Additionally, central banks will see a significant decline in the demand for their liabilities, and a resulting loss of their primary interest rate policy instrument. The current interest rate environment is a rare one but impossibly an eternal one.

Economic theorists and empiricists are trying to fully understand the structural developments taking place with technology in different sectors and their systemic implications. A fundamental observation – with important effects for financial stability – is that digitalisation is producing an enormous accumulation of intangible capital that potentially creates financial fragility. Li (2017), for example, offers a general equilibrium model that shows that firms' intangible investment (R&D) creates new productive capital and, once created,

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capital can be sold to financial intermediaries. In good times, well-capitalised intermediaries push up the price of capital. This motivates firms to create more capital, but to do so, they must build up cash holdings. As firms' money demand expands, the yield on inside money (i.e. intermediaries' debt cost) declines, so intermediaries increase leverage and push up capital price even further. This is, overall, a description on how even R&D can potentially drive growth, which can then also bring instability if a funding bubble is created around it.

In the financial sector, these innovations are mostly generated around so-called FinTech companies. Philippon (2017) describes FinTech as an industry that covers digital innovations and technology-enabled business model innovations in the financial sector. He shows that such innovations can disrupt existing industry structures and blur industry boundaries. They can democratise access to financial services, but also create significant privacy, regulatory and law enforcement challenges. Using post-crisis US data, he finds that the unit cost of financial intermediation has declined only marginally – contrasting sharply with other industries – since the crisis and considers that significant welfare gains from improvement in financial services are technologically feasible but unlikely to happen without entry of new firms.

This structural change in technology in the financial sector happens in parallel to competitive changes in the industry. Cömert *et al.* (2016) describe the historical evolution of banks and banking innovations. They observe that in the late 1950s and 1960s, large banks' behaviour and innovations resulted in financial instability processes and consider that the cumulative effect of this period's innovations led to financial instability in the 1980s, due to institutional fragility and incoherence. These developments caused the emergence of «too big to manage» megabanks, both in the US and elsewhere. Even after the Great Recession in the 21<sup>st</sup> century average bank sizes have kept growing, while the number of competitors has significantly fallen.

This complex combination of technological and competitive changes can be only understood if the features of the new financial activities are properly addressed. Many of the innovations related to digitalisation and FinTech cannot be observed through the lens of the standard/traditional buyer-seller industrial organisation approach. Many of the new services and activities – in the fast-growing payment instruments market, for example – are provided by multi-sided platforms where network economies, cross-subsidies and cross-price and quantity relations are essential. Regulators and supervisors can only monitor these technological challenges and develop appropriate financial stability policies if their approach takes into account the way these new platforms and services operate.

What lies ahead seems to be a new financial intermediation with huge amounts of information processing (*big data*) and new delivery channels. A new business where the distance between households, small firms and their lenders will be increasing and «communicating in more impersonal ways», as predicted by Petersen and Rajan (2002). There also seems to be room for improvement in lender productivity and greater access to credit through new delivery channels. However, banks will interact with new players from the FinTech business in various ways, from fierce competition to cooperation. Regulators will then need to check whether regulation offers a level-playing field for such interaction and the necessary tools to preserve financial stability.

This note discusses the emergence of financial digitalisation and its implications for financial stability. The analysis is structured in three sections following this introduction. Section 2 analyses what digitalisation brings to the financial sector in terms of costs, competition and delivery channels. Particular attention is paid to the role of information, networks and platforms. Section 3 focuses on payments as the current main driver, and the related regulatory challenges and financial stability policies. Section 4 ends the note with a summary of the main conclusions.

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## 2 Digitalisation and Banking: Theoretical Issues and the New Competitive Environment

With the rising of the «new economy» based on information sharing and big data, a debate has emerged between economists on the implications for important issues such as employment and macroeconomic stability. An interesting seminal piece discussing this issue was presented by Bradford Delong and Lawrence Summers at the Jackson Hole Conference in 2001. From the baseline economic standpoint Delong and Summers (2001) show that for most of the 20th century, price discrimination – charging one price for one consumer and a different price for essentially the same good for another consumer – was seen as a way for monopolies to further increase their monopoly profits. However in the information age, the background assumption may be different with price discrimination being an essential mechanism for attaining economic efficiency and social welfare. Industries should have incentives to invest in technology and price discrimination offers such incentives. However, this will be difficult to do where many industries are facing decreasing marginal costs unless there are substantial investments in innovations. The financial industry is no exception.

As shown by Rifkin (2014), the classical industrial organisation theory states «cheaper prices, resulting from new technology and increased productivity, mean more money left over for consumers to spend elsewhere, which spurs a fresh round of competition among sellers. There is a caveat, however. These operating principles assume a competitive market (...) In the long run, however, new players invariably come along and introduce breakthroughs in technology that increase productivity and lower prices, prices for similar or alternative goods and services, and break the monopolistic hold on the market.» This would lead to «an endgame in which intense competition forces the introduction of ever-leaner technology, boosting productivity to the optimum point in which each additional unit introduced for sale approaches “near zero” marginal cost».

