

STUDY

Requested by the ECON committee

Competition issues in the Area of Financial Technology (FinTech)



Policy Department for Economic, Scientific and Quality of Life Policies
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DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

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Abstract

The increasing number of FinTech services provided by newcomer start-ups, traditional financial institutions and big tech companies can bring new competition challenges to the playing field. Some factors can result in anticompetitive behaviours, namely the network effects derived from the use of online platforms, the access to customer data, standardisation, interoperability and the use of algorithms. Combined with a service-by-service analysis, the study provides both, descriptive analysis and normative tools to anticipate and manage anticompetitive behaviours as they occur.

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CONTENTS

LIST OF ABBREVIATIONS	6
LIST OF BOXES	8
LIST OF FIGURES	8
LIST OF TABLES	9
EXECUTIVE SUMMARY	11
1. THE FINTECH MARKET	16
1.1. The European financial context	16
1.1.1. FinTech disruptive and innovative services	17
1.1.2. The traditional financial sector is restructuring itself after the financial crisis	18
1.1.3. Bank adoption of FinTech and digital transformation: ' <i>open innovation</i> ' ecosystems	19
1.1.4. Challenger banks and neobanks	20
1.2. FinTech services	20
1.3. The European FinTech market	22
1.3.1. Market volume	22
1.3.2. Adoption rates	26
1.4. The European FinTech providers	32
2. COMPETITION ISSUES IN THE FINTECH SECTOR	48
2.1. The supply & demand FinTech explanatory matrix	49
2.1.1. The rationale of the explanatory matrix	49
2.1.2. The explanatory matrix's basic categories: supply-side (technology); demand-side (users)	51
2.1.3. A preliminary list of common competition challenges based on the matrix' explanatory categories	51
2.2. Banking	53
2.2.1. Business models: replication of offline models in deposits' services and innovation in lending services	53
2.2.2. Competition issues in the business processes: regulatory disparities and market power of big tech companies	55
2.3. Payments, transfers and Forex	56
2.3.1. Business models: FinTech providers are entering the whole payment chain	56
2.3.2. Competition issues in the business processes: the difficulty of defining payments markets and the access to critical assets	59
2.4. Digital currencies	62
2.4.1. Business models: from mining to exchange services	62

2.4.2. Competition issues in the business processes: diverse markets with different competition issues	65
2.5. Wealth & Asset management	68
2.5.1. Business models: online platforms for advisory and management services	68
2.5.2. Competition issues in the business processes: the impact of algorithms	70
2.6. Personal finance management	71
2.6.1. Business models: analytical and visualisation tools to help customers to understand their financial situation	71
2.6.2. Competition issues in the business processes: customer's data access and security	72
2.7. Insurance	73
2.7.1. Business models: disintermediating customers and risk carriers	73
2.7.2. Competition issues in the business processes: commonalities with FinTech competition concerns	75
2.8. Enabling technologies and infrastructures	76
2.8.1. Business models: from consulting services to Software as a Service	76
2.8.2. Competition issues in the business processes: oligopoly in the advanced cloud services market	79
3. AN ASSESSMENT OF COMPETITION CHALLENGES AND THE USE OF COMPETITION INSTRUMENTS	81
3.1. The landscape of competition challenges, and the use of competition instruments: descriptive and normative tools	81
3.1.1. The explanatory matrix as a descriptive tool	81
3.1.2. Platform-based technologies	83
3.1.3. Data and data-intensive technologies	87
3.1.4. Competition challenges falling outside competition policy tools	90
3.1.5. The competition policy decision tree as a normative tool to assess the challenges and the instruments to address them	91
3.2. The use of descriptive and normative tools to assess challenges and possible courses of action on a service by service basis	93
3.2.1. Deploying descriptive and normative tools on the service-by-service analysis: the resulting competition dynamics	93
3.2.2. Banking – marketplace lending	96
3.2.3. Payments, transfers and Forex	97
3.2.4. Digital currencies	98
3.2.5. Wealth and asset management	99
3.2.6. Personal finance management	101
3.2.7. Insurance	101
3.2.8. Enabling technologies and infrastructures	102
4. CONCLUSIONS OF THE ASSESSMENT	103

4.1. General overview and analytical tools	103
4.2. The role of regulation	103
4.3. The role of competition policy	104
4.4. Competition considerations in regulatory policy reform	105
REFERENCES	106
COMMISSION DECISIONS	115
ANNEX I. DESCRIPTION OF FINTECH SERVICES	117
Banking	117
Payments, Transfers and Forex	118
Digital currencies	119
Wealth and Asset management	120
Personal finance	121
InsurTech	121
Enabling technologies and infrastructures	122
ANNEX II. METHODOLOGY	124
Analysis of the size and characteristics of the FinTech market	124
Analysis of the structure of FinTech service providers	124
Analysis of the global financial inclusion	132
ANNEX III. LIST OF EXPERTS INTERVIEWED	132

LIST OF ABBREVIATIONS

ACCC	Australian Competition and Consumer Commission
AI	Artificial Intelligence
AISP	Account Information Services Provider
API	Application Programming Interface
AIF	Alternative Investment Fund
ASPSP	Account Servicing Payment Service Provider
ATM	Automated Teller Machines
BoE	Bank of England
BTC	Bitcoin
CMA	Competition and Markets Authority
CRA	Consumer Reporting Agencies
DLT	Distributed Ledger Technology
EBA	European Banking Authority
EBF	European Banking Federation
EC	European Commission
ECB	European Central Bank
EMV	Europay MasterCard Visa
EPC	European Payments Council
ETF	Exchange-traded fund
EU	European Union
EUR	Euro
FCA	Financial Conduct Authority
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
IBER	Insurance Block Exemption Regulation
ICT	Information and Communications Technologies
INR	Indian Rupee
IoT	Internet of Things

IPO	Initial Public Offering
IT	Information Technologies
MADA	Mobile Application Distribution Agreement
MiFID	Markets in Financial Instruments Directive 2004/39/EC and Directive 2014/65/EU [MiFID II]
NFC	Near Field Communication
NLP	Natural Language Processing
OBIE	Open Banking Implementation Entity
OECD	Organisation for Economic Cooperation and Development
OEM	Original Equipment Manufacturer
OS	Operating System
P2P	Peer-to-peer
PFM	Personal Finance Management
PISP	Payment Initiation Service Provider
PSD2	Payment Services Directive (EU) 2015/2366
PSP	Payment Services Provider
RTS	Regulatory Technical Standards
SCS	Chinese Social Credit System
SEPA	Single Euro Payments Area
SME	Small and Medium-sized Enterprise
TFEU	Treaty on the Functioning of the European Union
TPP	Third-Party Payment Service Provider
UK	United Kingdom
US	United States
USC	Utility Settlement Coin
USD	United States Dollar
vs	versus
WWW	World Wide Web

LIST OF BOXES

Box 1:	The impact on competition of the process of drafting the Regulatory Technical Standards (RTS) on strong customer authentication under the PSD2	60
Box 2:	The case of Apple Pay in Australia	61
Box 3:	The Open Banking initiative in the UK	73
Box 4:	Payment smart card market concentration in France	79
Box 5:	Antitrust investigation on the standardisation process for e-payments	86

