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FINANCIAL INTERMEDIATION AND NEW TECHNOLOGY: THEORETICAL AND REGULATORY IMPLICATIONS OF DIGITAL FINANCIAL MARKETS

by Michele Lanotte^a and Maurizio Trapanese^b

Technological progress in finance has been accelerating over the last decade. In the future, it is likely that financial intermediaries may face significant challenges as regards their traditional business model and functions, since an increasing share of payments may be settled without banks' deposits and capital markets may increasingly provide direct credit to the economy. This paper aims to outline the theoretical and regulatory implications stemming from digital financial markets, with a particular focus on the growing importance of BigTech and FinTech firms. We study the importance of information and communication in financial intermediation, and outline the impact of technological progress on the core functions traditionally performed by banks and other financial institutions, and on payment systems. In this context, we discuss the role of public policies, and the main issues for regulation, supervision, competition, and consumer protection.

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1. Introduction¹

In the last decade, several factors, such as technological innovation, changes in the regulatory framework and in consumers' behaviour have been reshaping the financial services industry. Digital innovation has brought major improvements in connectivity of systems, in computing power and cost, and in newly created and usable data. These developments have brought about new business models and new entrants in the financial landscape.

As technology has increased information exchange and reduced transaction costs, the production of financial services may be unbundled and aggregated in different ways, allowing consumers to find and assemble their preferred suites of services and products. In this context, economies of scale and network effects play a pivotal role especially in e-commerce marketplace and platforms. These scale effects allow BigTech firms and other new players (e.g., agile start-ups and FinTech companies)² to deepen their inroads into core financial products.

Technological innovations in the field of information and communication challenge the traditional intermediation functions performed by banks. In particular, lending activities are challenged through digital platforms. BigTech firms are supposed to introduce more competition and can materialize the risk of a vertical disintegration for traditional intermediation functions. The provision of financial services by financial institutions can be challenged through the entry into financial markets of specialized competitors. These developments have the potential to increasingly render informational and communication advantages competitive components in the financial system, by reducing barriers to entry and weakening banks' traditional role as first point of contact for financial services.³

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² According to the Financial Stability Board (FSB), "BigTech firms are large technology companies with extensive established customer networks. Some BigTech firms use their platforms to facilitate provision of financial services". BigTech can be seen as a subset of FinTech firms – a broader class of technology firms that offer financial services (FSB, 2019). Usually, FinTech firms are smaller than BigTech companies including Google, Apple, Facebook (Meta), Amazon and Microsoft (GAFAM) in the United States and Baidu, Alibaba and Tencent (BAT) in China. For these definitions, see FSB (2017), FSB (2019), Carstens (2018), and Stulz (2019).

³ The impact of technological progress on the efficiency of the allocation mechanisms of savings between economic agents as well as the implications for the functions traditionally performed by banks and other financial intermediaries are outlined in a number of theoretical and empirical contributions. These papers come

The business model of these new comers is based on the interactions with users and their data. BigTech firms are expanding their footprint in payment and financial sectors using big data to scrutinize their customers.⁴ In order to react to this situation, incumbent financial institutions are adapting their business models, reshaping their products by leveraging on new technologies to improve efficiency. In this new environment, customers' data play a pivotal role. User data represent a key variable to identify and develop customized services.

However, classic economic drivers continue to play a significant role even in the digital era. Economies of scale and scope and network effects are present in many aspects of financial services production, including customer acquisition, funding, compliance activities and data. Despite advances in technology, consumer search and assembly costs remain material. These forces encourage re-bundling, and confer advantages to large multi-product providers.

The result of this change is an increasing level of competition, a reduction of entry-market barriers, a reshaping of the market definition, since the traditional elements used for identifying a specific market are progressively changing.

In some jurisdictions (e.g., China, and India)⁵, BigTechs play a substantial role in the retail payment system. The rapid growth of instruments such as stable-coins or other FinTech initiatives can affect significantly the role of monetary policy in case the banking system is crowded out by these new solutions. Moreover, concentration risks may increase in the provision of financial services to end-users, and in the provision of strategic infrastructure, given that a few non-financial market operators are assuming dominant position in the value chain (for instance, cloud providers) at global level. This can exacerbate the systemic risk at worldwide level and affect financial stability.

These developments pose several policy challenges for regulators. The traditional public policy goals in areas such as financial stability, competition, and consumer protection have to be revised in the light of this new economic environment. The complexity stemming from the new eco-system can exacerbate the traditional trade-offs between stability and competition and efficiency, and consumer protection and privacy.

from international organizations, academic authors and national authorities. They are broadly in line with our assessments and conclusions. See for these strands of literature the following: Boot et al. (2020); Cardillo et al. (2021); Claessens et al. (2018); Cardillo et al. (2022); The Economist (2021).

⁴ BigTech firms usually offer financial and payments services mainly through supervised financial institutions. In Europe, for instance, many BigTechs have set up either payment institutions (PIs) or electronic money institutions (EMIs) to distribute their products. In other cases, the preferred strategy is a partnership with incumbents.

⁵ In China, for example, BigTech firms had by 2018 already processed payments equivalent to 38 percent of GDP (FSB, 2020).

It is important that policy makers are able to deliver a clear answer to the challenges posed by the technological innovation in order to reduce the uncertainty, ensure financial stability and level playing field without detriment of the consumer protection. Moreover, a fast reaction would be very useful in order to try to anticipate possible future developments. Once more, cooperation across jurisdictions at the international level represents a crucial aspect in order to ensure a stable growth of financial markets since in a digital environment risks can be spurred very quickly and affect different economic sectors. High regulatory standards and common best practises are key tools for ensuring correct market practices and sound risk management.

This paper is organized as follows. We start with a theoretical analysis on the importance of information and communication in financial intermediation, thorough the categories outlined in the economic literature about delegated monitoring, adverse selection, and moral hazard. In this context, we study the existence of communication frictions and the fundamentals for relationship banking (**paragraph 2**). Then, we examine the recent technological innovations in financial services industry, especially the growing importance of BigTech and FinTech firms, and show how this technological progress may impact on the core functions traditionally performed by banks and other financial intermediaries (**paragraph 3**). Subsequently, we pay attention to the main technological changes occurred within the payments systems, in terms of mobile payments and open banking where BigTech and FinTech play a pivotal role (**paragraph 4**). Finally, we assess the role of public policy and the main policy challenges that can help shaping the future financial system, with a special focus on prudential regulation and supervision, competition and consumer protection policies (**paragraph 5**). **Paragraph 6** concludes.

2. Information and communication in financial intermediation: the theoretical debate

This paper adds to the existing economic literature by discussing how the recent technological innovations have the potential to render informational and communication advantages competitive components in the financial services industry. This happens by reducing barriers to entry and weakening banks' traditional role as first point of contact for financial services or bridge between borrowing firms and depositors.⁶ The widely observed innovations in information technology during the last years may erode both location and inside private information as sources of bank profitability.⁷

⁶ See De Bonis and Ferrero (2020).

⁷ For example, Petersen and Rajan (1994) document dramatic increases in distance and substantially changing modes of communication between small firms and their lenders in the US in the last 25 years.

2.1 Delegated monitoring, adverse selection, and moral hazard

The economic theory has outlined the role of two key factors in shaping financial innovation: information (in terms of data collection and processing) and communication (in terms of relationships and distribution of financial products and services). In these two areas, financial intermediaries overcome a number of frictions in order to allocate savings into investments more efficiently: in the field of information, the reference is to adverse selection and moral hazard, and for communication, to space/time distance among economic agents.

These frictions represent essential components in the functioning of the modern financial systems, allowing financial intermediaries to acquire a significant degree of market power, which is exercised through informational and/or spatial capture of their direct counterparties at the cost of effectively discouraging the entry of new actors in the markets. The impact of digitalization on these factors is enormous and is expected to increase in the years to come, due to the changes in the structure of financial intermediation.⁸

To resolve information frictions, financial intermediaries, above all banks, collect, manage, and screen a large amount of information on risky investment projects proposed by their borrowers (that is non-financial firms). This typology of relationship and decision making and the associated adverse selection/moral hazard issues among a high number of actors have been analysed by the theory of financial intermediation since Diamond (1984).

This strand of literature draws the attention upon the delegation to an intermediary of the task of monitoring loans granted to firms, while minimizing the cost of such a delegation, which is useful for resolving incentive problems between lenders and borrowers. The bank has gross cost advantages in collecting private information on its direct borrowers, because the possible alternatives are too expensive, in terms of either a duplication of efforts in the case each lender monitors directly its own borrowers or a free-rider outcome, where no lender makes any monitoring activity. This analysis defines the determinants of incentive problems among economic agents and delivers a model in which a financial intermediary shows a net cost advantage relative to a system centred upon direct relationships between savers and borrowers.⁹

⁸ For an overview of these trends see: Petralia et al. (2019), and Stulz (2019), who present quantitative evidence of the impact of new technology on banking and financial markets; Claessens et al. (2018), who give a detailed description of these new developments on credit activities across a large number of countries; Vives (2019), who outlines the competitive consequences from tech firms and their impact on business strategy of other lenders, namely banks.

⁹ Before the Diamond paper, the classical economic literature had outlined some possible cost advantages for banks in delivering such a delegated monitoring. However, this literature failed to deliver a clear theoretical framework of the specific reasons that ensure this net advantage of intermediation over direct relations among

The net cost advantage belonging to financial intermediation is mainly due to diversification, even in a risk neutral economy. Diversification within a financial intermediary is the crucial element to understand why there is a net benefit (that is a reduction in costs) from delegating monitoring to an intermediary which is not monitored by its own depositors.

Two types of diversification are considered: one is the traditional diversification by subdividing independent risks, while the other is diversification by adding more independent risks of a given scale. According to Diamond, the intuitive reasons for the value of diversification are different in a model with risk neutral agents from the one with risk adverse agents. In the first model, diversification increases the probability for the intermediary to have sufficient loan returns to repay depositors. In the second model, diversification increases the intermediary's risk tolerance towards each loan, allowing the risk bearing necessary for incentive purposes to be less costly.