Company-customer interaction and network economies become essential. This is a critical ingredient of the financial services industry as lending relationships have been a defining competitive advantage for decades. However, many of the new relationships are (and will be) articulated with channels based on multi-sided platforms and networks. In a traditional (one-sided) market a change in the total production cost is shared between consumers and producers (price adjustment) and/or with related changes in demand (volume adjustment). In multi-sided markets – as most digital channels for banks – network economics cause a sharp decrease in marginal costs, and prices and quantities on one side of the platform affect prices and quantities on other sides of the platform. This

has been happening, for example, in the payment card industry and it will also happen in other payment-related fast-growing services (e.g. mobile payments).

As for the management of information in financial intermediation services, this area is also largely affected by technological change. Liberti and Petersen (2017) revise the definition of hard and soft information in the essential bank-customer lending relationships. They define hard information as quantitative, easy to store and transmit in impersonal ways, and whose information content is independent of the collection process. Conversely, soft information is mainly qualitative, difficult to store, mainly transmitted in personal ways, and accumulated through long-standing relationships. They show that technology changes are driving a greater reliance on hard relative to soft information in financial transactions. This has altered the design of financial institutions by moving decisions outside the traditional boundaries of the organisation.

Nevertheless, information can reach the financial institution in many ways. Non-financial companies such as Google, Amazon or Facebook generate and store massive amounts of information and take advantage of the interactions made by the so-called «creative commons», which is a form of accumulation and diffusion of knowledge and the provision of services through sharing in multiple media environments such as social networks. Many of the providers based on creative commons already operate through powerful platforms (e.g. Uber in the transportation industry). However, banks still need to develop this information-based technology but there are important barriers to this, mainly coming from confidentiality and information safety. When a services industry deals with systemic issues (health, financial stability), creating this type of platform is not as easy as it may seem. However, banks can still have a competitive advantage in exploiting their huge accumulation of information through big data. In order to exploit hard information – or even to transform soft information into hard information – some advantages of big data management are potentially quite useful. Banks can manage data that are available in real time. Most importantly however, they can manage large amounts of information in a relatively short time. Einav and Levin (2014) show that because datasets were often small in the past, statistical power was an important issue. Datasets with tens of millions of distinct observations and huge numbers of covariates are now quite common. The most important feature of big data is perhaps in the quality of the information it may provide. In the case of risk management, for example, historical data could be as relevant as current data, and overall, it is more important for data to be detailed and accurate rather than immediately available.

In managing these new information technologies, banks are also facing risks and adjustments that are common to many other industries, and these are easily observable nowadays. Cyber-risks and the transformation of human capital are probably the most important ones that banks deal with. Banks are now investing huge amounts in cybersecurity. According to the website Breach Live, in 2016 alone there were 4,149 vulnerabilities detected in information systems that caused data breaches affecting 4.2 billion information registries globally. There are 3,000 data breaches every minute. It is important to consider that one of the information advantages attributed to banks in managing credit and market risk is their day-to-day market participation but this only makes the amount of information that banks have to protect larger and larger.



As for jobs in the banking sector, there has been a major transformation. In the case of the European Union, for example, while some traditional branch-based jobs have been cut by hundreds of thousand since 2008, there have also been new positions generated to face the IT system transformation and the massive amount of regulation coming as a response to the crisis. Regulatory compliance and technology are the main new two sources of bank employment. Using data from Reuters, the total headcount of jobs at banks on the STOXX Europe 600 Banks Index was 2,362,677 at the end of 2015, only 5.2% less than the 2,491,125 in 2007.

The combination of a change in the processing of information and the supply of services with a high regulatory pressure in the banking industry occurs alongside the entry of an increasing number of competitors from the FinTech sector. This results in a change in existing networks and standards. Again, there are potentially great benefits to previously underserved segments (potential for financial inclusion, more competition, new channels) but also potentially high costs from destabilisation. This involves a challenge for the regulator/supervisor: how to regulate the FinTech industry? If we consider the case of the cab industry and the dispute with new providers (e.g. Uber) as a reference, there are various alternatives being considered. One would be to simply ignore the entrants and let them compete freely with the incumbents. This is perhaps non-optimal as it leaves consumer protection, security and other important issues uncovered. Another extreme measure would be to strangle the entrants, swamping them in a large range of regulatory compliance issues. Perhaps, an intermediate solution would be to regulate each innovation according to its specialisation. That is, regulating activities rather than actors. In the banking sector, this alternative seems to make even more sense as regulating activities may prevent the enormous social costs from failure of banking/payment systems and (potentially) FinTech services. The idea is that failures of individual components may not be as disruptive as the failure of a systemic nature. The basic translation is: not all the players may need the same regulatory framework to have a level playing field. As will be discussed in the next section, the payment industry is now the main laboratory for financial innovation, and we will evaluate the regulatory alternatives for FinTech and banks.

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### 3 Payments as the Main Current Driver: Regulatory Challenges and Financial Stability

Payment systems are an essential pillar of any financial system and represent one of the largest industries worldwide. This is not surprising considering that there were around half a trillion non-cash payment transactions made globally in 2016<sup>1</sup>.