LIST OF FIGURES

Figure 1:	FinTech services classification	22
Figure 2:	European online alternative finance market volumes 2013-2016 in million EUR (excluding the UK)	23
Figure 3:	European online alternative finance market volumes 2013-2016 in million EUR (including the UK)	23
Figure 4:	Online alternative finance volume by country 2015 (in million EUR)	24
Figure 5:	Alternative finance volume by model in Europe 2013-2016 (in million EUR)	25
Figure 6:	Financial technology market size estimate for selected Central and Eastern European countries as of 2016, by country (in million EUR)	26
Figure 7:	Percentage of people who have an account at a bank or financial institution in selected countries or regions (% age 15+)	28
Figure 8:	Percentage of people who have an account at a bank or financial institution in EU28 (% age 15+)	29
Figure 9:	ATMs and commercial bank branches in 2015 in selected countries or regions (per 100 000 adults)	30
Figure 10:	ATMs and commercial bank branches in EU28 (per 100 000 adults)	31
Figure 11:	Number of FinTech companies worldwide by country/region	33
Figure 12:	Number of FinTech companies by country in the EU27 (excluding the UK)	33
Figure 13:	Percentage of FinTech companies by service category and region	34
Figure 14:	Total investments in FinTech companies by country/region (in USD)	35
Figure 15:	Yearly evolution of money raised by region/country (in USD)	35
Figure 16:	Total investments in the FinTech sector by service category (in USD)	36
Figure 17:	Percentage of investments in the FinTech ecosystem by service category and region/country	37
Figure 18:	Percentage of investments in the FinTech sector by service category and country in the EU28	37
Figure 19:	Average funding by funded company by region/country (in USD)	38
Figure 20:	Average funding per funded company by country in the EU28 (in USD)	39
Figure 21:	Percentage of firms depending on the number of employees in the FinTech sector by region/country	39

Figure 22: Distribution of companies by number of years since constitution by region/country	40
Figure 23: Percentage of money raised by funding stage within the region/countries	41
Figure 24: Percentage of companies by acquisition status within the region/countries	42
Figure 25: Percentage of IPO companies within the region/countries	42
Figure 26: Network graph of acquisitions in EU28	43
Figure 27: Network graph of acquisitions in the US	44
Figure 28: Network graph of acquisitions in Asia	44
Figure 29: WebPlot of acquired companies by service category and sector of the acquiring company (worldwide)	45
Figure 30: WebPlot of acquired companies by service category and sector of the acquiring company (EU)	46
Figure 31: The underlying tension in FinTech services: accessibility vs. trust	47
Figure 32: The supply/demand explanatory matrix on FinTech competition issues	50
Figure 33: Marketplace lending model scheme	54
Figure 34: Payment chain stages	57
Figure 35: Front-end payment services providers	57
Figure 36: Back-end payment services providers	58
Figure 37: Operators of retail payment infrastructure	58
Figure 38: End-to-end payment providers	59
Figure 39: The cryptocurrency ecosystem and value chain	63
Figure 40: Robo-advisory evolution	69
Figure 41: Personal finance business model	72
Figure 42: InsurTech value chain	74
Figure 43: The supply/demand explanatory matrix on FinTech competition issues	82
Figure 44: Regulatory assessment process of the dynamics affecting the FinTech services	92

LIST OF TABLES

Table 1: Categories of FinTech services proposed in the existing literature	21
Table 2: Business models for the provision of FinTech enabling technologies	78
Table 3: Competition-related dynamics in the provision of FinTech services	95
Table 4: Alternative Finance Models (Glossary)	117
Table 5: Payments, Transfers and Forex services (Glossary)	118
Table 6: Digital currencies services (Glossary)	119
Table 7: Wealth and Asset management (Glossary)	120
Table 8: Personal finance services (Glossary)	121

Table 9:	InsurTech services (Glossary)	121
Table 10:	Enabling technologies and infrastructures (Glossary)	122
Table 11:	Number of FinTech companies by country	125
Table 12:	Types of funding used in the analysis and relation to the types of funding provided by <i>Crunchbase</i>	128
Table 13:	Number of funding rounds by year and country/region	129
Table 14:	Acquisitions by country/region of the acquired company and the acquiring company	131

EXECUTIVE SUMMARY

This study analyses competition issues in the FinTech ecosystem. After describing the current situation of this ecosystem, the services, the market, the users' perception and the providers of FinTech services, the study focuses on analysing potential anticompetitive factors and their impact both in the FinTech ecosystem as a whole and in concrete services categories. The area of FinTech is still very young and constantly evolving. This is why an established case practice of how to deal with competition concerns has not yet been developed and official decisions by competition authorities have still to emerge.

The FinTech services

FinTech services offer significant potential benefits to European consumers, such as cost reduction, improvements in efficiency, greater transparency and a contribution to the goal of financial inclusion. **FinTech has come to revolutionise the way in which traditional financial services providers work and interact with their customers.** It is changing the dominant paradigms by which traditional financial services are provided, resulting in a significant disruption.

Given the rapid evolution of FinTech services, **there is no consensus on a standard classification.** In this study the following categories are proposed, which encompass the FinTech services currently provided:

- (1) Banking —deposits and lending—,
- (2) Payments, Transfers and Forex,
- (3) Digital currencies,
- (4) Wealth and Asset Management,
- (5) Personal Finance,
- (6) InsurTech, and
- (7) Enabling technologies and infrastructures.

The FinTech market

The difficulties defining the exact scope of FinTech services make it challenging to quantify the size of the current and potential market. An additional difficulty is the complexity of differentiating FinTech services provided by traditional firms in the financial sector from other services. As a result, **there are no estimates of turnover for FinTech services (considering all the services analysed in this study) as a whole in Europe at the moment.**

The FinTech users

Some sources estimate that the average percentage of digitally active consumers using FinTech services in 2017 was 33 %. In Europe, the **UK and Spain** are the countries with the highest share of FinTech users, with 41 % and 37 % respectively. Germany, with 35 %, is the third European country above the global average. Globally, **FinTech services related to payments and transfers** showed the highest penetration among users (50 %), followed by insurance (24 %), savings and investments (20 %), financial planning (10 %) and borrowing (10 %).

FinTech is considered to have an enormous potential in improving **financial inclusion.** FinTech services have the capacity of providing more easily accessible and affordable financial services to large masses of the population and small and medium-sized enterprises (SMEs), especially in the area of credits and payments.

Besides financial inclusion, it is no surprise that **improving user experience** is at the heart of the conceptual design of FinTech services. In fact, in 2016, 37 % of Europeans expressed their willingness to switch their financial services provider if it does not offer advanced technology services or products. Unlike what happens with other digitalised services, digital skills and access to technology are not the only factors influencing the penetration of FinTech services. **Trust** is a key element of all financial services and is equally in FinTech.

The FinTech providers

According to the *Crunchbase* database, there are more than 3 850 FinTech service providers in the world. The EU ranks 2nd in number of services providers after the US, with more than 1 000 FinTech companies. Enabler companies are the most frequent, followed by providers of banking services.

The level of investments in the sector provides a good overview of the relevance of FinTech services in different regions. The **US leads** the ranking accounting for some USD 29 billion of total investments, followed by far by China, the UK and India as shown in

Figure 14. The EU (excluding the UK) ranks 5th, accounting for USD 3.6 billion.

European companies (including the UK) **are smaller**, with a larger number of micro-enterprises with less than 10 employees. **European FinTech companies** (excluding the UK) **are also younger** with an average age of 6.5 years compared to 9.8 in the US and 8.5 in India.

In the EU and the US, the percentage of FinTech companies that have been acquired is much higher than in other markets. It suggests that **currently market exit of start-up FinTech companies in the EU mainly happens through acquisitions**. Companies in Europe are likely to be acquired by larger firms to complement their current offering. This fact leads to the need for a close monitoring on the acquiring of firms to avoid anticompetitive behaviours.