Delegated monitoring models predict well diversified financial intermediaries, which allow better contracts to be used and Pareto superior allocations. Their capital structure is mainly composed of debts (deposits), with – despite this high leverage – a low probability of failure. Commercial banks, insurance companies as well as financial conglomerates are considered to be the most obvious applications of such models in the financial system.

An interesting implication is that intermediary's assets are illiquid. This is because the intermediary is delegated the task of observing information about each loan which no one else but the borrower observes. The centralisation of monitoring each loan by a single intermediary means that there are not active markets for these assets. And this is another reasons why financial intermediaries might improve on allocations with respect to competitive markets.

The model proposed by Diamond (1984) is related to other two strands of economic literature, while improving on their theoretical assumptions and results: 1) the single agent-single principal models, which define conditions when monitoring additional information about an agent is key to resolve moral hazard problems. Diamond extends these analyses to costly monitoring in a many-principal-settings (where principals are depositors of an intermediary or security holders of a firm); 2) the theory of financial intermediation based upon imperfect information. Diamond adds an explicit analysis of the costs and benefits of this delegated monitoring and the conditions under which financial intermediation becomes feasible and convenient. The result is that delegation costs tend to

agents. For example, Schumpeter (1939), in assigning this delegated monitoring to banks, stressed the importance for the banker to know not only the financial elements of the transaction at stake, but also “the customer, his business and even his private habits”. In some cases, the costs of monitoring were considered to be so high that in the limit there was no valid economic reason in using an intermediary. Such a situation - always quoting from Schumpeter – was considered to be “sufficient to turn the history of capitalist evolution into a history of catastrophes”.

go to zero, implying that asymptotically no other delegated monitoring structure has the potential to bear lower costs.¹⁰

The role of intermediaries' capital in calibrating this delegated monitoring is stressed by Holmstrom and Tirole (1997), who draw their results from the empirical evidence coming from the episodes of credit crunch occurred in a number of developed countries during the 1990s. The modelling approach chosen in this paper does not contain features that would imply the definition of a special category of eligible financial institution. In this respect, the monitoring intermediary could be a bank, an equity holder, a venture capitalist, or any other. These authors develop a principal-agent model potentially able to replicate some of the stylized events occurred in the nineties and thereby to highlight the role of different kinds of capital constraints.

Repullo and Suarez (1995) use a similar moral hazard model to study how the firm's net worth determines the choice between direct and indirect financing. Hoshi et al. (1992) go in the same direction. However, in all these papers intermediaries do not appear to be capital constrained and there is no evidence for a positive role of intermediaries' capital in determining the intensity of the delegated monitoring.

These analyses show how the distribution of wealth across firms and financial intermediaries affects investment decisions, interest rates, and the intensity of delegated monitoring. Any form of capital tightening affects poorly capitalized firms the most, while each such shock has a sizeable effect on interest rates, monitoring intensity, the solvency of intermediaries and firms' leverage depending on relative changes in the components of capital. In such a model, a firm's net worth determines its debt capacity: borrowing firms with substantial net worth can rely on cheaper, less information-intensive finance; firms with low net worth have to rely upon financial intermediaries, who can reduce the demand for collateral by monitoring more intensively (meaning that monitoring becomes a partial substitute for collateral).

However, not all firms can be monitored in equilibrium, because intermediaries have to maintain some regulation or market-determined levels of their own capital. So in the market for monitoring, the interest premium paid on monitoring capital depends upon the relative amounts of firms' and intermediaries' capitals. When monitoring capital decreases, poorly capitalized firms are the first to get squeezed (and credit crunches increase the interest rate spread between intermediated and market debts). If banks are allowed to vary the intensity of monitoring, then the model finds that

¹⁰ Papers representing the first approach are Harris-Raviv (1979), and Holmstrom (1979). Leland-Pyle (1977), and Chan (1983) contain the main elements of the second strand of literature.

an increase in monitoring capital relative to firms' capital leads to lending that involves more intense monitoring elements.¹¹

All in all, in these models the issue of diversification, the degree of firms' leverage, and the capital structure of financial intermediaries are closely correlated and contribute to determine the intensity of the borrowers' delegated monitoring.

2.2 Communication frictions and relationship banking

To deal with communication frictions, financial intermediaries tend to engage in repeated interactions with their borrowers, facilitating the collection, processing, and re-use of their information. The importance of communication in determining the structure of the financial industry and the emergence of new intermediaries or actors active in each segment of financial intermediation is rapidly increasing, as it is the case in these years for the entrance in the banking markets of new tech firms, and tend to overtake that of information.

According to Boot et al. (2020), banks have historically built massive branch networks to act as 'the first point of contact' for their customers in the entire domain of financial services. Building on this capacity, the literature on financial intermediation has outlined the role of banks as 'relationship lenders': the proximity between banks and borrowers has been indicated as the essential factor to facilitate monitoring and screening, and to resolve problems of asymmetric information.

Following Petersen and Rajan (1994), and Berger and Udell (1995), a large amount of theoretical literature has proposed some variables, such as age, intensity, or exclusivity, as key explanations in order to characterize relationship banking. Boot and Thakor (1994) show theoretically that relationship lending improves credit conditions for firms mainly through lower interest rates.¹² In their view, relationships helps explaining the comparative advantage of an incumbent bank over new lenders. Relationship banking allows possibly unique contractual features, including flexibility and discretion, the extensive use of covenants, and the inclusion of collateral requirements. These

¹¹ These findings appear to be consistent with the Scandinavian experience in early 1990s, where the banking sectors of Sweden, Norway and Finland have been most severely hit by the credit crunch and had to be rescued by their governments at a very high price. The financial crisis hit small and collateral-poor firms the hardest. Larger firms were less affected as they could renegotiate their loans or go directly to the commercial paper or bond markets. Scandinavian banks have begun to invest in more information-intensive lending technologies in the wake of reduced firm collateral.

¹² Empirical evidence on this issue can be found in: Harhoff and Korting (1998), as to German banks; Degryse and Van Cayseele (2000), as to Belgian banks; Berlin and Mester (1999), as to US banks; Dimitri et al. (2010), as to Italian banks; Lopez-Espinosa et al. (2017), as to Spanish banks. See also Bolton et al. (2016).

contractual features may facilitate implicit long-term contracts and resolve agency and information problems (Boot, 2000).¹³

However, there are also some costs to be borne in relationship banking. The flexibility of bank debt (in particular the possibility for renegotiation) may give rise to perverse ex ante incentives on the part of borrowers. A potential solution could be to grant the bank claim a higher seniority or collateral in order to reinforce bank bargaining position vis-à-vis the borrower and facilitate timely intervention.¹⁴

The proprietary information about borrowers obtained by banks may give them an information monopoly, allowing higher interest rates charged on loans (Rajan, 1992). The threat of being informationally captured by the bank may make the borrower reluctant to borrow from the bank, implying that investment opportunities may be lost. Alternatively, firms may choose to enter in multiple bank relationships. This option may reduce information monopoly, but at the cost of worsening the availability of credit. This happens because multiple banks may cause too much competition ex post, reducing lending to 'young' or new firms.¹⁵

Financial intermediaries are able to exert a significant degree of market power due to their information and communication advantages over outside competing lenders. The economic literature has long debated over the relative efficiency of a relationship-based banking system (where a firm is locked into a relationship with a single bank) compared to a transactions-based system where many banks - or even other financial intermediaries - compete for each transaction a firm undertakes.

However, while the benefits of bank financing are relatively well understood, the associated costs are not. The real cost of bank credit is that banks acquire bargaining power over firms' profits, since the bank can monitor the firm and control its investment decisions on the basis of the amount of private information acquired on the firm's projects, while outside competitors face adverse selection problems. In doing so, the bank alters the division of profits between itself and the firm,

¹³ Puri and Rocholl (2008) investigate the reasons for which banks treat their retail customers well, as opposed to an alternative behaviour in which banks pass on 'lemons' to their retail depositors. Using data derived from the German banking markets, they find that cross-selling could be a valid explanation for retail banking relationship becoming so important for banks. Their evidence suggests that banks benefit - the economic magnitude is found to be relatively large - from an increase in both brokerage accounts as well as other retail products such as retail loans, which tend to be significantly related to equities underwriting.

¹⁴ Bolton and Scharfstein (1996), and Dewatripont and Maskin (1995) indicate that when the bank has a sufficient degree of seniority, the senior claim can insulate the bank from the unintended consequences from these perverse incentives on borrowers' side. This because the value of the claim becomes less sensitive to the firm's total value and hence the bank's action. The bank could be now credibly threatened to call the loan and this threat helps in imposing its wishes upon the borrower.

¹⁵ For these considerations about banks' lending to new entrants, see See Ongena and Smith (2000).

distorting firm's incentives. In this case, the firm may prefer to obtain credit from arm's-length sources (that is, going directly on the markets), in order to reduce the bank's ability to extract firm's surplus without diminishing its control.¹⁶

Similarly, the economic literature has examined the issues stemming from communication-related 'spatial capture', essentially due to search, switching and transportation costs, potentially allowing banks to price discriminate among customers (Boot et al., 2020).

A number of studies has investigated the effect of geographical distance on bank loan rates, taking into account the distance between both commercial borrowers and their bank branches and commercial borrowers and other competing banks. Loan rates decrease with the distance between the firm and its lending bank, while increasing with the distance between the firm and competing lenders (Degryse and Ongena, 2005).

Increasing distance between the borrower and alternative lenders significantly relaxes price competition and results in higher borrowing costs for the firm. In this analysis, transportation costs (not asymmetric information) are to be considered the main explanations for the observed spatial price discrimination in financial contracts. These findings highlight an important source of rents for financial intermediaries based on location.

