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THE RISE OF DIGITAL FINANCE

Empirical evidence on fintech firms, banks and customers

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INTRODUCTION

1. The rise of Digital Finance and the economic environment

The last twenty years marked a milestone in the culture of ecosystems, as a founding pillar of managerial knowledge (Dhanaraj & Parkhe, 2006; Iansiti & Levien, 2004). In this glance, the digital ecosystems rose their interest in relationship to the dynamics of the financial sector (Palmiè et al., 2020) counting on the development of financial technology (Fintech).

This book put the emphasis on the role of innovation, its disruptive effect on all the industrial sector, and its ability to induce firms to adapt to its brand-new paradigms. Digital economy is experiencing a large-scale evolutionary path, in which banking and financial institutions are taking part at a fast pace, seen their essential role of intermediation among all players, so as the issuance and supply of products and services to business and private customers. The various products and services related to payments, loans, trading, and intermediation costs cover a relevant role in establishing acceptable levels of efficiency of each industrial sector, and in a context of high competitiveness in terms of financial burden and time costs, the configuration of new business models is urgent. In addition to that, besides the role of public expenditure, the financial system is the most important stakeholder in the promotion of ecological and digital transitions enhanced by the Next Generation EU recovery plan (Bank of Italy, 2022). Fintech has been living a rapid growth pace and are currently in charge of reshaping the banking sector, the payments system, trade, investments and also the way of intending money via the implementation of digital currencies.

The Digital Financial ecosystem, i.e., the Fintech ecosystem is composed of existing, traditional companies like banks and insurance companies, and also of totally new companies (generally start-ups) that are implementing new notions and business model based on financial technology. Even if Fintech is known to be a sector endowed with great margin of growth,

especially in the last few years and during the Covid-19 pandemic, it still represents a marginal share compared to the rest of the financial ecosystem (Vives, 2017).

Evidence of such progresses are mostly visible in China and the US, with Europe as a follower. The US is the largest Fintech hub, counting on barely 5 million companies. Europe Fintech's industry is fragmented and different from country to another one, with the UK leading the chart with 820,000 registered firms (Riyanto et al., 2018).

The segments of major development are digital payments, lending, deposits, capital raising, crowdfunding, insurance, financial advisory, and investment management (Financial Stability Board, 2017). The advantage of Fintech is given by the capacity to cut brokerage costs and implement the paradigm of financial inclusion, i.e., the opportunity to extend the provision of financial services to those customers that had no access to traditional institutions until nowadays. The most important challenge that regards traditional banks is related to the management of big data. The financial ecosystem is experiencing the big data transition (or the open banking platform paradigm) and due to this factor, a link between the economic financialization and the information flow of financial institutions has been enhanced (Klioutchnikov & Klioutchnikova, 2019).

Additionally, Vives (2019) argues that digital disruption on the banking has impacted competition among the players and enhanced the efficiency and its positive influence on the customers' satisfaction.

According to what stated, it is underlined the role of new technologies in addressing greater efficiency in the issuance of digital financial services. Thus, incumbent banks are demanded to shift towards new business models endowed with customer-centric platforms, that can be managed through the utilization of Application Programming Interfaces (i.e., APIs). Such mutations represent the major challenges for incumbents, which are focused on the exploration of cost reduction strategies by cutting physical branches and comply with new standard thresholds for the services provided, in order to challenge the extreme competition from newcomers.

Nonetheless, banks are still in charge of establishing if Fintech could represent a threat or an opportunity for the financial system, by choosing between challenging the raise of financial technology and contrast its boundless opportunities or accept the future developments and enhancing their will to cooperate (Temelkov, 2018).

One of the main causes responsible for the success of Fintech is related to the difficulties experienced by MSMEs entering credit lines from traditional incumbents, together with the other factors listed above, preparing a

fertile soil for the implementation of digital services competing with traditional ones (Patwardhan, 2018). The risk for banks is to lose the customer base and potential future income if no measures are taken. The European Banking Authority (2018) foresees a potential operative loss between 29% and 35% in this regime of competition.

The timing of the banks' digital transformation is essential to hold on in their strategic industrial positioning and keeping the role of leading players in the system, and potentially increasing their revenues. The profit loss in perspective may be a good reason to opt for a regime of cooperation with Fintech. The aspect of banking digitalization is of high priority for the European supervisory board, which includes the issues of digital transformation, financial stability and resilience and cybersecurity in its priority axes along the 2022-2024 period (European Central Bank, 2022).

According to the extant literature, three directions of digital transformation are outlined: the degree of openness, collaboration, and investment (Skan et al., 2014). The first component is related to the process of involvement of external technological solutions. Fintech widely employ this approach to integrate external components in the banking core business via the utilization of specific technologies, i.e., the APIs, to increase the services added value. It is proved that the correct addressing of the commercial partnership established would carry mutual advantages for the parts involved. Leading organizations should seek the simplification of internal processes and increase the use of external utilities, platforms, and micro-services where possible. All with a view to a component-based architecture, which resembles a set of interoperable building blocks, which will drive next generation innovation and efficiency. Indeed, many financial institutions look to the future of their business as digital platforms with some physical branches, explicating the open banking paradigm (Rousseau, 2019; Camerinelli, 2020). Such paradigms foresee a new outlook and a new strategic, operative approach. Banks and financial institutions are focusing on the search of expertise among the STEM, to acquire new competences, and new tools and functionalities into their core businesses, typical of other sectors of commerce, through APIs (Bender, 2015). Nazaritehrani and Mashall (2020) in particular, argue that the positive relationship between the impact of the use of e-banking channels (considering ATMs, POS, Internet banking, Mobile banking, and Telephone banking) on the growth of profit and market share. In this framework, then, it is essential to inquire the role of technological finance and expose outline the behaviour of the main stakeholder involved.