We have also analysed the relationship between the acquiring companies and the acquired companies and concluded there is a strong geographical endogamy. European companies are acquired by European companies and US companies are mainly acquired by US companies.

Competition issues in the FinTech sector

Most of the potential competition issues in the FinTech sector described throughout the study have not occurred —or have not been detected by competition authorities— so far. Thus, the discussion about the competition problems is still **hypothetical**; however, it is necessary to analyse where competition concerns may arise and how they should be addressed, as they may materialise in the future.

The application of competition instruments to analyse potential anticompetitive behaviours in the FinTech sector faces several challenges, the most relevant being the **difficulty in applying these traditional instruments to the new market phenomena** such as market definition and assessment of market power. Traditional indicators such as market shares, prices or profit margins fail to explain the economic relationships between offer and demand in the provision of FinTech services. Missing a stable market, any analysis of competition is bound to be tentative, since competition challenges could unfold in different directions, depending on what turns out to be the decisive factor that provides a competitive advantage.

Commonalities in FinTech competition challenges

A **service-by-service approach** based on the business model of each service category has been used to explain the competition issues. This should not obscure the fact, however, that there are **strong commonalities¹ in FinTech competition challenges** that go beyond a particular service, or operator.

Common competition challenges have been analysed taking into account two perspectives:

- The **supply-side perspective**, with two categories of technology that have great influence in explaining competition challenges: **online platforms** and the intensive use of **data**.
- The **demand-side perspective**, which refers to the way users **access and operate** FinTech technologies and their **behaviour and perception** of FinTech technologies as a means to deliver financial services.

The use of **multi-sided online platforms** to provide FinTech services implies that the definition of the **relevant market** cannot be undertaken following traditional models built on the premises of *pipeline* businesses where value is generated by the supplier of a product or a service. In the case of platforms, the value or a large part of it, is generated by the users on the other side. The second competition challenge resulting from the combination of platform dynamics and users' perception and behaviour is the generation of **network effects**. FinTech platforms are not as regulated as financial trading platforms, and therefore the challenges arising from network effects need to be assessed as a competition challenge. These challenges include the risk that multi-sided network effects enable a large platform to be **insulated** from competition from smaller platforms with fewer participants and can create **barriers of entry**. Other factors may be at play that modulate the intensity and features of the network effects, and their influence on the potential competition issues. It is particularly relevant whether users tend to choose only one provider (*'single homing'*) or several providers (*'multi-homing'*). Network effects increase with the **intensity of use** and the **single-homing** nature of the platforms.

Interoperability is another potential anticompetitive factor related to platforms. An active pursuit of non-interoperability can act as a deterrence with anticompetitive effects if access to the market is difficult or costly.

Standardisation also plays a relevant role in the field of competition between FinTech providers. If standardisation lowers entry costs, and prices, and/or allows firms to compete on more *core* parts of the service, then it has a positive effect. However, standardisation may also result in an oligopoly where providers may take the opportunity to agree on features of the service to split the market between them.

Access to data may become another competition issue in the FinTech ecosystem. Therefore, the role of data to establish a competitive advantage needs to be borne in mind as one of the elements involved in assessing the competitive position of the company resulting from a merger. Control over unique data troves, resulting from the combination of datasets from multiple sources, should also be one of the main factors considered when assessing potentially anticompetitive behaviours. They can result in, for example, **exclusionary conduct** when not allowing competitors to access data, the conclusion of **exclusive contracts**, if the incumbent uses its control over a particularly valuable dataset to create a network of contracts that forecloses competition, or **tying and bundling** of services, leveraging the firm's position and imposing the use of other services.

¹ Explained in section 3.1.

Computer algorithms themselves may also result in anticompetitive practices. They may do so in a way that promotes express and **tacit collusion** because they can learn by themselves and conclude that the best way to maximise profits is to develop collusive practices.

Specific competition issues of each FinTech category

Banking

The main obstacle for the development of a competitive market is not due to existing anticompetitive behaviours in the market, but a **lack of clear regulatory standards**. Banking platform markets are primarily multi-home and do not have a high intensity of use, so potential anticompetitive factors might not have a real impact on competition at this stage.

Payments, transfers and Forex

Payments are the FinTech services that competition authorities are paying the most attention to. Relevant concerns that could lead to diminishing competition in the provision of payment services include **access to critical assets** such as data and mobile near field communication (NFC) chips, and the **use of an incumbency position gained offline** to engage in exclusionary conduct towards competitors.

Digital currencies

The market for digital currencies is characterised by **competition between currencies** (inter-cryptocurrency market) and **competition between exchanges** (intra-cryptocurrency market). While each sub-market, namely mining, exchanges, wallets and payments, is subject to diverse dynamics which may result in different competition issues, there are also common factors among them. One of the most relevant is the presence of **network effects**. Another potential anticompetitive factor is the **standardisation of distributed ledger technology (DLT)** and other technical protocols. Private or public consortia agreements in relation to technical standards may affect the market entry or have an impact on current costs.

Denial of access to the gateways of traditional banking activities, such as payment systems for bank account transfers or card processor schemes, is also a potential anticompetitive behaviour.

The arrival of permissioned cryptocurrencies promoted by banks, even by central banks, will reshape the current competition level in the cryptocurrency market, broadening the number of competitors. However, the **market power of banks in traditional banking services might be used to limit competition in the cryptocurrency market** through pre-emptive acquisitions or predatory pricing schemes.

Wealth and Asset management

The potential competition challenges in this area involve the **fee policies** of different service providers, the **blurring of boundaries** between different types of services (information, advisory, management) and the implications of the **use of algorithms**. The last one is an issue that looks more promising from a competition policy perspective. The effects of the use of algorithms in the provision of FinTech wealth management services is mixed. On the one hand, there are pro-competitive effects, such as increased transparency on both price and quality variables as well as a more efficient development of products and services. On the other hand, there are also risks for competition, such as the **potential role of algorithms** to be facilitating factors for co-ordination and **collusion** (algorithmic collusion).

Personal Finance management

Competition issues regarding digital Personal Finance management (PFM) services arise mainly in the field of **customer data access**.

Insurance

Access to customers' data and the impact of algorithms on pricing strategies are the main factors that can lead to anticompetitive practices. The standardisation of private blockchains might also create barriers of entry if the standardisation process lacks the required transparency.

Enabling technologies and infrastructures

There are no specific competition concerns in technologies such as DLTs, Artificial Intelligence (AI) and Data Analytics, apart from the common ones (standardisation, network effects, access data).

There are some specific niches of cybersecurity technologies where market concentration and potential competition concerns might occur.

The advanced cloud services market is dominated by a small number of big tech companies and, furthermore, the barriers for new actors to access this market are huge.

Conclusions

The current state of the markets for FinTech services is generally **too fluid** to reach firm **conclusions on the existence of competition challenges that need the deployment of competition tools on a large-scale basis**. The special role of regulation in the field of financial services sends a message of caution about the appropriateness of competition policy tools as the preferred means to address every challenge.

FinTech services, as part of the digital economy, share potential competition challenges with other digital businesses, mainly those derived from the provision of services through digital platforms and the access to customer data. Thus, the remarks regarding competition in the digital environment remain valid in the FinTech ecosystem.