It is important to note that location rents differ from rents derived from customer switching costs, which are attributed to widespread informational asymmetries (Sharpe and Steven, 1990, and von Thadden, 2004). The capacity of financial intermediaries to overcome information and communication frictions tend to create barriers to entry, making the provision of financial services less contestable. These circumstances have been associated in economic literature to stable and forward-looking financial intermediaries. This in turn can be transformed in a net Pareto improvement for non-financial firms.

3. The impact of technological progress on core intermediation functions

The recent technological innovations in the field of information and communication may challenge traditional intermediation functions and banking activities (The Economist, 2021). In the decade after the global financial crisis (GFC), banks have been confronted with a low-interest-rate environment, deleveraging efforts, and increased regulation and compliance costs. Furthermore, banks have dealt with the competition in retail financial services by financial technology and

¹⁶ The welfare effects of borrowing from a bank rather than arm's-length sources is ambiguous, given that the benefits of being bank-controlled have to be weighed against the costs of distortions. The firm tends to choose its optimal borrowing structure, with the objective to reduce the bank's control-appropriated surplus. The two fundamental variables in guiding this strategy are the level of initial borrowing from the two different sources and their relative assigned priority (Rajan, 1992).

platform-based competitors.¹⁷ The traditional banking activities have been moving away from being performed in physical branches to using much more information technology and big data, along with highly specialized human resources.

In parallel, a higher proportion of financial intermediation is being conducted through the markets, implying that financial sectors are more intertwined and other non-bank financial intermediaries have gained prominence in the allocation of savings into investments, with the effect of reducing banks' market share. Stulz (2019) reports claims from primary US consulting firms, according to which some key developments occurred after the GFC, such as digitalization and market-based finance, would make most financial firms irrelevant by 2030.

However, data from market capitalization, assets and market shares for banks in a number of important jurisdictions in the last decade indicate that these intermediaries are far from being considered as irreversibly declining institutions. Notwithstanding their growth, the role of FinTech platforms within overall lending activities and capital allocation remains limited in all the advanced economies (Cardillo et al., 2022). This does not mean that banks can ignore the recent trends and not take in due account the threats and challenges that new technology firms may represent for their business model and functions in the intermediation process.

According to Cardillo et al. (2021), traditional banks are rethinking their business model to address the following main challenges stemming from the developments emerged in the last decade: low interest rates, tighter regulation, technological innovation, and increasing competition from market-based finance. In this context, banks will likely have to exploit the benefits of digitization, through the reduction in operating costs and the increase in the scale of production.¹⁸

BigTech and FinTech firms are entering banking markets because of the high complementarity between the financial services and the customer knowledge they have and the products they are able to offer. BigTech firms have the ability to challenge banks across a large number of product lines, while the typical FinTech firm is a specialized firm that challenges a specific product line of banks (for example, loans). These companies are organized around two-sided platforms. The browsing and

¹⁷ Digital disruption in finance is driven by factors on the supply side (mainly technological developments, such as internet application programming interfaces, cloud computing, smartphones, digital currencies, and blockchain technology) and demand side (mostly linked to higher customer expectations resulting from the digitalization of commerce, the real-time transaction capability of internet-connected devices). For a detailed overview of both these factors, see OECD (2018), Adrian and Mancini-Griffoli (2019). According to Vives (2019), demographic factors and the decline in reputation of traditional financial intermediaries also play a role, as younger generation are more likely to adopt innovative products from digital banks. The Economist (2019) says that 85 per cent of the millennials in the US (i.e., people born from 1981 and 1996) use mobile banking, and the forecast is even for higher share for the generations born after 1996.

¹⁸ See also FSB (2020), FSB (2021), ESRB (2022).

transacting of both buyers and sellers on the platform create a very large amount of data, which allow these firms to understand the evolution of consumers' preference and adapt their selling strategies.

Digital technology is changing the demand for financial services and is leading the sector to be more customer-based. It may have a large impact in terms of augmented competition and contestability of banking markets, while improving efficiency and innovation, enhancing supply diversity, and bringing to a more competitive financial system globally. Moreover, financial inclusion through countries and economic sectors may increase.

It is likely that these developments may put pressure on the margins of the incumbent intermediaries, bringing them to an increased risk-taking in order to preserve existing rents and profits, with the result of potentially undermining financial stability across the board. Pareto optimal solutions would require that incumbents would undergo severe restructuring of their business models simultaneously and that new entrants gain market shares because of their efficiency and not because they bypass regulation or monopolize customers to extract rents. Regulators should try to govern these emerging risks, through an appropriate policy response that is able to preserve financial stability, while accommodating these new market trends (Rajan, 2006; and Vives, 2019).

3.1 Challenges to banks' specificity

In order to fully understand the challenges banks are (or will be) confronted with, it is necessary to start investigating how the specificity of banks is undergoing significant changes due to the rapid observed pace of technological progress.¹⁹

Preliminarily, it is worth recalling that the role/function of banks in financial intermediation is considered to be 'special' because they are in a position to:

- 1) Perform maturity transformation activities and interact directly with savers and borrowers, when they create deposits and make loans (i.e., they act as vertically integrated financial intermediaries). This function, as we have explained in the previous paragraph, is accompanied by the monitoring of opaque loans that would not be funded directly by the market;
- 2) Provide services where they act as agents/brokers with no direct risk taking (wealth management, advisory services, payments); these services are built upon information and communication synergies derived from banks' core functions performed under 1) above.²⁰

¹⁹ Here we follow the categorization of intermediation functions and banking activities as outlined in Boot et al. (2020), and we do not go through the specificity banks have due to their operations with central banks.

²⁰ For example, information derived from payments can help monitoring loans, information from lending can assist underwriting, and communication channels with depositors can foster cross-selling of financial products (i.e., they behave as horizontally integrated financial intermediaries).

These two functions rely on information processing of hard information, verifiable and codifiable, and soft information, based on relationships banking. Digital revolution has greatly increased the importance of hard information and the tools that are available to process it, namely artificial intelligence (AI), machine learning (ML), application programming interface (API) through the use of big data (Vives, 2019).

Because of the combination of these two functions, banks are inherently fragile intermediaries and offer the potential for systemic consequences from their failure. This is why banks are under a comprehensive regulatory system, the core of which is represented by capital requirements, and under a safety net composed mainly by deposit insurance frameworks and lender of last resort function by central banks.

The vertical integration of financial functions performed by banks are challenged through digital platforms that compete with traditional financial intermediaries for direct access to customers. BigTech firms introduce an additional layer of intermediation between consumers and financial institutions, reducing banks' informational advantage, and appropriating an increasing share of their rents. Consequently, banks can lose direct access to clients and face the risk of a vertical disintegration for their traditional intermediation functions.

As to the horizontal integration performed by banks, innovations in information and communication allow the entry into financial markets of specialized competitors (for example, non-banks, and electronic payment services providers). These actors have been increasingly acquiring a prominent role in the areas of asset management, insurance, brokerage, advisory and payment services. In doing so, they are facilitated since these areas do not require a structured access to a balance-sheet; in other words, these activities can be undertaken without a significant credit risk-taking.

Traditionally, banks have been able to take advantage from their proximity to borrowers/savers and keep their profitability levels up to satisfactory levels mainly through the cross-selling of their own (or third-party-originated) financial products. For example, the asset management industry is still dominated by banks,²¹ notwithstanding non-banks are more competitive in offering similar services.²²

²¹ This situation seems to characterize more the European and in Japanese financial systems. In the US, this phenomenon is less prominent for reasons that may pertain to the structural separation imposed since 1930s between banking and asset management activities. However, since 1999, when the Glass-Steagall Act was repealed, many banking groups have begun to increasingly engage in asset management (Berzins et al., 2013, and Sialm and Tham, 2016).

²² Ferreira et al. (2018) indicate that mutual funds' performance is negatively affected when a management company is owned by a commercial banking group. They find that commercial bank-affiliated funds

However, this situation is not supposed to last in the future: the technology-driven distribution channels for financial services are expected to diminish banks' position as first/unique-point of contact among borrowers and savers, given that these new specialized providers are in a condition to have a direct access to final customers. These new firms do not suffer from organizational inefficiencies as large banks do; their lighter structures help them to be more efficient in the use of new technology. As a consequence, they may be able to be competitive over banks in a number of strategic profiles, such as price, speed, and convenience.

In addition to technological progress, the horizontal disintegration of financial services is also caused by regulation. Offering specialized financial services often does not require a full banking license, thus lowering the regulatory compliance costs of specialized entrants (for example, several jurisdictions only very recently grant licenses for the provision of electronic payment services). The communication-driven horizontal disintegration of financial service provision is different from past experiences that were mainly information-driven.²³ Since the current disintegration is driven by communication, it is less impeded by information frictions, and can induce deeper structural changes in financial service provision.

3.2 New technologies and efficiency in the financial industry

Understanding the growth and the driving forces of BigTech firms in finance is essential in order to assess the opportunities these technological developments may provide for enhancing financial intermediation and the associated risks (Frost et al., 2019).

These firms have broadened their presence in finance through an identified strategy, which shows common patterns around the globe. First, they start with the offerings of services in the field of payments (in some cases, framing their services upon the existing payments infrastructures). Thereafter, they expand their activities into the provision of credit, insurance, and savings and investment products (either directly or through other partner financial institutions).²⁴

underperform unaffiliated funds by about 92 basis points per year. Underperformance is higher the larger the size of the lending division relative to the asset management division and the larger the fund's direct exposure to the stock of the bank's lending clients. Several hypotheses have been put forward for this behaviour. In particular, when fund management companies are owned by commercial banking groups, this underperformance may be driven by a conflict of interest between the lending and the asset management divisions; alternatively, banking groups may impose Chinese walls to prevent communication between the asset management and lending divisions so that funds operate independently of other bank divisions.

²³ The reference here is to the originate-to-distribute model in the field of securitization; it was associated with incentive problems, driven by moral hazard and adverse selection.