These payments are critical to the efficient operation of any financial system. Any malfunction can create disruption and instability. Also, because of the size of the payments system, there is a concern that inefficiency in the system can act as a drag on economic activity. A report by Schmiedel *et al.* (2012), suggests the costs to society of providing retail payment services can vary between 0.80% and 1.20% of GDP.

<sup>1</sup> <https://www.worldpaymentsreport.com/download>.

At this point, I must make clear that I will for the most part not deal with Bitcoin or similar virtual currencies in this paper. I recognise their increased use over the last few years, and the interesting theoretical and technical questions they induce. However it is beyond the scope of this note<sup>2</sup>.

The introduction of FinTech has been mainly oriented (up to now) toward payment services. At the retail level, the usage of different payment modes has differed historically but it appears to be converging (Carbó-Valverde and Kahn, 2016). Probably the most effective way of decreasing the overall cost of a retail payments system is to reduce its reliance on cash. FinTech providers will surely contribute to such reduction, but their role in the payment system and their interaction with banks is still at an early stage. Questions remain as to whether the introduction of the new players will lead to new instabilities in the payments system. Maintaining the proper degree of efficiency and safety is a difficult balancing act. There are relevant questions such as if regulation of the new providers should be comparable to that of bank or would a «lighter touch» (reduced capital requirements, regulatory sandboxes). Additionally, it is unclear whether the goal of guaranteeing fair competition between old and new providers can be met under the proposed standards of current regulations, including the so-called Second Payment Services Directive (PSD2) in the European Union. With the fundamental uncertainties about the ultimate organisational structure of the payment system after the FinTech revolution, these questions will remain open for some time.

The main challenge seems to be ensuring a level playing field between bank and non-bank providers, as well as an adequate level of control and oversight over them. Dermine (2016) notes there is a need to assess «the threat» posed by digital banking as seen in the context of a long series of innovations in the banking sector that includes telephone banking, payment cards, the development of capital markets, internet, smart-phones, and cloud computing. In particular, it raises public policy issues: its impact on the profitability and solvency of banks, the protection of borrowers and investors, and the systemic importance of the new players, the FinTech starts-up specialised in financial services.

In Europe, the PSD2 initially pursues a single standard for all providers of payments services that do not themselves take deposits or issue electronic money. The crucial question is how tight the standard should be. As noted by Verdier and Mariotto (2015), the trade-off between financial stability and competition is key to payment innovations. They suggest that creating new licenses for non-banks is not the only regulatory option to enhance competition in retail banking markets. By allowing the introduction of new payments arrangements on a small scale the regulatory structure enables both the business and the regulator the opportunity to begin to understand the risks and benefits from the innovation.

While PSD2 lays out general principles for equitable access, the implementation of these will ultimately be the responsibility of national regulators. In the interim, there is a transition period when some suppliers of these services are not still fully regulated or treated on par with credit institutions.

<sup>2</sup> The use of virtual currencies as a medium of payment – as opposed to a speculative investment – is increasing but still rather limited.

Rules for access will determine both the pace of innovation and the ultimate structure of the payments industry. Boot (2016) suggests that online platforms could offer a supermarket type model facilitating access to various products and services of disparate providers along with record keeping. He refers to firm such as Google, Facebook, Amazon or Apple making use of payments solutions such as ApplePay as a platform to gain direct customer interface for related products and services. This implies that legacy financial institutions then might be relegated to serving as the back office to the platform. The importance of these questions of access and the rules for it cannot be overstated.

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## 4 Conclusions

This note discusses the impact of digitalisation on banking activities and the challenges that this imposes for financial stability. There are four main conclusions from the analysis:

*i)* The digitalisation change has been around for decades but today, its impact and the speed of diffusion and change seem unprecedented. In line with other industries, this is transforming the competitive structure of the banking sector, with new entrants from the FinTech industry. It also implies a revolution for bank delivery channels and information processing systems, and change in the jobs and skills that are required in financial services. From an academic perspective, understanding the economics of banking currently requires a shift from the standard buyer-seller model of standard industrial organisation to models based on network externalities and multi-sided platforms with several related prices and cross-subsidies.

*ii)* Digitalisation and FinTech are also an opportunity to reduce marginal costs and increase productivity in financial services. However, there are also financial stability concerns associated with these processes as they imply a massive accumulation of intangible capital which is not always appropriately valued in capital markets, and they also blur the industry boundaries and create significant privacy, regulatory and law enforcement challenges.

*iii)* Giving its systemic nature, the new activities and players in the financial sector cannot be regulated (or unregulated) the same way that other industries are enforcing regulation (e.g. taxi cab industry, social media etc). One potential solution would be to regulate each innovation according to its specialisation. That is, regulating activities rather than the players.

*iv)* Another important challenge for regulators is to ensure a level playing field between bank and non-bank providers, as well as an adequate level of control and oversight over them. There have been some regulatory initiatives in this direction – particularly in Europe – but they are still far from ensuring that level-playing field.

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