1. THE FINTECH MARKET

KEY FINDINGS

- FinTech, financial services provided through technology, have come to **revolutionise** the way in which traditional financial services providers work and interact with their customers.
- FinTech providers include three types of stakeholders: (1) **newcomers** to the sector, such as **start-ups** offering new services or products; (2) **traditional financial services providers**, or incumbents; and (3) **technological companies** that develop tools, services and products in the field.
- Competition issues affecting FinTech services depend on the specific characteristics of each service. FinTech services have been categorised as follows: (1) **banking**; (2) **payments, transfers and Forex**; (3) **digital currencies**; (4) **wealth and asset management**; (5) **PFM**; (6) **InsurTech**; and (7) **enabling technologies and infrastructures**.
- There is **no clear classification** of the FinTech sector. The blurred definition of the FinTech concept makes it difficult to quantify the size of the current and potential market.
- FinTech can play a relevant role in improving **financial inclusion**, providing more accessible and affordable financial services. Current users also expect to receive better and more efficient financial services with the benefits of digitisation.
- There is an underlying tension between **improving accessibility and usability** of financial services through technology and **assuring consumer trust**, which is essential for the functioning and stability of the financial system.
- The US is the most relevant player among FinTech service providers, followed by the EU. Within the EU, the UK is by far the largest contributor to FinTech, accounting for 45% of all EU companies. China and India are also becoming relevant actors.
- In **mature and developed markets**, FinTech companies tend to be **smaller** and **more focused on providing added value** to existing financial services. In **less mature financial markets**, such as China and India, FinTech start-ups on average receive much higher levels of financing and often become listed companies, suggesting that these **firms are filling the existing gap** by becoming relevant providers of financial services themselves.
- There is a strong **geographic endogamy** in acquisitions of FinTech services suggesting that specificities of the markets (regulation, availability of services, and consumer profiles) make it difficult for FinTech companies to provide their services at a global scale.

1.1. The European financial context

FinTech services offer significant potential **benefits** to European consumers², such as **cost reduction**, **efficiency improvements**, better **adaptation** to customers' preferences, greater **transparency** and a contribution to the goal of **financial inclusion**. FinTech

² European Parliament (2017).

services also provide cross-border financial services between Member States and extend financing and investment alternatives to European businesses and households. Furthermore, FinTech services may also contribute to the achievement of some of the most relevant European Union objectives, such as the **Digital Single Market**, the action plan for consumers' financial services³ and the **Capital Markets Union**. These services also provide innovation⁴ to the market by bringing about the application of new business models and technologies to financial services.

1.1.1. FinTech disruptive and innovative services

FinTech adoption provides major impacts on the financial industry: **lowering barriers to entry** by eliminating physical branches and large organisational structures; **disintermediating** the current value chains; introducing **new business models** based on **platforms** and **sharing economies**; and providing a more efficient provision of services.

For decades, the financial industry has massively used information and communications technologies (ICT) in all its internal processes (back-end). More recently, with the emergence of the internet, ICT have enabled banks to offer online services to their customers, both from fixed and mobile devices. By January 2018, 51 % of European adults used internet banking⁵, doubling since 2007 when it was only 25 %, with substantial differences⁶ across age, country and education level.

FinTech has come to revolutionise the way in which traditional financial services providers work and interact with their customers. It is **changing the dominant paradigms** with which traditional financial services are provided, resulting in a real disruption in terms of applicable business models and, potentially, in a growing market share.

This is the case, for example, of loans, where assets (loans) are traditionally financed in the bank's balance sheet through their own capital and liabilities (deposits and wholesale financing). The new scenario consists of the disintermediation of these activities by means of peer-to-peer (P2P) lending platforms, in which the assets and liabilities disappear from the balance sheets of the new FinTech companies and their work becomes the **intermediation between lenders** investing in every individual loan borrowed. They use very novel credit scoring techniques based on AI, big data or social crowd-scoring. The appearance of this new type of intermediation has been accompanied in some countries⁷ by the **regulation of alternative financing**⁸, allowing the emergence of new FinTech P2P lending companies.

More recently, with the entry into force of the new Payment Services Directive (PSD2)⁹, FinTech services providers will be able to start developing new, hitherto unknown models based on the online platform business models. FinTech providers enable the

³ European Commission (2017b).

⁴ European Commission (2018).

⁵ Eurostat (2018).

⁶ Eurostat (2018). *'Internet banking is particularly popular among 25 to 34 year olds, with 68% using this facility. The use of internet banking tends to increase in line with the education level of the user. While only 24% of those with low education use e-banking, 77 % of those with high education use this service.*

Among EU Member States, internet banking is most common in Denmark (where 90 % of people aged 16 to 74 said they were using it) and the Netherlands (89 %), followed by the other Nordic countries - Finland (87 %) and Sweden (86 %).

The lowest shares were registered in Bulgaria (5 %) and Romania (7 %). Less than 30 % of those between the ages of 16 and 74 use internet banking in Greece (25 %) and Cyprus (28 %).

⁷ CrowdfundingHub (2016, p. 9).

⁸ European Commission (2018a).

⁹ European Commission. Payment services (PSD2) Directive (EU) 2015/2366.

https://ec.europa.eu/info/law/payment-services-psd-2-directive-eu-2015-2366_en.

disintermediation of banking activities with respect to their clients, by offering financial products without being a bank or providing standard banking services by linking their platforms to their customers' bank accounts, such as the origination of payments or transfers.

Likewise, thanks to PSD2, FinTech companies operating under the concept of a PFM, or aggregator, can act as the financial portal for their clients, adding and processing **customer banking data** so that they can offer third-party financial products. Companies can do this by means of accessing the information and data contained in each client's bank account(s). In this way, the financial assets and liabilities of the clients, i.e. their loans and deposits, will remain within financial institutions, and clients will have no need to accede to these institutions, because they will always interact with them through their FinTech service providers, such as PFMs. In this sense, PFM acts as a trusted and independent manager of client finances, without being part of any bank or having any commercial dependence on them. To this end, FinTech providers must negotiate their application programming interfaces (APIs) with customers' banks and determine the prices for use, along with establishing appropriate cybersecurity measures.

Another significant segment of financial business being disrupted by FinTech is the financial advice on investments provide to customers through tools known as **robo-advisors**. These robo-advisors supply **investment advice** –in particular, in the activities of asset allocation in portfolios, selection of assets or investment funds and the execution and liquidation of orders- all in an automated and online way, substituting the staff of the traditional entities the client would normally refer to. The robo-advisors employ sophisticated algorithms, even with AI, for these tasks in order, to offer real time solutions.

Other innovations with a relevant impact in the financial sector are the new **cryptocurrencies**, like Bitcoin, which are digital currencies that operate in a decentralised way by means of P2P technologies, like **blockchain**, and without participation or supervision by any central bank or institution. These cryptocurrencies offer technological and operational paradigms that are a source of disruption for the entire sector, including monetary policy and financial stability.

All these disruptive and innovative applications utilise new and emerging technologies, among which those stand out are AI, cloud computing, biometrics, digital identity, blockchain, cybersecurity, RegTech, internet of things (IoT), augmented reality, etc.

These technologies are being developed or used in the financial sector by **three types of stakeholders**: (1) **newcomers** to the sector that are mainly start-ups offering services or products that have both a financial and a technological background; (2) **traditional financial services providers**, or incumbents, such as banks, insurers or brokers; and (3) **technological companies** that develop tools, services and products for the financial sector, that enable the provision of FinTech services or allow the companies to provide these services themselves.

In this environment, new agents, particularly tech start-ups, are generally able to offer financial services for lower costs and at a higher efficiency than the incumbents, due to the lack of legacy infrastructures or organisations and the ability to better take advantage of innovations. It is also generally understood that they can offer better user experiences, which poses significant challenges to other agents, especially traditional financial service providers.