²⁴ The presence of BigTech firms in finance is most advanced in some business segments in China, with Ant Financial (part of Alibaba Group) and Tencent, which provide financial services for retail and small business

The distinctive feature of their business model is the combination of two elements that allow them to provide services at almost zero marginal cost, namely: 1) network effects (determined by e-commerce platforms, messaging applications, search engine); and 2) technology (artificial intelligence, machine learning models, application interface programming). The provision of credit-related services to small retail clients is typically done with no human necessary intervention. They overcome information asymmetries using big data, artificial intelligence techniques and blockchain technology.

The entry of technology firms in credit markets can be explained by lower transactions costs, access to better information, or a superior screening technology with respect to incumbent financial institutions.²⁵ Fuster et al. (2019) study the effects of FinTech lending on the US mortgage market. Using loan-level data on the near-universe of US mortgages from 2010 to 2016, they find that FinTech lending model represents a technological innovation which reduces frictions in mortgage lending, such as lengthy loan processing, capacity constraints, inefficient refinancing, and limited access to finance by some borrowers.

FinTech lenders process mortgages faster than traditional lenders (measured by total days from the submission of a mortgage application until closing).²⁶ This result holds even when the sample is restricted to nonbanks, indicating that it is not accounted for by differences in regulation. In this analysis, faster processing by FinTech lenders does not result in riskier loans. FinTech default rates are about 25 per cent lower than those for traditional lenders. Moreover, interest rates are not economically significantly different (meaning that no ‘lax screening’ is occurring).

Financial intermediation performed by these new actors seems to be characterized by greater efficiency, with the potential to promote financial inclusion.²⁷ A number of comparative analyses derives useful insights about differences and similarities across jurisdictions as to the driving forces

clients. One of the Alibaba Group’s subsidiary is Alipay, which is the largest mobile payment company globally; this Group also operates a money market fund, which is the largest in the world (Yu’ Bao). Other BigTech companies are increasing active also in East Africa, Egypt, and India, through the entry into payment and banking-related services of Vodafone M-Pesa; in Latin America, with the e-commerce platform Mercado Libre; in Asia with Kakao Bank, KBank and Samsung Pay in Korea, Line and NTT Docomo in Japan and the payments and credit services of ride-hailing apps Go-Jek and Grab in Indonesia, Malaysia, Singapore; in France, with the banking services from Orange; and in the US, with Amazon, Apple, Facebook and Google offering payment services. Although the activities of BigTech firms in credit provisions are most pronounced in China, credit activity has also increased in other countries (Korea, US, Brazil, Argentina, and Mexico), even if on a reduced scale. This can be due to the presence of incumbent bank-based payment systems, and in some cases to regulation. See Frost et al. (2019).

²⁵ See Vives (2017), Philippon (2015), and Philippon (2018).

²⁶ See Berg et al. (2021).

²⁷ See Vives (2019) for this assessment on efficiency gains from BigTech and FinTech.

of BigTech and FinTech in finance. For example, Claessens et al. (2018) document the rise of FinTech lending in a number of countries, pointing out its main drivers, such as income per capita, regulatory stringency, and competition in banking. This paper is important also in the perspective of the implied policy response from the point of view of competent authorities in each country.

In some cases, FinTech introduces more efficiency in the financial system through a number of channels:

- it can more effectively screen borrowers via statistical models, overcoming the information asymmetries that are at the core of the traditional banking;²⁸
- FinTech lenders may be able to approve loans immediately;²⁹
- it reduces the need for personnel and for an extended (and costly) branch network, given that their customers use internet-based application;
- FinTech allows much more targeted price discrimination;³⁰
- FinTech firms can increase financial inclusion by granting access to financial services for less developed countries as well as segments of the population and small and medium-sized enterprises currently unserved or underserved by traditional banks;
- FinTech firms have no legacy technologies to deal with and are characterized by a culture of operational efficiency, which allow them to be constantly on the edge of innovation;
- finally, cloud computing is another source of efficiency for new entrants in banking markets.

However, if these firms are entering financial intermediation as a consequence of other key drivers (e.g., regulatory arbitrage, additional risk-taking, network effects, and informational advantage), the overall effects on the financial system could be less positively determined and would imply less welfare improvements.

²⁸ As to the credit assessment techniques adopted by BigTech companies, Frost et al. (2019) find that these credit scoring techniques, based on big data and machine learning – have performed better than credit bureau ratings in terms of predicting loss rates of small businesses. However, these authors outline that it is not clear whether this outperformance has the potential to persist through a full business and financial cycle. Any assessment on the ability of these new credit scoring systems to identify client characteristics and solve asymmetric information problems should be based upon a complete cycle, evaluating the probability of these loans going into default in stress situations.

²⁹ They process mortgage applications 20 per cent faster than other lenders with no higher defaults and adjust supply more elastically than do other lenders in response to exogenous mortgage demand shocks. See Fuster et al. (2019).

³⁰ FinTech lenders are able to charge higher interest rates, especially to low-risk borrowers, which are more likely to be less price sensitive and more time sensitive. See Vives (2017), and Philippon (2018).

3.3 How banks can react to new entrants in financial markets

In an extreme scenario - where BigTech/FinTech firms and digital platforms on the one hand and non-bank financial intermediaries on the other fully take over the two main banking functions (those mentioned in para. 3.1 above) - the future of banks might be challenged.

Boot et al. (2020) outline that banks can be relegated to the role of upstream (noncustomer-facing) suppliers of maturity transformation services, while downstream (customer-facing) services will be taken over by platforms and specialized providers. According to the Economist (2021), existing financial intermediaries may have few options for staying in the markets: either they become platforms and compete directly with BigTech firms or they become specialized in single financial products that BigTech firms cannot offer. In any case, incumbents have to undergo severe restructuring and a new wave of banking consolidation might occur (ESRB, 2022).

However, there are a number of factors that can prevent such an extreme outcome.³¹ First, in order to preserve their competitiveness, the most active banks may decide to scale up their investments in communication and information technologies and systems. In this way, these banks can widen their core services offerings and develop more digital-oriented financial products, while accepting a substantial change in their overall business model. Banks may also enter business partnerships with tech firms in order to enhance their expertise in financial digitalization.

Banks may - at least for now—be able to maintain their competitive advantage in serving corporate clients and avoid a complete disintegration of their business model. This because BigTech firms and price comparison sites are mainly focused on retail consumers. This situation may change, however, since Bigtech offering cloud services – such as Amazon, Microsoft, Google, and Alibaba - are entering the corporate markets.

The potential access to non-financial information on corporate customers would enable the providers of cloud services to compete with banks in the corporate segment as well. Both BigTech and FinTech firms are still lacking the extensive experience and expertise in risk management that represent one of the strengths of large banks. Moreover, traditional banks still are in a position to offer more complex financial products and have access to cheaper funding due to their banking charter.

The complete disintegration of banks' functions can be limited to the extent banks may preserve their role with respect to their most information-intensive customers. This may lead to the revival of their role as “trusted advisors” that provide tailored solutions for large corporate customers with

³¹ For these considerations, see Vives (2019), Boot at al. (2020), and Dell’Ariccia et al. (2017) who deliver a detailed overview of the competitive challenges from large technology firms and their impact on business strategy of banks.

complex needs (e.g., hedging, funding, compliance, and IT infrastructures). A revival of this role (very close to merchant banking) would be consistent with the economic literature outlining that relationship banking can survive competition (from non-banks and tech firms) by increasing its relationship intensity (Boot and Thakor, 2000).

According to the most recent empirical evidence,³² the relationship between financial technology firms and existing financial intermediaries in some cases have been largely cooperative, with banks relying on and benefiting from the provision of innovative technologies by third parties, including by acquiring such firms. In others, BigTech has behaved as a direct competitor to financial institutions (offering similar services to unserved market segments). In yet other cases, BigTech is a third-party vendor to financial institutions, or both a third-party vendor and competitor.

FinTech firms have determined significant modifications in the structure, provision and consumption of financial services, but have not managed to acquire a dominant position in the market in many jurisdictions.³³ Although they initially aimed at replacing traditional banks, FinTech firms have settled on forming partnerships with incumbents when faced with difficulties in increasing their business scale and customers.³⁴ In this context, a number of external constraints/obstacles may hinder these efforts and prevent a successful outcome, at least in the short term (e.g., organizational complexity of large banks; uncertain regulatory stance on the use of new digital tools; reduced profitability gains).

Overall, the advantage of Tech firms is that they operate with no legacy systems as to allow a fast and flexible response to changing external conditions. While incumbents are confronted with stricter regulatory constraints, Tech companies can exploit the information collected in their platforms by non-financial activities to design and offer new banking services.³⁵

³² See FSB (2019), and Frost et al. (2019).

³³ According to Vives (2019), notwithstanding continuous growth, FinTech credit still represents a small share of total credit, even in countries (e.g. China) where its impact has been most pronounced. Claessens et al. (2018) indicate how FinTech credit tends to be more important in countries with higher income per capita and a less competitive banking system. Ernst & Young (2016) show that UK, US, Singapore, Germany, Australia, and Hong Kong are the leading FinTech hubs on the basis of access to funding, government policies, and demand for FinTech services.

³⁴ In some cases, customers' willingness to switch from traditional banks has not met the expectations in a number of countries, given that the switching costs are normally high and incumbents have developed adapting strategies to respond to FinTech competition. An exception to these trends comes from those geographical locations where incumbents were not active (e.g. some areas in China and Africa); in these case new entrants have gained large market shares.

³⁵ For example, Bigtech platforms with a focus on internet search (e.g., Google) gather information about customers from search activity; those with a focus on social media (e.g., Facebook) have direct personal data

BigTech platforms have penetrated more less-developed banking markets with payment services and money market mutual funds and insurance offerings. With regard to lending, BigTech platforms tend to lend more in countries with a less competitive banking sector and less strict regulation. Given large network effects and economies of scale and scope, BigTech could also lead to greater concentration in specific segments in some markets. With a greater reliance on third-party service providers (data storage, transmission and analytics) – markets which tend to be highly concentrated – operational failure or cyber-events can more easily lead to systemic events.