2. The structure of the book

The present book intends to outline a comprehensive, mixed approach to the evolution of the digital financial ecosystem, exploring the characteristics, the behaviour, the implications, and the future guidelines of development of the main stakeholders involved in this considerable process.

The first chapter is a theoretical contextualization of the Fintech world, explaining how the complexity of the system has been a factor, on the one hand of survival to the power of Big Tech and, on the other hand, the growing success of the digital financial ecosystems, which have been able to challenge the monopoly of financial services supply to incumbent banks. The chapter provides the theoretical pillars that are necessary to approach to the quantitative output of the end of this book, outlining possible future developments and trends of growth. Several sources have been consulted, in order to build a reference framework regarding the birth, the rise and the evolution of the Fintech sector.

The second chapter provides a forecast of the research about one of the central issues regarding the digitalization of financial services. The exploration of the studies regarding the payment systems, digital currencies, cryptocurrencies, and the challenge of the private business to the currency issuance. The bibliometric explorative analysis included in this chapter outlines the avenues of future research in a sector that sees the destabilization of the overwhelming power of traditional financial institutions. Here the role of disruptive technology is analysed, with a focus on Blockchain technology and the potential of the creation of Central Bank Digital Currencies (CBDCs). To carry on the analysis, documents were extracted from Scopus and WoS – Web of Science databases, then analysed and processed through VOSviewer, to obtain information about the state of the art of the research in the field.

The third chapter, in accordance with the path followed in the structuration of this volume, assumes the pillars of the challenge proposed to traditional banks, which have to counter the growing role of Fintech and Big Tech in the digital financial services provision. This chapter aims to outline the competitive innovation guidelines available, to assess the strategic positioning of incumbents in the context of the digital financial ecosystem. A qualitative analysis on company websites has been conducted to extract information about the internal and external strategic decision assumed in order to accomplish the pursuing of digital transformation. Then, a quantitative analysis was carried out to map out the positioning of banks. New concept related to the banking-as-a-platform business model have been implemented, con-

sidering the role of bank dematerialization and the outlining of the value chain proposal in response to the demands of the customers.

The fourth chapter analyses the last stakeholder considered in the present study. A theoretical approach to the role of the customers in the process of digitalization of financial services. The focus is centred on the digital financial literacy issues, stressing on the need for new generations to acquire new knowledge in the disposal of digital financial tools, and the consequent attitude towards use. A reference framework on the role of government, educational institutions and private entities is outlined, in order to establish effective strategies of knowledge dissemination and behavioural intention implementation.

The fifth and final chapter is a quantitative attempt to assess the trend of growth of the Fintech sector in Italy. To carry on the analysis, a dataset of 157 Fintech and Tech firm was built. The mapping of the companies has been conducted with the support of the Italian Fintech Observatory, that map the trends in the Fintech market. The quantitative instruments employed in the analysis foresaw the application of the DEA model, providing interesting insights on the assessment of nonparametric efficiency of the specific sector. Territoriality, so as economic indicators, and banking proximity turned out to have a role in the investments in Fintech companies throughout the peninsula. Main implications regarded the role of managers in decision-making issues, mainly on the choices of investments. Policymakers shall adopt instruments to foster such investments in peripheral areas, creating a homogeneous framework to enhance the presence of Fintech everywhere.

Finally, conclusive remarks are reported, to wrap up the contents of the present publication.

1. A BRAVE NEW FINTECH WORLD: THE RESISTANCE TO THE DESERT OF INNOVATION

Abstract

After the 2008 global financial crisis, the remodulation of the economic system let the floor to the technological disruption based on artificial intelligence and the Internet of Things. More recently, the disruption of the Covid-19 pandemic and the paradigm of "New Normal" enhanced and boosted the digitization in many economic sectors.

The emergence of the Big Tech firms, after barely a decade, transformed itself into a digital desert, which is preventing innovation growth because of the dominant position of such firms, which block the innovation processes by absorbing high-tech start-ups. The boundless market share detained by the Tech Giants and their economies of scale is an unrivalled entrance barrier for innovative start-ups. Fintech, apparently, for its features, resists to this dominance of Big Tech, continuing to produce innovation and stimulating the growth of start-ups and R&D programs worldwide. This is mainly due to the uniqueness of the value proposition in terms of product and services, the business model and organization, the know-how of their human capital.

The present chapter describes the countereffect of the Big Tech dominance by examining the Fintech industry under the lenses of complexity, which nurtures the creation of an extended ecosystem with a bottom-up approach. The creation of territorial clusters made of reciprocal relationships and networks is the formation pattern of such an ecosystem, which is, on its side, challenging and stimulating innovation in the traditional financial sector, where incumbents are hardly able to innovate from inside. A study of the extant literature offers the foundations to analyse possible future developments in the open banking and insurance innovation.

Keywords: Fintech firms; digital divide; digital financial ecosystem; complexity theory; embedded finance.

1.1. Introduction

The economy digitization has been for years a driver of development and efficiency for many industrial sectors. The 2008 global financial crisis boosted the digital transition, especially in the financial sector, where the disruptive revolution led by financial technology has opened new avenues of sustainable development and social sustainability. This phenomenon has been further incremented by the disruption of the Covid-19 pandemic, which enhanced the shift to digitalization in many economic sectors, launching the paradigms of the so-called "New Normal". It, indeed, marked the aim of pursuing financial inclusion through the dematerialization of products and services, reducing operational and transaction costs, so as geographical barriers to reach institutions and intermediaries.