1.1.2. The traditional financial sector is restructuring itself after the financial crisis

The financial sector faces two simultaneous changes, predominantly from the point of view of incumbents: (1) the changes provoked by the **financial crisis** and its consequences on

restructuring business and balance sheets, as well as the new regulations oriented to prevent future crises and to limit their effects on the whole economy; and (2) the need to **adapt business models** to the FinTech revolution through a digital transformation of the traditional business models.

These changes have resulted in relevant challenges for stakeholders, particularly incumbents. For instance, the European Central Bank (ECB) points out the challenges faced by European banks are: **low profitability**; the **impact of digitalisation**; **low interest rates**; dealing with **overcapacity** and **fragmentation**; **cleaning up their non-performing loans**; **stronger regulation**; and the **Brexit process**¹⁰. Oliver Wyman¹¹ also identifies the agenda for European banks consisting of the following key actions: **responding to changing** buying behaviour related to digital opportunities; **upgrading legacy systems** and processes; **increasing financial resource efficiency**; **consolidation** opportunities; building **workforce skills**; and offering **solutions to social challenges**.

The banking sector is still restructuring itself after the financial crisis. The European Banking Federation (EBF) reports that the **number of credit institutions** in the EU-28 **has** consistently **fallen** for the past eight years¹² in a row and last year the number of banks decreased by 453 to 6 596 banks¹³ from 8 525 in 2008, a total decline of 6 %. Germany is home to more than 25 % of all the banks in the EU. **Concentration** could increase the efficiency and scale of European banks.

This opens **new opportunities** to new entrants not affected by the same rules as incumbents. Still, nowadays, the banking sector seems to be too large for new FinTech companies to capture just a small fraction of it; banking is a business of managing huge financial assets for all the participating members of any economy. As the EBF reports, by the end of 2016¹⁴, the total amount of deposit liabilities held in EU banks amounted to EUR 22.1 trillion, which was a 0.7 % drop from the previous year. Moreover, the total value of outstanding loans from EU banks amounted to EUR 23.6 trillion, an increase of 0.3 %.

1.1.3. Bank adoption of FinTech and digital transformation: 'open innovation' ecosystems

As the EBF points out, there is a **wide** and enthusiastic **adoption** of the online and mobile banking and payment services among customers. This trend has reduced the importance of widespread physical bank branch networks. According to EBF, during 2016 in the EU-28 countries, European credit institutions continued to experience a contraction of their main infrastructures and human resources, which was a trend of the previous years¹⁵: a reduction of 4.6 % of their branches (a 20.4 % compared to 2008), and a reduction of 1.75 % of their workforce (a 16.4 % compared to 2008).

All incumbents have now embarked on **digital transformation** processes. The following priorities are often cited regarding engagement in this digital transformation process: adopting new Information Technologies (IT) architectures and technologies as biometric, cloud, AI or big data; offering an excellent customer experience; increasing digital sales; developing new business models; stimulating a more innovative workforce and working as

¹⁰ Lautenschläger, S. (2017, p. 13).

¹¹ Oliver Wyman (2017, p. 5).

¹² European Banking Federation (2017b).

¹³ European Banking Federation (2017b). The decline is led by the Netherlands (-113), Germany (-72), Austria (-62), Ireland (-46), Italy (-45), Hungary (-34), France (-22) and Spain (-11).

¹⁴ European Banking Federation (2017a).

¹⁵ European Banking Federation (2017b).

agile organisations; taking cybersecurity to the highest executive level; taking advantage of the PSD2 challenge; and either collaborating with or taking over the FinTech start-ups.

As part of their strategic initiatives, many European incumbent banks are developing **FinTech ecosystems**, under the paradigm of *'open innovation'* which combines technology, customers and regulatory compliance around innovation and business models. This paradigm involves a bank meeting with start-ups and learning from them about their technologies, business model, methodologies and cultures. In this open innovation ecosystem, the start-up and the bank agree to develop tests and trials, all with the required regulatory compliance, using the bank's data and clients as proofs of concept to determine the future of the financial industry. Other incumbents have venture capital instruments to invest in FinTech start-ups, besides other direct participations in the capital of new FinTech firms.

Also, big tech companies are investing in FinTech and in greater amounts, since they do not face the same risk compliance issues as traditional financial providers.

1.1.4. Challenger banks and neobanks

In banking services, the FinTech innovations also manifest with the rise of the so-called **challenger banks** and **neobanks** which are becoming a global movement. According to the consultancy KPMG¹⁶ *'challenger banks can be established firms – most likely midsize or specialist – that seek to compete with larger institutions. Neobanks¹⁷ tend to be newer, completely digital mobile, but there's some overlap'*. Both innovative types of banks have common ground as they both use new technology platforms, without carrying inefficient and old-fashioned legacy systems, cumbersome organisational structures and large branches base.

Challenger banks are popping up worldwide, and they constitute a potential opportunity for a faster increase in the provision of cross-border banking services across Europe. They can also be a tool for **financial inclusion** as they do not require deploying physical branches and are less hampered by regulation due to the fact that they do not provide a full range of financial services.

As KPMG reports, besides the UK phenomenon with *Atom Bank*, *Monzo*, and *Starling Bank*, there are more than 100 challenger banks everywhere. In Germany, *Fidor Bank*, *Solaris Bank* and *N26* are the known challenger bank cases. In Spain, there are challenger banks backed by incumbent banks like *OpenBank* from *Santander Bank*, and *ImaginBank* from *CaixaBank*. Big tech companies in Asia have launched their challenger banks, like China's *MyBank* from *Alibaba Group* and *WeBank* backed by *Tencent*.

1.2. FinTech services

Competition issues affecting the provision of FinTech services depend on the specific characteristics of each service. Therefore, the first step in analysing competition issues is to **categorise** the FinTech services.

The existing literature on this topic proposes several categorisations; however, given the rapid evolution of FinTech services, there is **no consensus on a standard classification**

¹⁶ Caplain, J. (2018, p. 1).

¹⁷ Some of the best challenger banks and neobanks are arising in the UK, attracting big capital investments, either coming from venture capital like *Goodwater Capital*, or incumbent banks as *BBVA*. According to *Crunchbase*, since their respective launching date, *Atom Bank* has raised GBP 329 million; *Monzo* has pulled a total of GBP 109 million; and *Starling Bank* has obtained USD 70 million.

yet. Table 1 summarises some of the existing categorisations that try to systemise the complex cluster of FinTech services.

Table 1: Categories of FinTech services proposed in the existing literature

IOSCO ¹⁸	PWC ¹⁹	EY ²⁰
Payments	Transactions and payments systems	Money transfer and payments
Lending / Crowdfunding	Banking	Borrowing
Planning	-	Financial planning
Trading & Investments	Investment and wealth management	Saving and investments
Insurance	Insurance	Insurance
Data & Analytics	-	-
Blockchain	-	-
Security	-	-

Based on the existing literature, a classification of FinTech services is proposed in the following Figure 1, including current services and new services with high potential growth in the short and medium term. The proposed classification encompasses the most comprehensive set of the current FinTech services and those that are expected to be provided in the coming years, as it combines all the classifications defined by other sources. In the following this classification will be used as a basis for the analysis.