Digital technology may have a large impact in terms of increased competition and contestability of banking markets. The margins of incumbents can be put under pressure, perhaps leading to increasing risk taking, and a competition can start to capture the rents in the sector. Digital innovation may allow a reduction of fixed, variable and switching costs, enabling low-cost providers to compete with the incumbent financial institutions.³⁶

These new competitors may take away specific customer segments and revenue bases from incumbents or widen access to financial services for underserved customers, without the need to achieve large scale economies.³⁷ Some new entrants have a strong market power (for example, Google, Facebook, Amazon Tencent, and Alibaba). In most cases, these new-comers are unregulated entities and are not subject to a supervisory framework or to a safety net.

At the same time, new technologies are changing incumbents business models due to supply (APIs³⁸, digital wallets, smart phones, cloud computing³⁹) and demand factors (change in consumers' behaviour and preferences).

As to supply factors, innovation technology reduces transaction costs, change the boundaries across firms and sectors, breaks and reshapes the traditional supply chain of financial services that becomes more disaggregated (the so-called vertical disintegration, see para. 3 above). In this way, financial services can be unbundled and re-bundled in order to maximize profits and minimize the

on users and their connections; and those with a focus on e-commerce (e.g., Amazon) have data on both sellers and buyers and their habits. See Vives (2019).

³⁶ See FSB (2019), and Frost et al. (2019).

³⁷ Apps and cloud-based computing and software platforms allow company to quickly achieve the break-even point without raising huge amounts of funds to finance upfront investments. In the future technological innovation will accelerate this trend.

³⁸ Application programming interface (API) is a set of rules and specifications followed by software programs to communicate each other, and an interface between different software programs in order to facilitate their interaction.

³⁹ Cloud computing is an innovation in computing that allows for the use of an online network (cloud) of hosting processors so as to increase the scale and flexibility of computing capacity.

burden stemming from the regulatory framework.⁴⁰ New entrants may also add new services, increasing the number of activities and players of the value chain (Segal-Knowles, 2020) in the light of the consumers' trends.

As to demand factors, technological innovations is changing the relationship with clients since banks are no longer the only owner of data stemming from client transactions (the so-called horizontal disintegration, see para. 3 above). In the digital environment, third parties' providers may place themselves between the financial intermediaries and customers customizing their services. For instance, customer can now get an overview of all their accounts at different banks with apps from just one party and are not obliged to rely on their own bank. These virtual markets will connect consumers (demand side) with producers (supply side).

4. The impact of new technologies on payment systems

In recent years, non-bank innovators have significantly changed the way people make and receive (instant) payments for products and services.

The payments market has been characterized by the rapid proliferation and widespread adoption of innovations, from streamlining payments or integrating billing, to mobile payments, security developments, or cryptocurrencies and peer-to-peer transfers. Such innovations continue to make payments increasingly cashless, while digital platforms are increasing their popularity among customers. What is even more, is that payments started to be part of a much broader environment that includes other business areas, namely the mobile platform industry and non-payment value-added services market. Competition and, more in general, the complexity of the whole payments landscape is significantly increasing also with new entrants from different industries, willing to reach the mass market and being supported by cutting-edge technological infrastructures.

In this paragraph, we focus on three main types of innovations potentially reshaping significantly the traditional business models of financial intermediaries: 1) mobile wallet; 2) open banking.

⁴⁰ A typical example can be observed in the retail payments market. Chip-and-pin technology for cards seems to be quite antiquated since several new forms of payment are used (QR codes, mobile and digital wallets, contactless payments etc.) on daily basis. Indeed, the innovation technology foster specialization and enables different companies to provide specific part of the transaction value chain (e.g. acquiring bank, issuing bank, processor, clearing and settlement infrastructure owner).

4.1. Mobile payments

Due to their high level of flexibility and enhanced security, mobile payments have become a key tool for consumers around the world (FSB, 2019).⁴¹ Indeed, mobile payment is the preferred medium for paying or receiving payments, as it offers high-speed and low-complexity. This in turn is a powerful magnet for all types of companies to offer their goods and services via mobile platform (Allied Market Research, 2020). Telecommunication providers, groceries, retailers are now gradually launching their mobile apps through which customers can shop online from anywhere.⁴²

Mobile payments market is quickly growing.⁴³ The global mobile payment market size was valued at \$1.48 trillion in 2019, and is estimated to reach \$12.06 trillion by 2027, growing at a compound annual growth rate (CAGR) of 30.1% from 2020 to 2027. (Allied Market Research, 2020).⁴⁴ The driving factors of this robust growth are the rapid penetration of smartphones across the globe and the increase in the m-commerce industry especially in emerging countries. These data show that customers are using their accounts more frequently, but they are using them for new and more advanced use cases. This outlines a change in using mobile payments from the early days when the main use cases were bill payments and Peer to Peer (P2P) payments in the form of occasional domestic remittances.

⁴¹ A mobile payment is defined as “any payment where a mobile device (e.g., phone or tablet) is used to initiate, authorize and confirm an exchange of financial value in return for goods and services. Mobile payments are transactions conducted using a mobile phone and payment instruments that include banking instruments such as cash, bank account or debit/credit card, and stored value accounts (SVAs) such as transport card, gift card, Paypal or mobile wallet and exclude Carrier billing using the telecom’s billing system with no integration of the bank’s payment infrastructure, or Telebanking.

⁴² For instance, McDonald’s has launched the Quick Mac mobile application to enable customers to order food and pay for it via their smartphones. The Quick Mac app combines a variety of services, including ordering, payments, offers, push notifications and geolocation. The McDonald’s Quick Mac app allow customers finding the nearest restaurant by map or list, place an order and pay using pay-box, Visa, MasterCard or PayPal, etc..

⁴³ Although there are still geographical discrepancies, mobile payments show a solid growth in some geographical areas, such as China, India and Northern Europe (GSMA, 2020). Emerging economies, such as India and China, have high penetration of smartphones along with increasing 3G and 4G connectivity users. In addition, both the countries account for more than one-third of the world’s population and approximately 90% of the population under the age of 30 years resides in these emerging markets.

⁴⁴ In December 2020, the number of registered accounts grew by 12.7 per cent globally to 1.21 billion accounts. Moreover, transaction values also grew since, for the first time, the global value of daily transactions exceeded \$2 billion dollars, and is expected to surpass \$3 billion a day by the end of 2022 (GSMA, 2020). The Global System for Mobile Communication Association (GSMA) represents the interests of mobile operators worldwide, uniting more than 750 operators with almost 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors.

The Covid 19 has played an important role in spurring this growth since consumer preferences (Greene et al., 2021; Ardizzi et al., 2020) on the one hand and government public support on the other hand have changed the demand for new efficient retail instrument payments. Indeed, many banks and financial institutions provided their customers with new digital instruments, including mobile solutions to deal with the operational challenges posed by the pandemic. The fastest growth was in regions where governments provided significant pandemic reliefs to citizens (GSMA, 2020).⁴⁵

The increasing number of smartphone owners worldwide has paved the way for enlarging the range the products and services and open up new markets using the innovative payment alternatives. BigTechs have been very active in this contest, leveraging on their financial strength and their ability to meet consumer requests. Customers who use their smartphones for mobile payments can store information of credit or debit cards in mobile wallets on their smartphones, and this information can be used to perform payments by tapping or waving it over a sensor at the point of sale or at the comfort of their homes. The mobile wallet is a new application of mobile payment, which functions as a replacement for the conventional wallet and more.

Mobile wallets are tools that incorporate mobile remote payments, mobile proximity payments as well as other value-added services such as mobile loyalty, ticketing, private ID, etc. A mobile wallet is the interface platform that allows consumers to use the mentioned mobile services, replacing the “material” wallet. By allowing users to store their credit card, debit card, gift card, or bank account data in their phones, wallet apps eliminate the need to carry around multiple physical cards. The most interesting feature is that the payment service is ‘just’ an underlying facilitator, whereas the driving forces of the mobile wallet are the mobile marketing services connected to the mobile wallet (see table 1).

Different types of digital wallets – Table 1

	Apple Pay	Google Pay	Walmart Pay	Venmo	Cash App
Installable on Moblie Device	✓	✓	✓	✓	✓
Hold Cash Balance	✓	✓		✓	✓

⁴⁵ The value of government-to-person (G2P) payments quadrupled during the pandemic (GSMA 2020).

	Apple Pay	Google Pay	Walmart Pay	Venmo	Cash App
P2P Transfers	✓	✓		✓	✓
Contactless In-Store Payments	✓	✓	✓ (QR code)		
Loyalty Cards/Coupons	✓	✓	✓		
Transit Tickets	✓	✓			
Store Cryptocurrency	(can integrate with crypto wallet)	(can integrate with crypto wallet)		✓	✓ (Bitcoin only)

At present, consumers are looking for a wider experience than just the payment itself; customer-engagement is the key to develop a long-term relationship with clients. Fast, secured and frictionless payment solutions are crucial for the customer experience. According to Juniper Research⁴⁶, transaction volumes for mobile payments will almost double from 26 billion in 2021 to 49 billion in 2023 (Juniper Research, 2021). They have become a mainstay of online and in-store transactions enabled by the faster, more reliable Internet connectivity lower-cost smartphones featuring contactless technologies like Near Field Communication (NFC).

Mobile wallets offer several advantages for consumers compared to payment card checkout models, including enhanced authentication embedded in smartphones (PINs, patterns, biometric readers, for example) and the convenience of having card details already stored on the device. Growing adoption of those wallets is also likely to kick start parallel growth in other forms of digital payments, including QR codes and direct carrier billing (DCB)⁴⁷, which offer the same characteristics regarding frictionless payments, convenience, and security. Mobile payment market will represent a good source of revenues for the ecosystems although data breaches and security issues in mobile payments are the two main risks hampering the growth of the market.

⁴⁶ The report is based on surveys run among 13 countries situated in 8 different regions.

⁴⁷ The Direct Carrier Billing is an online mobile payment method which allows users to make purchases by charging payments to their mobile phone carrier bill.