The digital financial revolution has been fostered by the raise of Fintech, which gained the interest of the public since the first decade of the 2000s, with the birth of the first pioneering actors of the digital financial services providers. Most of those subjects succeeded in becoming the Tech Giants that entered the everyday life. It is to the Big Tech firms that we due the digital transition we are living day by day, but it is also to them that we must attribute the declining path of the digital desert we are incurring. Inspired by the theory issued by Schumpeter on creative destruction, the evolutionary path of Big Tech has been able to interrupt the innovative flow fuelled by those thousands of MSMEs, start-ups and spinoffs that are dedicated to the science and technology processes as their core business. The witnessed alarm here reported is, then, connected with the threat of the lack of a push for innovation on a bottom-up approach in the next future.

It is known that nowadays Tech Giants are in control of the ICT market, counting on the large scale spread of innovative solutions that they incorporated, and eventually acquired, blocking the innovation process built by high-tech micro and SMEs, provoking a generalized production decrement. In this context of collective halting of the technological progress, the fintech sector has been able to resist and contrast this trend, reporting a continuous and constant growth in terms of technological empowerment and market share. This enabled the birth of what is as defined fintech ecosystem, which is favoured by several factors of success.

The aim of the present chapter is to analyse the key to success of an ecosystem, i.e., the Fintech ecosystem, which has peculiarities that make it act as a "David in a world of Goliaths", cultivating the opportunity to function as a microcosm of innovative start-ups that are catalyser of innovation. In this chapter, the role of Fintech is underlined, and how it is related to the

support to the digital shift of incumbent banks and how it can contrast, either contribute to, the shift toward digital finance conducted by the Big Tech, which as of now, has been only able to compete in the segment of digital payments. In this glance, an overview on the concept of embedded digital finance was advanced, in order to assess the role of Fintech between the rescue of the banking sector reputation and positioning, and the superpower enacted by the Tech Giants. Political, social, and managerial determinants are essential to explain such a phenomenon, triggering implications for the stakeholders. One of the most relevant conclusive remarks is connected with the update of a common regulatory framework to pursue the stability and the resilience of the financial system within the European Union. A hint to the role of digital currencies is also considered.

1.2. Theoretical background

1.2.1. The success of Fintech and the new market positioning of incumbents

Rising of Fintech is one of the main issues in the field of research related to finance, digital innovation and business management resulting in a large and heterogeneous body of scholarly literature.

The reason of the significant impact of digitization on the financial system is in the very nature of the financial products themselves: they are based on information. The disruption of technological evolution and the entrance in the market of big players involved in digitization let the floor to the shift of financial firms to a dematerialization of assets, processes, and several components of their core activities. There are several factors which contributed to foster the birth and spread of financial technology: first, the growth of the IT technology and its application to many branches of the economic activity; this process let financial firms initialise new activities of totally new product development, beyond the mere digitalisation of existing services.

A second factor is represented by the change in consumers' behaviour patterns: consumers are endowed with new tools to interact with financial services providers, so to aim to a new more personalised customer care. Third, a radical change in financial ecosystems enhanced the opportunity for firms to rethink and resize internal operations, so as to start new ecosystems made of hybrid models and sectors. A last factor is detected in the regulatory framework, which has been made stricter after the 2008 financial crisis,

together with the creation of sandboxes for the testing of new products and financial support to start-ups.

In the last decade, scientific efforts concentrated on the determinants related to interaction between Fintech and business environment. According to an EY report (2019) consumers interested in Fintech raised by 400% since 2015, making the subject of digital finance a consistent topic in the debate, under the light of users/consumers, which are more willing to obtain digital services also from their physical financial institutions (Capgemini, 2018). Numbers are from the side of Fintech, which are developing more and more throughout the years, becoming a very relevant share of the financial market. Nowadays, most of the Fintech market is concentrated in North America and Asia (22% and 15% of the total of the Fintech firms). Europe ranks third, with 9.7% of the world's total Fintech firms. A considerable growth is recorded in South America, where the presence of financial digital firms is growing at a notable pace.

The reason of this relevant gain in importance is due to several factors, which can be resumed into some macro categories: first, a not yet clearly defined regulatory framework, which lets more room for movement respect of traditional banking institutions. Although European directive of digital payments, issued in 2015 but only come in force in 2017, puts the pillars of regulatory of the financial technology, there are still some grey zones where regulatory is not enacted yet. Another point of strength is represented by the feasibility of their business model.

The presence of several interfaces let the customers access and benefit of the needed services without almost any kind of time and space limitations. Other pros are identified in the opportunity (in some countries mandatory) to share third party information in order to have customised services and also the opportunity to profile clients and design new models of risk sharing. A third opportunity is related to the competitiveness of Fintech, which are able to offer products and services at lower costs than traditional banks, reducing entrance cost barriers for customers, reaching new objectives of financial inclusion. All those elements make Fintech an interesting segment to be analysed under several points of view.