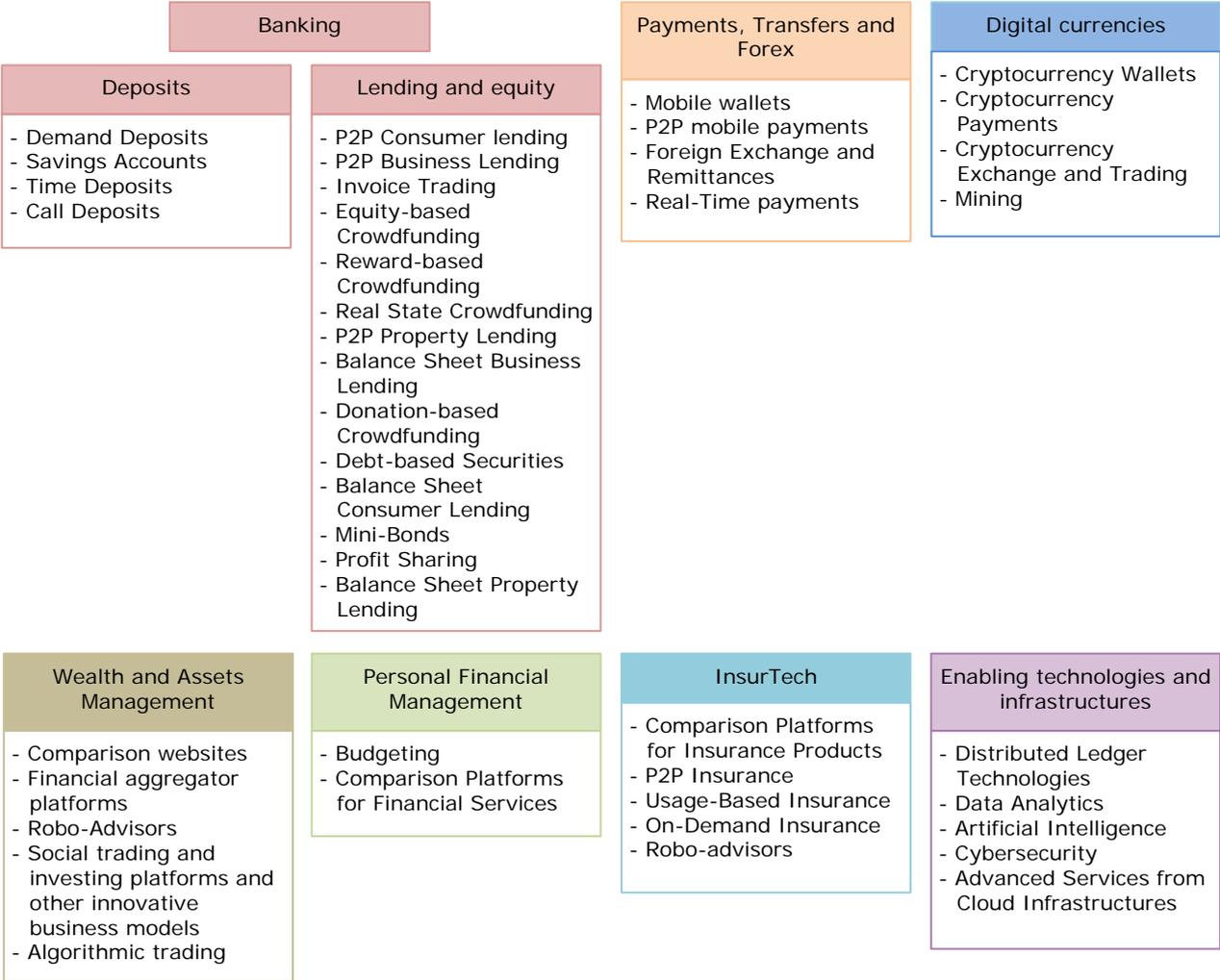
The FinTech services on an individual basis are described in more detail including a brief glossary **in Annex I**.

¹⁸ IOSCO (2017, p. 4).

¹⁹ PWC (2017, pp. 10–11).

²⁰ EY (2017, p. 14).

Figure 1: FinTech services classification



Source: Iclaves (2018).

1.3. The European FinTech market

The **difficulties in defining** the exact scope of FinTech services makes it challenging to quantify the size of the current and potential market. An additional difficulty is the complexity of differentiating FinTech services provided by traditional firms in the financial sector from other services. As a result, **there are no estimates of total turnover** for FinTech services (considering all the services analysed in this study) as a whole in Europe at the moment.

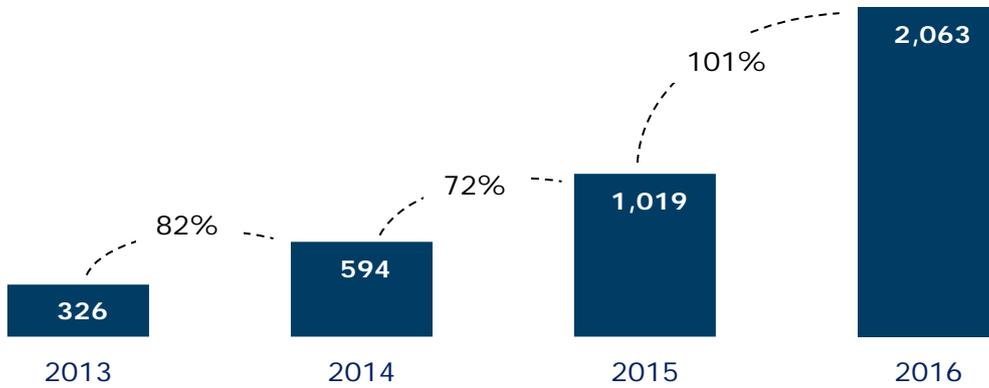
1.3.1. Market volume

Some research and consulting organisations have provided estimates of specific services in specific countries or regions. Cambridge Centre for Alternative Finance estimated²¹ the total volume of online alternative finance in the EU to be EUR 7 671 million as of 2016. The figure for 2016 is 41 % higher than in 2015. The UK is the main market and represents

²¹ Ziegler, T. et al. (2018, p. 16).

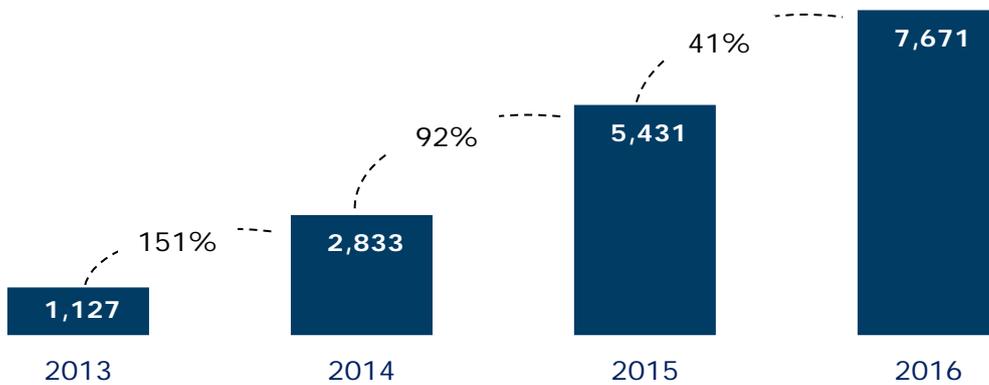
approximately 73 % of the total European volume, although its growth has decelerated in recent years compared to the rest of Europe, which grew 101 % between 2015 and 2016.

Figure 2: European online alternative finance market volumes 2013-2016 in million EUR (excluding the UK)



Source: Cambridge Centre for Alternative Finance (2016).