4.2. Open banking

Open banking⁴⁸ is the practice of sharing financial information electronically and under customers' approval. This includes, for example, financial management apps aggregating all of customer's financial accounts into one dashboard, faster payment transmissions⁴⁹ between accounts of different banks and product comparison services that enable customers to identify suitable financial products⁵⁰.

The backbone of this business model is the portability and open availability of customer data held by financial institutions (Leong, 2020). Following the development of internet and mobile banking, many customers explicitly grant third party providers (for instance, FinTech companies) permission to access their personal banking data in order to obtain other services. (BCBS, 2019; and Deloitte, 2021). At the same time, these third parties' providers may create new services (faster payments), cross-selling opportunities.⁵¹

Open banking produces significant benefits also to financial institutions. Access to data can be used by intermediaries for lead generation, cross-selling products, risk assessment, pre- and post-delinquency management, and product development; potentially leading to significant business augmentation, asset quality improvement, operational efficiency and cost optimization (Deloitte, 2021). Open banking allows clients to share their raw financial data to competitors of their current financial institution. This process favors competition by developing new products and services (Arner et al., 2021). Moreover, open banking has been used as a tool to tackle anti-competitive behaviour in the financial services industry in order to increase consumer welfare, since it provides customers with greater access to a range of financial services from a larger number of providers and established financial industry which can provide new use cases (Leong, 2020).⁵²

⁴⁸ The Basel Committee on Banking Supervision (BCBS) defines open banking as the sharing and leveraging of customer-permissioned data by banks with third party developers and firms to build applications and services, including for example those that provide real-time payments, greater financial transparency options for account holders, marketing and cross-selling opportunities (BCBS, 2019).

⁴⁹ Through open banking, merchants could receive payments directly and instantly from a bank account rather than through a payment provider such as MasterCard or Visa.

⁵⁰ For example, a client may connect his bank account to a budgeting app analyzing spending habits. Because the budgeting app can see and interpret spending habits, it can then recommend financial products, such as saving accounts that might help client in managing his savings.

⁵¹ The open banking application can be integrated with other services such as: hotel information, flights, etc.

⁵² The exchange of data among customers, financial institutions and third parties is facilitated through Application Programming Interfaces (API). This is a set of rules and specification for computer programmes which make it easier for various banks and financial services to communicate with each other (BCBS 2019). There are three different kind of API: 1) Open API: an interface that provides a means of accessing data based

Three main different approaches have been developed for fostering open banking and its related sharing customer-permissioned data with third parties: 1) mandatory approach (required by law, or regulation;^{53 54} 2) collaborative (involving industry and regulators working together);⁵⁵ 3) market driven (led by industry and no explicit rule requiring data sharing)⁵⁶ (Arner et al., 2021; and BCBS, 2019).

The scope of application varies across jurisdictions. For example, in the EU, the focus has been on payment accounts data, while in the UK additional measures have been implemented, such as the requirement for the nine largest banks and building societies to share publicly available information about branch and automatic teller machine (ATM) locations, services and fees. Hong Kong and Singapore have issued recommendations aimed at facilitating the adoption of open banking practices (BCBS, 2019).

According to a report published by Allied Market Research (2020), the global open banking market size was valued at \$7,295 million in 2018, and is expected to reach \$43,152 million by 2026, registering a CAGR of 24.4% from 2019 to 2026. The main driver contributing to the growth of the open banking market is the increase in the number of people using new wave apps and services, followed by the rise in customer engagement and attending banking customers need.

The surge in usage of online platforms for making payments is contributing to the growth of the open banking market since digital payment system is rapidly expanding with developing payment methods, increased e-commerce use and improved broadband access. Payment gateway APIs are used by online platforms to manage recurring billing, and these APIs are often used in open banking.⁵⁷ Therefore, the rise in the use of online platforms for making payments is expected to propel the growth of the open banking market in the coming years.

on a public standard. Also known as external or public API; 2) Internal/Closed *API*: an interface that provides a means of accessing data based on a private standard. Also known as internal API; 3) Partner API: an API created with one or two strategic partners who will create applications, add-ons, or integrations with the API (BCBS 2019).

⁵³ For instance, EU, UK and Australia. The European Union ('EU') has been the first jurisdiction in approving in 2015 a mandatory open banking approach through the Second Payment Services Directive ('PSD2').

⁵⁴ Directive (EU) 2015/2366 of 25 November 2015 on payment services in the internal market. Data sharing with third parties entered into force in 2018.

⁵⁵ For instance, Hong Kong and Singapore.

⁵⁶ For instance, US.

⁵⁷ For instance, in August 2021, Google Pay, a US-based digital wallet platform crossed 1 billion transactions. Additionally, in July 2021, PhonePe, a digital payments network, processed 1.5 billion transactions through the unified payments interface (UPI).

5. The role of public policies

The digital transformation of financial industry rises a number of key policy issues. Public authorities and regulatory bodies are required to define a new set of rules in order to manage delicate trade-offs between competition and financial stability, efficiency and consumer protection, innovation and sound risk management practices, market integrity and privacy.

The main concern refers to the possibility that policymakers protect outdated business models, and are not ready to foster innovation (Boot et al., 2020). The transition towards the new world requires changes to the regulatory framework in order to ensure a level playing field among operators, jurisdictions and sectors (Boot et al., 2020).⁵⁸ This because the current rules were designed for a world with a clear perimeter, where financial institutions played a pivotal role, and a small number of systemic payment systems represented the entire payment chain (Segal-Knowles, 2020). Today, financial intermediaries and payment systems represent only a fraction of the entire value chain.

So far, the basic principle of prudential regulation has been based on two well-known principles “same risk same rule” and “technological neutrality” in order to ensure the level playing field. From a policy perspective, the new digital environment may need some adjustments, since technology seems to be not neutral anymore. Against this background, three aspects require specific attention for public authorities: 1) prudential regulation and supervision; 2) competition and level playing field among sectors and jurisdictions; 3) consumers’ protection and privacy.

5.1 Challenges for regulation and supervision

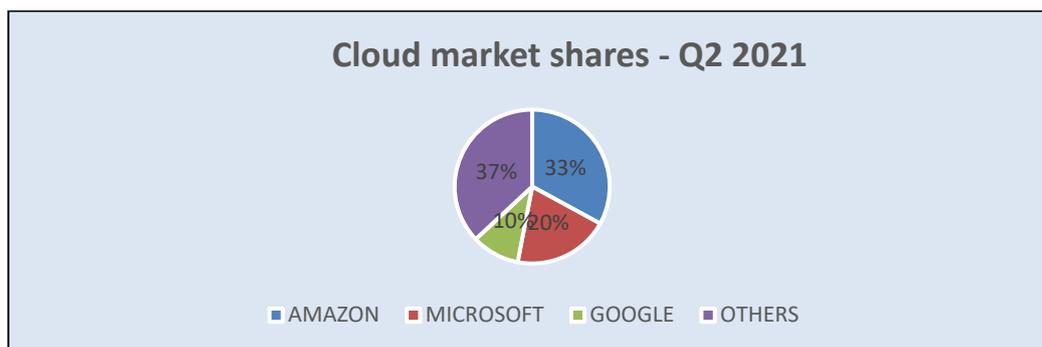
The regulatory framework currently in place for financial institutions (mainly banks) has been built upon two dimensions: 1) micro-prudential regulation, aimed at addressing specific risks, and focused on individual firms (Dewatripont and Tirole, 1994); 2) macro-prudential regulation aimed at correcting externalities and frictions, and focused on the financial system as a whole . The same rationale is applicable to the payments system. The current regulatory framework was developed in a world where few banks and few systemic payment systems were the backbone of the payments chain. The emerging ecosystem is characterized by new actors, which are not under the regulatory perimeter and may pose risk to the overall financial stability (Segal-Knowles, 2020).

New technologies challenge the above mentioned framework from different points of view, since new business models (e.g., lending platforms) and risks are emerging (e.g., cyber risk) or

⁵⁸ In the EU, all these unregulated companies can pose risk to the financial stability and integrity of payment systems since no specific prudential rules and or oversight principle are set out for them such as the Capital Requirement Regulation and Directive (CRR/CRD) or the Payment Service Directive (PSD2) if we consider the European regulatory landscape.

because traditional risks are attracting more attention (e.g., operational risk). The digital transformation of finance heightens cyber risk. Cybersecurity is an issue for all sectors and companies, including FinTechs and BigTechs. The attack surface is wider, since the interdependence increases and the unbundling of services reinforces interlinkages between users and providers, amplifying the web of interdependences. In addition, operational risks increase since a greater number of distinct entities are involved in the provision of a single product or service.

The use of technology by financial institutions implies greater reliance on third-party service providers. This widens the attack surface that is accessible from anywhere, and it incentivises attack. Indeed, certain core services (e.g. provision of cloud services) have become more concentrated, creating the potential that single points of failure could have a systemic impact. According to a Synergy group survey (Synergy Research Group, 2022), three providers (Amazon, Google and Microsoft) and four players control around two thirds of the global market for cloud services (see Graph below).⁵⁹



Source: Synergy Research Group.

This growing diversity of financial services providers and business models requires in certain cases to expand the regulatory perimeter. Payments, loans, and deposit taking services may be provided by specialized payment service providers (FinTechs), e-commerce platforms (BigTechs),

⁵⁹ The increased use of third-party providers means that financial institutions are relying on the shared services models. This approach requires regulated financial entities to develop new and more articulated strategies to develop sound risk management practices to ensure an adequate level of operational resilience (DNB, 2021). To this end, firms can opt to build a private cloud or use multiple cloud service providers for a variety of cloud-based services. Firms may also implement a hybrid approach, in which a fraction of computing services come from internal data centres while operating in utility mode across multiple cloud vendors. Such approaches avoid vendor capture and provide financial firms with features and services that promote greater security and have higher degrees of operational resilience when compared to traditional practices. Moreover, cloud services may enable smaller financial institutions access to more sophisticated architecture and security features than they would be able to acquire on their own. (FSB, 2019).

and other non-banking institutions. It is therefore important that regulators develop approaches to ensure a level playing field and provide clear requirements for licensing.