The raise in importance of Fintech is also forcing traditional banks to rethink their business models, both in terms of internal and external strategies, or inbound and outbound business configurations. The main relevant change is detected in the business model switch in the entire ecosystem, moving from a traditional territorially branched model to a banking-as-a-platform configuration, with a smaller or null presence of physical interfaces and a dematerialisation of structural capital, assets, and services. This is mostly

due to a mix of strategies that almost all incumbent banks have enacted or enabled at early stages. In compliance with PSD2 regulatory, indeed, for banks is now mandatory to develop internal digital applications, i.e., Application Programming Interfaces (APIs), which determine an internal push to change. Another strategy adopted by financial institutions is the outsourcing of digital services through the investments in partnerships with digital firms or fintech firms.

1.2.2. Resistance to Big Tech absorption

Such facts are crucial to assess what has been hypothesized in the premises of the present chapter, since the peculiarities of Fintech are among the reasons of survival of the innovation process triggered by the sector. Moreover, there are several reasons underlying the missed penetration of Big-Tech in the financial industry, except for payment systems.

A first, important factor of analysis results from a size comparison: Big-Tech represent the biggest firms in the information technology sector, while Fintech is a sector mostly composed by micro and SMEs, which make them more feasible to adapt to the entrance to a new economic sector. The traditional financial supply chain is, indeed, manned by the presence of incumbent banks, which are historically in control of complex financial operations, disclosing, in other words, the lack of banking culture by the Tech Giants.

This is a very relevant aspect to be recorded since this sector pays a consistent price in terms of a capillary presence on territories. Big Tech have headquarters, international offices, but not peripheral territorial branches, where the bank-customer relationship is built. Someone may say that Fintech have the same problem in customer care relationship management, but this issue is bypassed with a second, very important feature related to an indirect customer relationship component, generated by the strategic partnership between fintech and incumbents. The ability for fintech to build durable partnerships with traditional banks make them visible and in touch with customers, increasing their awareness towards such firms.

Indeed – as previously indicated – the only opportunity that Big Tech seized to attempt to land in the financial sector is limited to the electronic payments branch. In the last five years the Tech Giants have developed internally several electronic payment tools, like AmazonPay, AliPay, ApplePay, and others. All such applications have been developed on the PayPal business model, which created a disruption, almost two decades ago, in the e-payments world. PayPal has been a pioneer in the open banking innovation

system since it worked like an aggregator of bank cards for payments on the Internet. Moreover, it let the opportunity to send money directly among registered users. PayPal also gives the opportunity to safely pay online providing customer protection services without registering a user profile. PayPal is one of the cases where a fintech became a Big Tech, witnessing flourishing opportunities for such sector.

The case of PayPal, at the same time, shows another important hint, which is related to the nature of the service provided. Big Tech have limited – as of now – their presence in the digital finance only to the electronic payment systems. This satisfies a financial need related to a settlement point of view, which is sublimed by payment transactions. All those categories of financial services related to the financial behaviour of the customers (from savings to lending) – which foresees a more complex interaction with the service provider -, is still a prerogative of incumbents and fintech. We may say that, in some cases, a direct interaction with a hybrid system is still more effective in distributional terms.

Fintech have the potential to integrate in the banking supply chain without shocks in terms of market share. Indeed, according to the European Central Bank, even if the total amount of investment in fintech is considerably growing in the last years, the median amount of the investments is still related to an SME dimension (ECB, 2021). It is particularly true if we consider that the opportunity to create a flourishing market is related to the opportunity not to contrast but integrate to the banking system. According to Claessens et al. (2018), the development of fintech services is more effective in higher-income countries, where the banking ecosystems is composed of big incumbents with less competition and where regulatory and supervisory frameworks are less stringent (BIS, 2018). This is easily explainable with the most relevant advantage that fintech brought with dematerialization: the reduction of transaction and intermediation costs.

1.2.3. Complexity theory and fintech ecosystems development

An attempt to explain why such a microcosm may still be able influence the macro-system of information technology is given by the theory of complexity, specifically, the complex adaptive systems (CAS). This concept borrowed by physics and biology, perfectly fits to business organization issues. It tells us that the interaction at a micro-level of a myriad of agents will have the ability to influence the entire system producing tangible effects. The patterns of action stemming from one level both emerge from and are influenced

by processes operating at different levels, a characteristic referred to as complexity (Arthur, 2009).

There is no universal perspective and theory of CAS (Vidgen & Wang, 2006), nonetheless scholars imply that a CAS is composed of agents that interact and continuously adapt and organize themselves within an environment (Muthukannan et al., 2020). According to the extant organizational theory of complex systems, there are some specific attributes that fintech ecosystems consist of: emergence – that is related to the lack of a global controller body (Goldstein, 1999); adaptability, which deals with the ability to take advantage from the feasibility of the changing system (Holland, 2001); the presence of agents and interactions among them (Axelrod & Cohen, 2008); self-organization, since systems are composed of interdependency, interactions of its parts, and diversity in the system (Lindberg & Schneider, 2013).

Fintech ecosystems respond to this type of framework, in their ability to self-organize, adapt and learn from the interactions of their agents, producing effects at a macro-level in a system that is still looking for its settling at a global level. Regulatory is still *in fieri*, and not uniform in every single market, generating differences in approaches, interactions, and results in the markets. The US, UK and Chinese markets are less binding than the European market (Claessens et al., 2018), so the market share obtained by such firms is higher and more influential than others. The European Union is working on a regulatory framework which encourages innovation and competition in the digital finance industry, promoting best practices among firms in the light of the pursue of risk reduction for customers (EC, 2020). The lack of harmonization among the regulations adopted by the single member States is a restraint to a full development of digital operational resilience of the agents, which suffer from an indirect effect of the reform of the financial sector after the 2008 crisis.