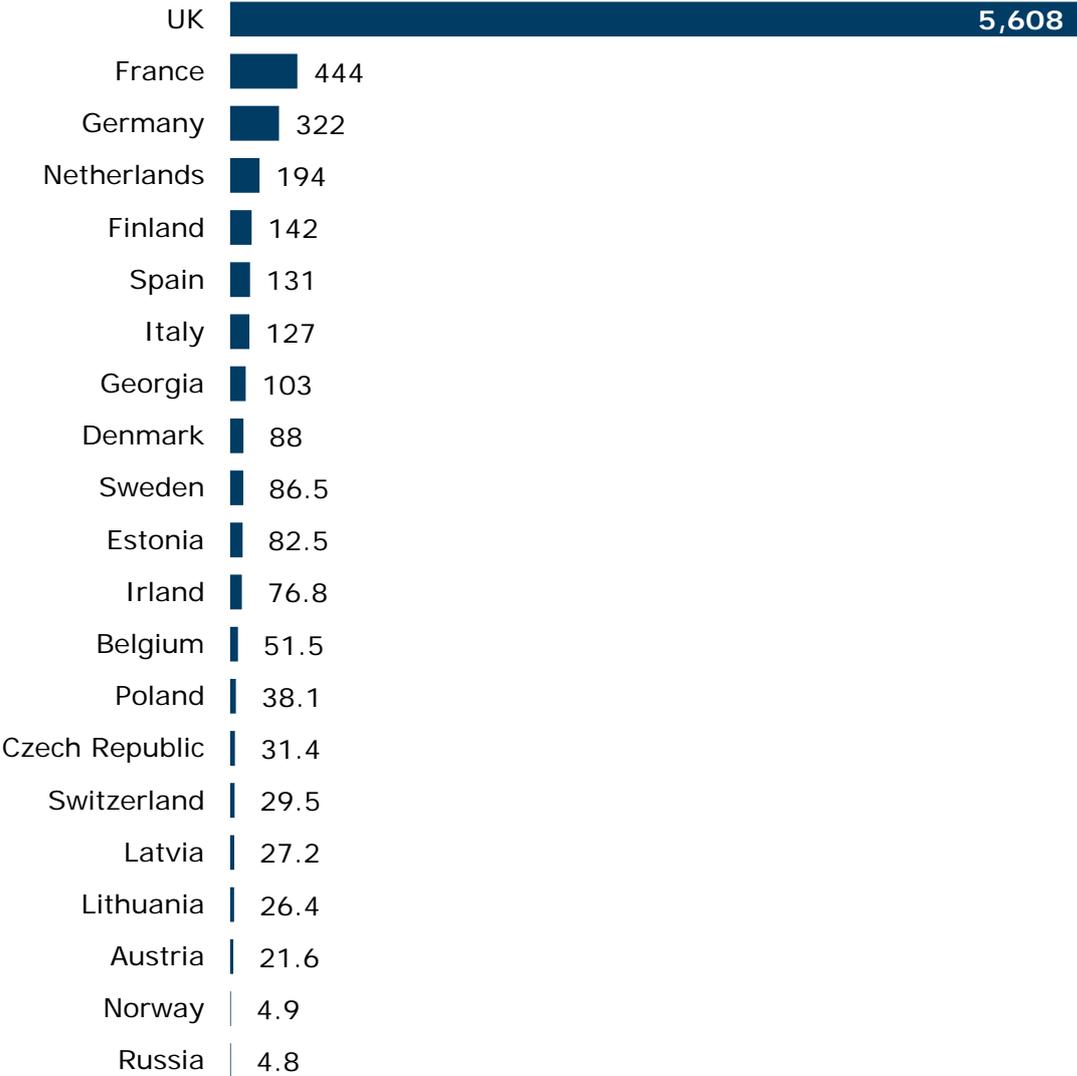
Figure 3: European online alternative finance market volumes 2013-2016 in million EUR (including the UK)



Source: Cambridge Centre for Alternative Finance (2016).

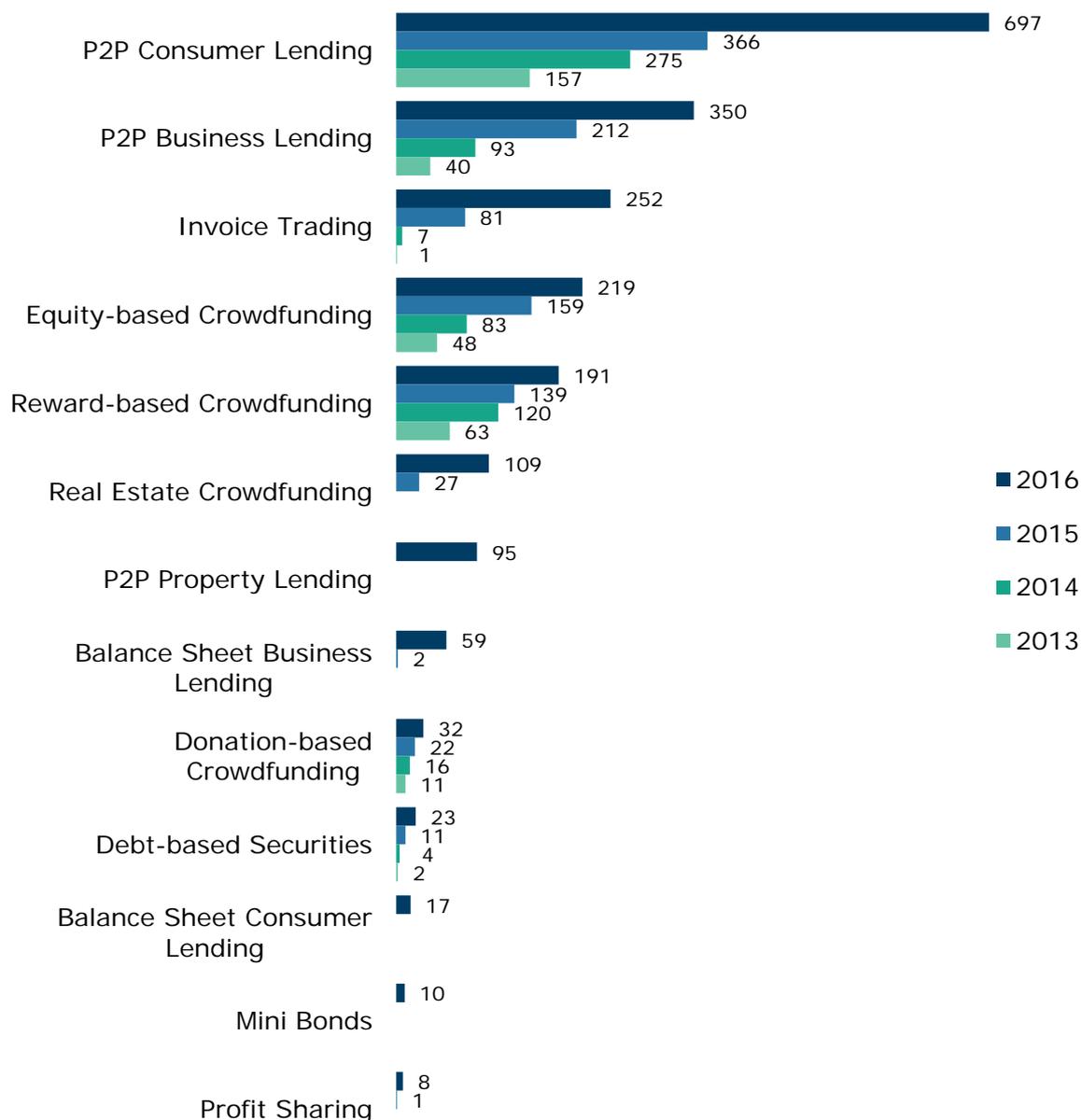
Following the UK, however at a significant distance, the countries with the greatest volumes of online alternative finance in Europe are France, Germany, the Netherlands, Finland and Spain.