However, expanding the regulatory perimeter may be challenging in practice. Bringing new entities into the fold of financial regulation may require legislative changes, which could be considered controversial since the border between regulated and unregulated activities is not clear-cut and may be resisted by powerful counterparties, such as BigTechs.

The revision of the regulatory perimeter ensures that activities are regulated and supervised in an appropriate way and ensure a fair level playing field (FSB, 2019). This is a crucial point from a regulatory perspective and accordingly among regulators there is a huge debate about the licence regime, since BigTech and FinTech companies sell new and complex financial products other than payment services (BIS, 2019; FSB, 2019; Frost et al., 2019; and Restoy, 2021).⁶⁰

In the light of the above, regulation needs to facilitate innovation by avoiding winners or losers. Accordingly, regulation should in principle be neutral, agile, proportionate and future proof. Rules should be developed having in mind the financial stability risks rather than the legal form in order to ensure the resilience of financial institutions and payment systems. Similar activities and similar risks should in principle be treated similarly, regardless of the market participant, underlying technology, or method by which the service is provided.

In this context, a purely activities-based approach to regulation may not be sufficient. Indeed, entity-based approach to regulation and supervision is important where financial stability and soundness of financial and payment systems play a pivotal role (DNB, 2021; Restoy, 2021; and Pierri and Timmer, 2021). Furthermore, platforms engaged in financial service provision are growing speedily and in they are becoming systemically important. In this context, large providers of cloud services may need to be designated as systemically important infrastructures, and subject to enhanced forms of regulation and supervision.⁶¹

⁶⁰ In its Digital Finance Strategy Communication (COM (2020) 591 final), the European Commission announced that “...will explore ways to ensure that the prudential supervisory perimeter is broad enough to capture risks arising from platforms’ and technology firms’ financial services provision and from techno-financial conglomerates and groups” (European Commission 2019). ... Indeed, the current FICOD does not deal with the risks stemming from the interdependence between financial undertaking and FinTech companies. The supplementary supervision of group risks entailed by FICOD could also be one way strengthen cooperation between sectoral supervisors so as to have a general overview of bundled financial services offered by various providers”.

⁶¹ A clear attempt to define a set of rules to deal with these issues is represented by the Digital Operational Resilience Act (DORA) published on 24 September by the European Commission. The DORA aims to establish a much clearer foundation for EU financial regulators and supervisors to be able to expand their focus from ensuring firms remain financially resilient to also making sure they are able to maintain resilient

The unbundling and re-bundling of finance value chains introduces new challenges also to supervision and oversight. For a traditional bank and financial institution, based on well-integrated functions, it is clear where responsibility lies for risk management, operational resilience and consumer protection. When the financial services value chain is split across different counterparties and jurisdictions it is more difficult to identify responsibility for misconducts and violations and to ensure an appropriate level of consumer protection.

All these challenges require supervisors to change their practices and tools. First, soundness and the robustness of new business models, payment instruments, technologies, peer-to-peer (P2P) or those based on digital footprint data are untested in downturns. Further, new and rapidly changing business models and processes pose risks that may be hard to monitor and quantify (IMF, 2020). The lack of supervisory reporting data for certain activities and clear set of rules for others (e.g., Buy Now Pay Later) represent two weaknesses deserving a fast policy answer from the policy-makers.

The disintermediation of financial supply chains incentives regulatory arbitrage. Risks can be “hidden” in complex network structures or placed in non-regulated entities or more lenient jurisdictions. Anti-Money Laundering/Counter-terrorism financing (AML/CFT) risks are likely to be increased by these trends, since unbundling and new business models may reduce the transparency of transactions.⁶² Establishing a level playing field across entities and sectors and avoiding a race-to-the-bottom across jurisdictions is a key goal to ensure a strong financial stability at global level. In particular, in the field of anti-money laundering controls there are significant differences among banks and other companies. In this field, a close cooperation among regulators is important to avoid a competition in laxity.

Digital technologies can also be a bonanza for supervisors (Enria 2021) since these solutions can help to get additional information from the large amounts of data available, and accordingly helping them in understanding of the risks facing the financial sector. Regtech and supotech solutions are emerging for a wide range of regulatory focus areas, including regulatory change tracking, fraud detection, know-your-customer (KYC), countering the financing of terrorism (CFT), conduct and prudential risk management.

operations through a severe operational disruption. To this end the proposal aims at bringing ‘critical ICT third party providers’ (CTPPs), including cloud service providers (CSPs), within the regulatory perimeter. These would be supervised by one of the European Supervisory Authorities (ESAs), who would have the power to request information, conduct off-site and on-site inspections, issue recommendations and requests, and impose fines in certain circumstances.

⁶² The failure of Wirecard, a German payment processor, shows how complex chain is a tangible evidence of the above-mentioned situation.

To this end, over the last years several authorities and international organizations (e.g., Bank for International Settlements) have created dedicated units in charge of facilitating innovation, developing new supervisory tools, and monitoring the related risks.⁶³ Many entities are recruiting skilled resources in the specific areas such as artificial intelligence (AI), machine learning, blockchain, etc. Ensuring expertise is critical for quality supervision/oversight and regulation, in order to be sure that supervisors can deal with the new challenges posed by the innovation.

5.2 Implications for competition policies

In a digital world, location and national borders become less important. Establishing a level playing field across entities and avoiding a race-to-the bottom across jurisdictions becomes paramount in order to ensure financial stability. (Boot et al., 2020). Nowadays, many traditional banking and payments services are provided by specialized FinTech companies, digital platforms, and by global tech giants (Amazon, Apple, and Facebook). However, the increased competition is not for the way of payment but for the means of payment (Adrian and Mancini-Griffoli, 2019).

FinTechs and BigTechs are reshaping the banking and payment landscape and this requires a change in the traditional approaches used to assess the level of competition, since BigTechs may assume a dominant position very quickly. Such situation may also generate conflicts of interest when both BigTechs and their competitors (e.g., banks) rely on the same core infrastructures, such as networks or cloud computing services.

The application of the traditional competition toolbox (e.g., market power) to analyse potential anticompetitive behaviours in the FinTech sector faces several challenges. The most significant one refers to the difficulty in applying these instruments to the new market phenomena, such as market definition and assessment of market power, since FinTech services include different products and are provided both by non-financial companies (i.e., the traditional companies) and financial companies. (European Parliament, 2018).

Indeed, from a product perspective, FinTech services can encompass lending products, payments, advisory services, managing assets, issuing crypto-currencies. Moreover, FinTech is a term used here to refer to companies whose business models are based on digital products. The term would leave out legacy banks, like Citibank, BNP, Deutsche Bank, Unicredit, Societè Generale or firms like Visa and Mastercard as to the payments sector, although these companies now offer FinTech products directly or through partnership (Van Loo, 2018).

⁶³ For instance, the ECB Single Supervisory Mechanism (SSM) has created the Suptech HUB to facilitate all innovation work and to better connect IT and supervisory experts.

Moreover, it is quite difficult differentiating FinTech services from other services.⁶⁴ Accordingly, identification of a stable market results in a quite challenging task and typical indicators such as market shares, prices or profit margins are not able to explain the economic relationships between supply and demand in the provision of FinTech services. (European Parliament, 2018). For this reason, the traditional focus of competition authorities on a single market, firm size, pricing and concentration may no longer be well suited to these market outcomes due to the structural changes featuring the relevant market.

This situation is particularly critical for online platforms (e.g. Amazon, Alibaba), which have been achieving dominant position in several markets over the last years. Their business model entails significant network externalities, (i.e. platforms attract more consumers as the number of sellers increases and vice versa) and economies of scale (given the intensive use of technology). This situation favours a constant growth by offering a wide array of services. That explains why platforms originally specialised in e-commerce, such Amazon, have quickly proceeded to offer payment services and other financial and non-financial services (Restoy, 2021).

These trends are intensified by the economies generated by the accumulation of data on platform participants. That data accumulation allows improving the supply of services and attracts buyers, and therefore sellers, as a result of network externalities. Market dominance can give rise to different types of anti-competitive practices, such as the establishment of preferential treatment for sellers affiliated with the platform, bundling of different services, personal data misuse, cross-subsidisation of products, and discriminatory access conditions for participants.⁶⁵

Against this background, several jurisdictions have revised their policies and methodologies for assessing and addressing anticompetitive conduct. In the EU, the Commission proposals for a Digital Markets Act (DMA) and Digital Services Act (DSA) are the answer to the rise of the platform economy and aim at updating rules on e-commerce which were developed in 2020 with the Directive on the e-commerce. The DSA sets out a horizontal framework for transparency, accountability and regulatory oversight of all online intermediaries offering their services in the single market, whether

⁶⁴ For instance, Amazon is at the same time a retailer, a marketing platform, a delivery and logistics network, a payment service, a credit lender, an auction house, a major book publisher, a producer of television and films, a fashion designer, a hardware manufacturer, and one of the most important cloud service provider in the world. The company plays a pivotal role in the e-commerce field and serves as essential infrastructure for other businesses that depend upon it (Khan, 2017).

⁶⁵ According to the Commission Services, in Europe there are over 10 000 online platforms operate in Europe's digital economy, most of which are SMEs, but few large platforms control important ecosystems in the digital economy and have emerged as gatekeepers in digital markets, with the power to act as private rule-makers. These rules sometimes result in unfair conditions for businesses using these platforms and less choice for consumers (European Commission, 2020).

they are established in the EU or outside, while the DMA regulates the providers⁶⁶ of a few large, systemic online platforms (the so-called gatekeepers)⁶⁷ ensuring their fair behaviour in the online world and not the entire competition framework of the digital economy.