Thus, at this stage, the promotion, and the enhancement of Fintech ecosystems in the financial markets need the support of governmental bodies to be implemented (Muthukannan et al., 2020). The first step to encourage the growth of such ecosystems is to create a collective system vision by policymakers in the opportunities of boosting digitalization, finalized at the creation of jobs and the opening of new market segments (Arner et al., 2015); second, the need to enact, with appropriate regulatory, strategic development plans to foster interconnections among digital financial hubs and incentives networked communities (Dhar & Stein, 2017); a final step is given by the effective realization and implementation of agents' behaviours in order to establish symbiotic partnership and operative results (Tanda & Schena, 2019).

1.2.4. Catching up with customers' trust and needs

The 2008 financial crisis created pressure both on governments and market agents, causing a huge loss of trust in the financial industry (Van der Cruijsen et al., 2016). That is why the adoption of stringent regulations mainly aimed at the customers' protection, in the light of risk and resilience of the financial markets (EC, 2020). The expansive monetary policy adopted by the Central Banks of all countries, with the cut-off of interest rates, reduced the profitability of the sector. Moreover, the implementation of PSD2 regulatory on digital payments paved the way for the entrance of new players in the market, i.e., Fintech firms, which are able to provide perfect substitute services to customers, with lower intermediation costs and easy accessibility (ECB, 2019).

The challenge that incumbents (which is followed up in chapter 3) shall seize in this outlook is focused on the search of a strategic positioning that has a threefold perspective (all addresses are summarized in Table 1):

- Increase the *efficiency of the organizational structure* (Lee et al., 2021); on the one hand, the digitalization of distribution and retail channels, conducted via the dematerialization of several products and services (i.e., closing many territorial branches and franchises); moreover, this process occurs also at internal level, involving reporting, corporate communication and management;

Table 1 – Guidelines to implement the new banking approach (source: authors' own elaboration)

Variables	Strategies	Areas of intervention
Organization	- Digitalization - Positioning	External - Distribution - Retail Internal - Reporting - Corporate communication - Management
Intellectual Capital	- Know-how increase - Decision making	- Board of Directors - Human resources management
Trust	- CRM - Omnichannel Marketing	- Retail channels - Customer care

- *Human resources* (Gupta et al., 2018) and *corporate governance* issues (Najaf et al., 2021; Wojcik, 2021); such aspects cope, on the one

hand, with the cut of hiring processes due to the decrement of income margins and, on the other hand, with the growing demand for high skilled human capital, endowed with competences in the fields of big data and digital services; similarly, such need is perpetrated in the structuration of boards of directors and higher management composed of key figures that matured competences in the STEM (Jamil & Seman, 2019), so as the opportunity to promote diversity and social inclusion to encourage a mindset change in decision-making processes (Sioson & Kim, 2019);

- *Trust recovery* (Stulz, 2019); the season of economic depression induced by the global crisis of 2008, and the scandals that hit the banking system in the last years - from Lehman Brothers to more circumscribed territorial cases - generated a steep decrease of customers' trust into financial institutions.

Such processes turned out to be long and expensive both in terms of money and intellectual capital, which are excellent reasons for banks to outsource assets and competences in the fintech sector, i.e., the adoption of API functionalities (Romanova & Kudinska, 2016) and the establishment of partnerships with Fintech firms (Oshodin et al., 2017)[1].

1.3. The challenge to Big Tech and the rise of embedded finance

The business integration between fintech and incumbent banks is an open challenge to the great power acquired by Big Tech, which are now disputing the monopoly of financial products and services provision to customers. Although for years the role of Tech Giants in digital finance has been limited to the segment of electronic payments, future developments foresee the entrance of such companies in other sectors. This diversification is pursued with the concept of embedded finance, i.e., the supply of financial products and services through other firms' channels. This phenomenon is on the upswing in retail e-commerce, where firms provide additional services linked to the purchase experience.

Consumers' needs have changed significantly in recent years, and so have their expectations of financial services. Not only does a large part of their life take place online, but digital apps and products are also integrated into everyday situations. Instead of offering isolated products on a website, companies therefore began to address consumers right at their 'point of need' –

[1] These issues are adequately developed in the dedicated chapter to banks evolution.

on e-commerce platforms, in apps from mobility service providers or on comparison portals (Hensen & Kotting, 2022). Although embedded finance has its foundation in open banking innovation, due to the allowance of third parties to access banking data via technical interfaces (i.e., APIs), this new strand is catching up the interest of Big Tech, which are increasing the offer of services like credit lines or Buy Now Pay Later (BNPL) services.

In this glance, Tech Giant benefit of two variables that make them gain a competitive advantage:

- An immeasurable catchment area, with millions of daily users who provide an indispensable source of big data;
- The mastery of innovation heritage worldwide.

Although incumbent banks attempted in leveraging their investments in automation, there is still a lot of ground lost they have to cover, revealing not to be able to acquire an economic advantage from automation costs. According to a Bain & Company report on Automation in Retail Banking, more than one third of the traditional financial intermediaries is not able to pursue cost savings on automation investments (Bain & Company, 2022). Although during the 2015-2019 timespan more than 80 million dollars have been invested in automation, results remain under the expectations. Nonetheless, investments in partnerships with Fintech will continue to increase, forecasting a performance improvement in the next years. The challenge of banking automation will face important issues, related to the rapidity of the evolutionary path, the practical opportunities given by the development guidelines and the opportunity to obtain stricter regulation on financial services supplied by technological firms.

1.4. Conclusions, future developments, and trends

The present chapter aimed at building a framework of the role of Fintech in the digitalization of financial markets, products, and services, as a sector that is living a considerable growth pace, in the context of economic dominance of Big Tech as monopolist of the innovative processes.

The innovative ecosystem was overviewed, considering the "Creative Destruction" theorized by Schumpeter, which is now halting, leaving a "digital desert", where the innovation process is obstacle by the dominant position of Tech Giants. Such firms, in fact, can count on their enormous penetration in the market, and the large-scale predominance in daily life utilization of their technology, which is not only internally developed, but most of the time absorbed by acquiring patents and innovative start-ups. In this

glance, the majority of the economic sectors are living a depressed period, in terms of innovative disruption, since such processes have been gradually reducing their impacts.

This trend is someway inverted by Fintech, which demonstrated to be resilient to Big Tech absorption since they have developed several features which make them a *unicum* in the innovation heritage. First, the continuous and rapid evolution of digital finance enhanced the creation of Fintech ecosystems, where the interaction of multiple small and medium agents has been able to influence an entire economic sector at a macro-level. Thus, the share conquered by Fintech in the financial industry has earned them a relevant role in money management, without losing their innovative potential, which is still increasing and gaining further consideration by incumbent banks.

The latter, on the other hand, are affected by a huge delay in the digitalization process, chasing new ways of innovation with many unfruitful efforts. How research demonstrates, automation investments made by incumbent banks turned out to be not profitable for more than one out of three banks, which are still seeking for a new positioning in the evolving scenario.

The lack of *know-how*, and broadly, of a human capital which is endowed with digital skills and competencies, is one of the weakest links of the innovation capability of traditional banks. In this framework, the role of Fintech is essential in supporting financial intermediaries in carrying on that evolution that is pushed by the continuous changes in customer needs and wishes. This consideration opens to another important issue, that is related to the integration of digital financial services with other non-financial core businesses.

The phenomenon of embedded finance, which is not totally new in management studies, has evolved through the landing of Fintech and Big Tech in the digital finance. Big Tech is insisting in the integration of diversified segments, in order to expand their market share that is based on their competitive advantage given by the disposal of a great amount of big data, so as the large-scale utilization of their technologies.

What shall banks do, then, to resist to the attacks of the Tech Giants, which already left towards the conquer of the digital financial ecosystem? Implications to the evolution of such scenario are twofold: on a managerial perspective, the risk assessment of incumbents' positioning in the market shall incentive to insist on a hard solution, which is supported by the role of Fintech in the implementation of digitalization of traditional banks; on the other hand, a soft solution would mean to create an environment of coopetition among incumbent banks, Fintech and Big Tech, where the solutions brought from embedded digital finance would appear as a win-win for each

sector. Such implication should also consider the role of customers and the satisfaction of their needs.

Customer loyalty and trust towards traditional banks decreased after the numerous scandals happened since the 2008 global financial crisis, and a new approach to customer relationship management would pay off to banks the price of the investment in innovative solutions. On a policymaker perspective, the main concerns regard the implementation of up-to-date regulations, which are able to accomplish the resolution of digital financial resilience, risk containment and stability of the system (EC, 2020).

The European Union has been considering the issue of a new regulatory in matter of digital payments, i.e., the PSD3, which will take the place of PSD2. This last law enforcement is particularly needed for some reasons, first of all the evolution of payment methods since 2015 and the entrance of new players in the electronic payment market.

Another aspect of novelty is given by the further need to boost competition on the markets. Among the gaps we find the standards that are often not shared and that implies a different behaviour from banks, hindering access in some way. The data provided by the banks are superficial, no descriptions are provided, no payment reasons details; banks often choose a single sandbox and block access to providers other than those they have chosen. Thus, such processes of customer identification are not efficient, redundant, and cumbersome. From the point of view of consumers, PSD2 has introduced opportunities in the field of data security and access to third-party partners but have reduced the customer experience.

Moreover, PSD3 aims to further reduce the risk of frauds and scams, which have increased proportionally with the entrance of many new competitors on the market. Finally, another aspect to be taken into account is related to the demand for more transparency on costs on payments made to non-EU countries. PSD2 has altered the market making it powerful and creative, but all the solutions made available have many limitations in terms of interoperability and standardization.

Finally, an additional observation ought to be made about digital currencies (which have been handled in a specific chapter), which are considered an instrument for monetary policy, which are monitored by Central Banks, and require themselves appropriate regulatory frameworks to counterbalance the private initiative of Big Tech in this segment too.

In this glance, there is the need for harmonization at a whole European level. To conclude, the policy implications are seen as an effective instrument to mitigate the risks and to balance the sphere of action of incumbent banks and full-digital finance providers.

2. MONEY AND PAYMENTS IN A DIGITAL FINANCIAL SERVICES ERA

Abstract

Since a decade ago, the economic market began a trend of increased computerization. Due to numerous disruptive occurrences in recent years, the framework is changing more quickly than it did before. The digitization of the financial system was strengthened by cutting-edge tools like cryptocurrencies, electronic money, and digital payments, though not without risk. In recent years, Central Banks have supported new directions in evolution and researched and the development of so-called Central Bank Digital Currencies (CBDCs) to assure financial stability and innovation. The current study presents a literature assessment of the ongoing research on the financial environment's digital transformation, with an emphasis on the development of a digital money, with implications on payments and monetary policy. A focus is implemented on the creation of the Digital Euro. In order to study insights on the subject under consideration and address potential future research, a bibliometric analysis of 586 documents pulled from the Scopus and WoS databases was done. The findings indicated a rising interest in these subjects, particularly those pertaining to the deployment of monetary policy instruments that can rest their pillars on the new frontiers of innovation related challenges, especially in terms of cybersecurity and financial digital transformation.