In November 2020, the UK government announced the intention to set out a dedicated Digital Markets Unit to enforce a new competition regime for digital platforms with “strategic market status”. In the US, the House of Representatives Subcommittee on Antitrust, Commercial and Administrative Law recommended rules to prevent discrimination, favouritism, and self-preferencing, and to strengthen antitrust laws and enforcement. The Subcommittee came up with a list of recommendations to regulate BigTechs (Amazon, Apple, Facebook and Google) in order to help reduce anticompetitive behaviour.

In China, the State Administration for Market Regulation (SAMR) published on October 2021 specific guidelines for “super large” internet platforms.⁶⁸ According to the SAMR, these platforms should be held to higher standards than their smaller brethren. The new rules require that the super

⁶⁶ According to the proposal the European Commission will designate a provider of core platform services as a gatekeeper if the platform provider meets the following cumulative criteria: 1) it has a significant impact on the internal market and is active in multiple EU countries. The DMA indicates that companies with an annual turnover in EEA exceeding EUR 6.5 billion in the last three financial years or having an average market capitalisation of EUR 65 billion or higher, and providing a core platform service in at least three Member States are presumed to meet this criterion. 2) It has a strong intermediation position, meaning that it links a large user base to a large number of businesses. A company is presumed to meet this criterion if it operates a core platform service with more than 45 million monthly active end users in the EU and more than 10 000 yearly active business users established in the EU in the last financial year. 3) It has (or is about to have) a stable and durable market position. Companies that have met the other two criteria in each of the last three financial years will be presumed to comply with this criterion. The DMA attributes specific powers to the European Commission to enforce non-compliance, including fines, periodic penalty payments and the power to impose additional tailored remedies on the gatekeepers. (European Commission, 2020).

⁶⁷ In particular, gatekeeper platforms will have to comply with a defined set of prohibitions and obligations to avoid certain unfair practices. These include inter alia: prohibitions to discriminate in favour of own services, obligations to ensure interoperability with its platform, and obligations to share data that is provided or generated by business users and their customers in their use of the platform. The proposal is limited to a number of ‘core platform services’: (i) online intermediation services (incl. for example marketplaces, app stores and online intermediation services in other sectors like mobility, transport or energy) (ii) online search engines, (iii) social networking (iv) video sharing platform services, (v) number independent interpersonal electronic communication services, (vi) operating systems, (vii) cloud services and (viii) advertising services, including advertising networks, advertising exchanges and any other advertising intermediation services, where these advertising services are being related to one or more of the other core platform services mentioned above.

⁶⁸ This definition includes any company that has over 500 million annual users, 1 trillion RMB (\$16 billion) market capitalization, and offers at least two services. Under such a metric are likely to be encompassed Chinese behemoth apps like online shopping platform Taobao, instant messaging and mobile payment app WeChat, the online payment platform Alipay and Douyin (Chinese TikTok).

large platforms to compete fairly, have higher standards for data security, be more transparent about their algorithms, and be subjected to comprehensive risk reviews (Reuters, The Records 2021). In India, main e-commerce platforms are prohibited from selling products supplied by affiliated companies on their websites – including financial products – to avoid potential conflicts of interest (BIS, 2019).

5.3 Consumers protection

FinTech has increased the opportunities for costumers offering a huge array of services and products. This trend has been reinforced due to the COVID-19, which has fostered the development of digital solutions in many countries. However, these solutions pose risks to consumers (online frauds, misconduct behaviours, data breaches, digital security incidents, etc.). They include not only those risks arising from the underlying technology enabling FinTech, but also from new business models, product features, and provider types.

As noted in the Bali FinTech Agenda launched in October 2018 by the World Bank Group (WBG) and the International Monetary Fund (IMF), FinTech can support economic growth and poverty reduction by strengthening financial development, inclusion, and efficiency. The critical challenge for policy makers is to harness the benefits and opportunities of FinTech, while managing its inherent risks. Indeed, the proliferation of providers and tailored services, and the massive use of data increase the risks of compromising privacy, abusive practices due to the lack of transparency or errors by unaware consumers.⁶⁹

Technology companies use an extremely large volume of data comprised of hundreds of different sources, types and formats due to more powerful computers and advances in algorithms. One special feature of using big data as an input to production is that data can be used many times by different firms at the same time, without being depleted. Data are non-rival which implies that from technological point of view that data are “infinitely usable” and using them for one purpose does not diminish their value (Jones and Tonetti, 2020).

Since data has become the strategic input in a data-driven ecosystem, they affect output, privacy, consumer welfare. This situation creates a trade-off between efficiency/competition and privacy/consumer protection (Feyen et al., 2021). Increasing access to more users through open data, interoperability standards and data sharing initiatives, for example, increases the potential of data for positive development impacts. Combining these data with traditional non-financial sources such as

⁶⁹ For example, a rapid expansion of the peer to-peer lending (P2PL) market in China in the first half of the 2010s was followed by significant platform collapses and incidents of fraud and platform operator misconduct that caused significant losses to consumers (Ding et al., 2021).

censuses, national surveys help fill data gaps, provide timelier and finer-scale assessments of programs and policies, and serve public policy needs.⁷⁰

The more data are reused, the greater is the risk of data misuse. This risk is evident in growing concerns about cybercrime and the potential for politically or commercially motivated surveillance. The scope for discrimination based on ethnicity, religion, race, gender, disability status, or sexual orientation may be further exacerbated by the growing use of algorithms via machine learning or other artificial intelligence application. Addressing these concerns calls for the regulation of personal data grounded in a human rights framework, supported by policies that secure both people and the data systems on which they depend. (World Bank, 2021).

FinTechs rely heavily on consumer data. How that data is used, whether it results in unequal treatment of different groups, to whom the data is disclosed and sold, and whether sensitive information is held in a secure fashion are challenges for any company, and especially for start-ups that do not have robust compliance regimes or deep experience. Moreover, many FinTech products rely on access to consumers' bank accounts or other transaction accounts, increasing these concerns.

According to a recent survey, a sizable swath of US consumers does not want to move their primary banking relationships to digital-only players due to security concerns (Insider Intelligence, 2021).⁷¹ With so much personal data circulating, the risks of data breaches and loss of personal privacy increase too. For instance, in July 2021, a popular neo-bank in the US experienced a massive data breach that affected more than 7 million users. In addition to passwords, hackers were able to access names, birthdates, physical addresses and other pieces of personally identifiable information.

Regulators need to balance the innovation and efficiency introduced by broader competition and innovation technologies with the negative spillovers on consumer protection. Much depends, as with data privacy, on whether consent can be adequately 'informed' and whether there are reliable objective tests for product suitability. This challenge of protecting the consumer will become more acute and difficult to deal with where consumers will assume a direct role (e.g. peer to peer lending)

⁷⁰ This consideration has been one of the most important driver behind open banking rules introduced in the EU in 2015 through the revised Payment Service Directive (the so called PSD2). PSD2 mandates open access to specific type of customers' banking data for specific licensed institutions (payment initiation services (PIS) and account information services (AIS)) to share their data between providers (e.g. banks and FinTechs), and thus support competition. The same approach has been followed by other jurisdictions such as Japan and Mexico (FSB, 2019).

⁷¹ According the survey, data security was the issue most widely cited (47,5%) by survey respondents who are either just "slightly" or "not at all" interested in switching their primary status to a digital-only bank supported by a large company.

or where the platform economy will assume a greater role in the financial services sector (e.g. Crowdfunding platform).

A step-by-step approach is crucial. New approaches to disclosure, and informed consent need to be developed to ensure increased efficiency, strengthen the consumer protection and reinforce trust among operators. This approach would require an in-depth assessment of market features, consumer experiences, and current regulatory framework. Ensuring effective, adequately resourced supervision of measures implemented; and implementing complementary measures - such as efforts to increase consumer awareness and industry capacity and understanding - are also crucial steps.

6. Conclusions

This paper has discussed how digital innovation may bring about substantial changes in the production of financial services. Technological progress is a medium-term process. External shocks – as it has been the case with COVID-19 emergency situation – can make the adoption of financial innovation even more rapid, and amplify its effects on the financial industry structure. Digital platforms may strengthen their market position, thanks to higher demand for digital services, and leverage upon their balance sheet strength to penetrate new markets more easily.

In this new context, the future of banks may appear bleak. In the extreme, digital platforms and specialized competitors can induce a complete vertical and horizontal disintegration of the traditional bank business model and functions. However, there are a number of limiting factors to this extreme scenario.

First, banks will aim to improve their capabilities in communication and in information processing through massive investment in information technology. This involves upgrading outdated systems and processes, unifying geographically segmented systems, shifting to cloud computing, and developing new, digital-oriented financial products and services that match customer needs (such as new customer interfaces and significantly faster credit decision systems). Banks may also acquire or cooperate with specialized FinTech firms in order to procure expertise for the digitalization of key processes.

The organizational complexity of large banks will complicate the transition. Moreover, banks may encounter difficulties in adapting to the new technologies smoothly, due to the higher (perceived) reputational risks relative to the new entrants. This can be amplified by uncertainty about the regulatory stance, and a lack of regulatory guidance regarding the use of new digital tools. Finally, low profitability and labor market frictions can prevent the required swift changes, especially in Europe.

Regulatory and supervisory policy tools need to adapt. Existing regulatory perimeters may not adequately cover emerging providers of financial services, and new players may pose challenges for

day-to-day financial supervision. It is increasingly challenging to balance competition and stability. Rules for control over data need to be defined, in a way that balances competition and efficiency with privacy and consumer protection, and enhances financial inclusion.

Existing approaches to competition policy and antitrust may not be well-suited to digital financial services, where measures of pricing and concentration for one market or firm may have become less informative. The nature of contestability must be understood in markets driven by increasing returns to scale but also by increasingly low entry barriers for niche services.

At the domestic level, central banks and other financial sector regulators need to cooperate with industry regulators, as well as with competition and data protection authorities. At the international level, authorities are already working together to share expertise on financial regulation of both new entrants and incumbents, and to coordinate policies. This becomes ever more important given the cross-border spillovers of anti-trust and data governance decisions, and the potential to improve service efficiency through harmonization of standards in areas such as cybercrime prevention, data protection, and interoperability.

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