Keywords: Financial digital transformation; Digital Currency; Bibliometric analysis; Blockchain; Electronic payments.

2.1. Introduction

Everyday life and the economy are experiencing disruptions in key areas because of the effects of digitalization (Ponce, 2020). Furthermore, a demo-

graphic shift is also occurring in which baby boomers are being overcome by millennials (Tilford, 2018), and this entails the use of new approaches in managing ever-day issues.

The process of digitalization also encompassed the monetary system, and this led to the creation of new and revolutionary payment methods as well as the emergence of digital money and cryptocurrencies (IMF, 2019; Barontini & Holden, 2019). A prominent part of the population still prefers using digital money; however, this trend is challenged, and new consumer segments are using alternative and digital methods more frequently (KcFED, 2020; Bank of Italy, 2021; ECB, 2022). In addition to this, the COVID-19 pandemic also significantly increased digital transactions as a result of social distancing and lockdowns leading to an increase in e-purchases and a reduction in physical transactions. The state of increased digitalisation and reduced need for physical cash lead banks and other financial institutions to offer more none-cash payment related services (ECB, 2020; BIS, 2021).

Physical payments remain an essential part of the financial system, however digital versions are gaining new importance especially due to the fact that bank-based services are being challenged by none-financial institutions like PayPal, Amazon Pay, etc. Furthermore, the emergence of cryptocurrencies like Bitcoin and Ethereum is challenging the traditional notions that regulated the baking and monetary system which is leading governments and Banks to rethink their services and the assets they offer as their main service pillars (ECB, 2019).

In fact, some Central Banks have been actively looking for the chance to introduce their own Central Bank Digital Currencies in recent years (CBDCs). The goal of such a plan might be to completely replace physical money as a frequently used liability by introducing the digital form of money in the near future (Mancini-Griffoli et al., 2018; Auer et al., 2020a, 2020b).

There are concerns about the rise in efficiency in many economic processes as a result of the move to digital money systems, which has garnered significant interest in public discourse on both the public and private sides (Barontini & Holden, 2019). On the other side, some worries about data protection, financial inclusion, and digital safety and security emerged (de Almeida et al., 2018; Senyo & Osabutey, 2020; Keister & Sanches, 2021).

Given all the mentioned point above it is important to understand if the changes in the global monetary system, due to digitalization, will create new benefits for global commerce and the economy or if it will incite many negative issues that will be hard to overcome.

With a specific deeper focus on the Digital Euro and the role of the European Central Bank, the current study's goal is to comprehend the state of the

art of research surrounding the process of digitalization of monetary systems and potential developments in the field of digital currencies. We gathered academic and related publications from the "Scopus" and "WoS" databases in order to analyse the prior literature before developing the analysis of the current framework. We then performed a bibliometric analysis on the publication extracted to measure the impact of the selected subjects in the literature. In order to give important theoretical and practical implications for academia, governments, and financial institutions, the results have been refined. Given that the topic is so novel in the literature, this element is crucial for emphasizing the significance of the current study. We believe that this area will be very important for academic research in the near future, and this study aims to help chart the course for what we see as a difficult intersection between research and innovation.

The chapter is organized as follows. The upcoming section is devoted to the analysis of the extant literature as a preparatory work for the bibliometric analysis. Furthermore, this method is extensively described in the methodology section. After this we consider the results of the bibliometric analysis. Finally, we discuss the findings and offer a conclusive summery of all the results, implications, and potential future paths for research.

2.2. Theoretical Background

A significant disruptive process needs to be taken into account in order to comprehend how the trend toward digitalization has led us to theoretically and practically confront the revolution taking place in the monetary system today. Although the discussion of digital money didn't start to heat up until recently, the advent of digital business and e-commerce (in the 1980s) forced early scholars to grapple with the problem of electronic payments (Byron et al., 1981).

It is obvious that in the early 2000s, the revolutionary idea behind Bitcoin made it possible to create cryptocurrencies and peer-to-peer money transfers that were unconstrained by state controls. The blockchain is a technology that has fuelled the emergence and growth of this new ecosystem. Private businesses have expanded their size and relevance in the financial world through the provision of this infrastructure, putting the dynamics and stability of the entire system at danger. In fact, as private organizations became more significant in the development of a separate, unregulated financial ecosystem, worries about security, data protection, and financial inclusion increased (World Bank, 2016; Fletcher et al., 2021). Furthermore, the Mediobanca report (2021), estimates that the PayTech industry in 2020 had a turnover of more than €140

Bn, with a projected growth rate of 14.4% in 2021. Everywhere there is a significant impact by this issue, with developing nations experiencing more stable growth rates (especially, Latin America).

This prompted the development of new financial and monetary tools, as well as the facilitation of the investigation, testing, and verification processes, by Central Banks in the process of creating CBDCs. This new digital fiat currency is a reaction to the decentralization of financial authority that has been facilitated over the past ten years by the emergence of cryptocurrencies, private tokens, and the sharp decline in the use of physical money. The rise of cryptocurrencies, private tokens, and the rapid fall in the use of real money over the past 10 years have all contributed to the decentralization of financial authority, which is why this new digital fiat currency was created.

Soderberg et al. (2022) assert that there are numerous economic and policy objectives associated with the development of CBDCs. First and foremost, it seeks to provide financial inclusion for those who receive insufficient assistance from financial institutions (Dev, 2006; Kapoor, 2014; Ozili, 2020). The pursuit of this objective is unquestionably important because it can only be accomplished by encouraging population access to digital technologies.

The business model of private banks that results from the launch of a digital currency from a central bank is the subject of another important flow in the literature on CBDCs. Many academics believe that the advent of CBDCs may result in the displacement of private banks and the disintermediation of private lending institutions (Keister & Sanches, 2021), such as a raise in interest rates for bank loans (Mersch, 2017), or the jeopardization of stable funding for banks (BIS, 2018). According to Meaning et al. (2018), the drawbacks of the development of CBDCs may outweigh the positive effects.

Additionally, several research concentrate on identifying the architecture supporting the operationalized business models by Central Bank to issue and manage the retail of digital currencies (Central Bank of Bahamas, Eastern Caribbean (7 countries), and Nigeria). Other 15 are testing a pilot version of their digital currency, with positive results, including Sweden, China, and the Russian Federation (Atlantic Council, 2022). Larger players like the US Federal Reserve and the European Central Bank (ECB) are still in the research stage. The ECB specifically sent out a survey to citizens to determine whether they were likely to accept a digital euro. The ECB then officially announced its digital euro project in July 2021, preparing for the potential to introduce it, while the ECB began working on its design in October 2021 (ECB, 2022). The ECB policy strategy states that the main goals of developing a centrally backed digital currency are to reduce the risks to financial stability, strengthen the Euro's position as a global reserve currency, and

establish robust regulatory frameworks for the dynamics of the digital monetary system (Bindseil, 2021).

The purpose of the current study is to conduct a bibliometric analysis based on those theoretical pillars in order to give a comprehensive theoretical framework of the existing literature from two perspectives: on the one hand, pursuing the goal of identifying research gaps that need to be addressed in the area, which is noted to be a relatively innovative topic given how recently it has evolved; on the other hand, under managerial, policy, and governance vantage points, results are helpful outcomes to deliver beneficial implications.

More information on the used methodologies is provided in the section that follows.

2.3. Methodology

We conducted a bibliometric analysis of academic papers to better understand the state of the art on the trends in research on Central Bank Digital Currencies.

Bibliometric analysis is preferred among several other methodologies for many reasons. It can be used to spot trends in journal and article performance, collaborative research initiatives, and the level of understanding within a body of literature (Donthu et al., 2020; Verma & Gustafsson, 2020; Donthu et al., 2021). In addition, the characteristics of the data that are made available – both in terms of quality and quantity – can facilitate the testing of hypotheses or the development of subjective perceptions of the state of the art in a particular field of study. The structuring of sound and innovative new research directions could result from the effective implementation of bibliometric analysis methods. This methodology is beneficial for developing comprehensive perceptions of phenomena, identifying specialized areas within the study strands, creating intelligent proposals for additional research, and contributing to the body of existing literature. Despite the many benefits cited by academics, bibliometric analysis is still regarded as a relatively new methodology. Even though it is a novel approach it is highly acclaimed due to its analytical potential.

Utilizing information like the quantity of publications or citations, the bibliometric methodology condenses the features of quantitative methodologies (Broadus, 1987). In the business sectors of management, accounting, finance, econometrics, or other social sciences, it has just recently become widely used (Wallin, 2005). Recently, a few academics have considered using the current methods to investigate the realm of financial technology,

digital payments, and money (Merediz-Solà & Bariviera, 2019; Kyriazis et al., 2020). Subsequent years have seen an increase in the number of scientific publications using bibliometrics. However, the enormous bibliographic datasets proved to be burdensome and impractical for routine review procedures (Ramos-Rodríguez & Ruíz-Navarro, 2004). Fortunately, bibliometric data in huge numbers can now be handled quickly because of technological advancements in published databases like Scopus and Web of Science.

The unified approach is based on both distance and strength of relationships between nodes, with the following term minimised:

$$V(x_1, \ldots, x_n) = \sum_{i<j} s_{ij} d_{ij}^2 - \sum_{i<j} d_{ij} \quad (1)$$

where s_{ij} indicates the strength of link between keywords i and j, and d_{ij} represents:

$$d_{ij} = \begin{Bmatrix} 0 \; if \; x_i = x_j \\ \frac{1}{\gamma} \; if \; x_i \neq x_j \end{Bmatrix} \quad (2)$$

where γ is the resolution parameter, an arbitrary positive integer, that determines the number of clusters to be obtained (Van Eck & Waltman, 2007; Van Eck et al., 2010; Naciti et al., 2021).

Additionally, we utilized a chronological analysis of keywords with a weighted average of the years in order to evaluate the evolving trend of keywords in the literature through time. The average year of occurrence for a keyword is calculated by:

$$y_i = \frac{\sum_t (n_{it} t)}{\sum_t n_{it}} \quad (3)$$

where n_{it} represents the number of times that a certain keyword i occurs in year t (t = 1981, …, 2022; Galletta et al., 2022).

We conducted the bibliometric analysis on a series of documents obtained from the databases “Scopus” and “WoS – Web of Science”. In order to find the document that is the subject of our enquiry, we set up a number of research questions. The phrases “digital euro” or “bank digital currency” or “digital currency” or “digitalization” could be found in the keywords, title, or summary of the documents that were analysed. It was able to obtain a group of 586 documents published between 1981 and 2022 by choosing these keywords. As a result, the goal of the research was to map out the currently