Figure 4: Online alternative finance volume by country 2015 (in million EUR)



Source: Cambridge Centre for Alternative Finance (2016).

By type of alternative finance service, **P2P consumer lending** represents the greatest market share in Europe, with a volume of **EUR 697 million**. P2P business lending, invoice trading and equity based, reward-based and real estate crowdfunding, all exceed EUR 100 million. Figure 5 shows the evolution of each type of service between 2013 and 2016.

Figure 5: Alternative finance volume by model in Europe 2013-2016 (in million EUR)

Source: Cambridge Centre for Alternative Finance (2016).

The consultancy *Deloitte*²² estimated that the **market size** of FinTech²³ (defined as IT solutions dedicated to the financial sector both from traditional and non-traditional entities) in 2016 in Central and Eastern European countries²⁴ was **EUR 2.2 billion**. The estimation

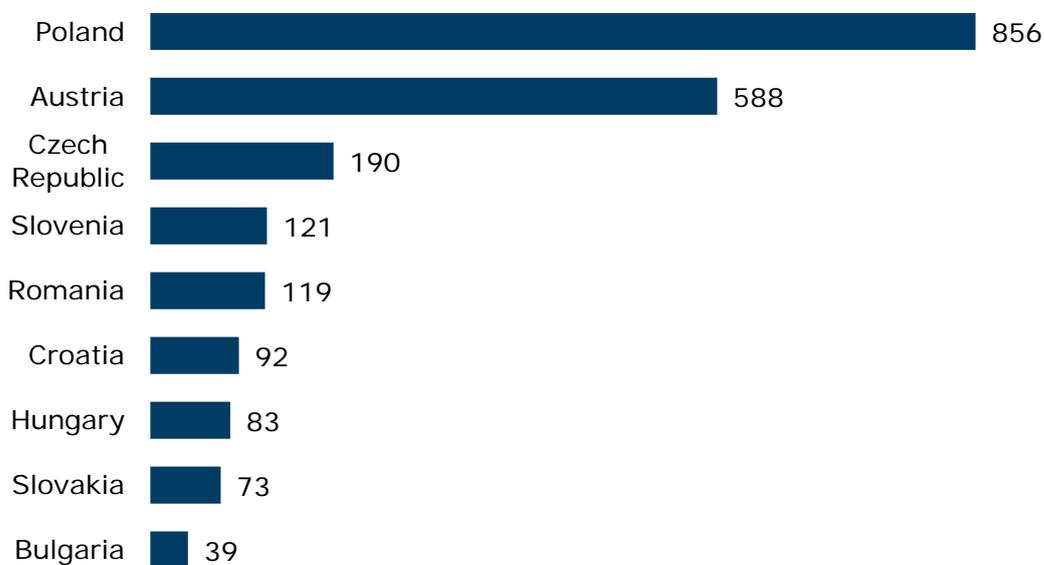
²² Deloitte (2016a, p. 6).

²³ *Deloitte* defines eight sub-categories of FinTech services in its study: (1) banking, (2) asset management and capital markets, (3) capital raising and personal finance, (4) payments, (5) data and analytics, (6) cybersecurity, (7) insurance and (8) other software.

²⁴ The report covers nine EU Member States: Austria, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia.

was of EUR 856 million for Poland alone, the biggest market of the nine countries analysed in the study.

Figure 6: Financial technology market size estimate for selected Central and Eastern European countries as of 2016, by country (in million EUR)



Source: Deloitte (2016).

A 2016 study on FinTech in Germany²⁵ estimated the **market volume** for various service categories in the country for the year 2015. That year, financing and wealth management services, including loans and factoring, social trading, robo-advice, crowdfunding and investment and banking, amounted to EUR 2.2 billion, while payment services amounted to EUR 17 billion.

In Spain, the *Observatorio Sectorial DBK* calculated that the turnover of FinTech companies had increased sixfold in only two years, growing from EUR 35 million in 2014 to EUR 206 million in 2016²⁶.

1.3.2. Adoption rates

The wide disparity between the available figures highlights the **difficulty of aggregating relevant data on FinTech services** and reiterates the **difficulty of defining the market** and delimiting the services to which it refers.

²⁵ Dorfleitner, G., Hornuf, L., Schmitt, M., & Weber, M. (2016, p. 14).

²⁶ DBK (2017).

The consultancy *EY* estimates that the average FinTech **adoption rate**²⁷ in 2017 was 33 %²⁸. There is consensus that China and India are the countries with the highest share of users, with over half of their connected population using FinTech services²⁹.

China and India have large tech savvy, but financially underserved populations. In those countries (as in other emerging regions) FinTech services are granting access to financial services to millions of people who would otherwise be excluded. In the case of China different factors favour the explosion of FinTech services. Very high rates of internet and mobile penetration, a massive adoption of e-commerce and a closed and protected domestic market and economy have been the breeding ground for the development of FinTech. The first targets of digital financial services were SMEs and individuals underserved by traditional financial providers followed by a growing middle class with needs regarding wealth and management investments, private banking and insurance. Chinese big techs, such as *Alibaba* and *Tencent*, are also taking advantage of great network effects. These technological providers have access to big data from customers, mainly from e-commerce and social media services, which are used to personalise FinTech services and improve efficiency. Additionally, by 2020 it is expected that the Chinese Social Credit System (SCS), a national reputation system providing ratings for every business and citizen, will be in place, opening new opportunities for FinTech³⁰.

In India, two important government initiatives have boosted the development of digital financial services. One initiative called '*Aadhaar*', launched in 2009, has allowed 99 % of the Indian adult population to be identified by digital means using biometric technology. The second initiative, the demonetisation policy put into place in 2016, pulled out the 500 and 1 000 Indian Rupees (INR) bank notes and gave a decisive stimulus to digital transactions.

In Europe, **the UK and Spain are the countries with the highest adoption rates of FinTech**, with 41 % and 37 % respectively. Germany with 35 % is the third European country above the global average. France and the Netherlands have adoption rates of 27 %, Ireland 26 % and Belgium and Luxemburg 13 %. These estimations include FinTech services from both new entrants, or non-traditional financial firms, and traditional financial firms³¹.

Payments and transfers are, globally, the FinTech services with the **highest penetration** among users (50 %), followed by insurance (24 %), savings and investments (20 %), financial planning (10 %) and borrowing (10 %)³².

In general, digital disruption seems to have affected corporate banking to a lesser extent compared to retail banking. The time and effort required to change a financial services provider for a business seems to be one of the reasons³³. FinTech providers also tend to solve issues specific to the corporate banking business and therefore present themselves more as **potential collaborators** or drivers for innovation than as real threats (understood

²⁷ Adoption rate refers to the average percentage of digitally active consumers using FinTech services. Data refers to 20 markets analysed, including: Australia, Canada, Hong Kong, Singapore, the UK, the US, Ireland, Belgium and Luxembourg, Brazil, China, France, Germany, India, Japan, Mexico, the Netherlands, South Africa, South Korea, Spain and Switzerland.

²⁸ EY (2017, p. 8).

²⁹ According to data from *EY* in 2017 India and China had adoption rates of 52 % and 69 % respectively. *Capgemini* quantifies the percentage of customers using financial services in the year 2016 from non-traditional firms above 75 % in both cases.

³⁰ Mittal, S. & Lloyd, J. (2016, p. 6).

³¹ EY (2017, p. 8).

³² EY (2017, p. 14).

³³ Grealish (2017).

as alternative providers)³⁴. This is also the case for insurance, where InsurTech service providers are mainly focused on the steps of the value chain closer to the user, such as sales and distribution, but have not yet so clearly threatened the risk carriers’ business³⁵.

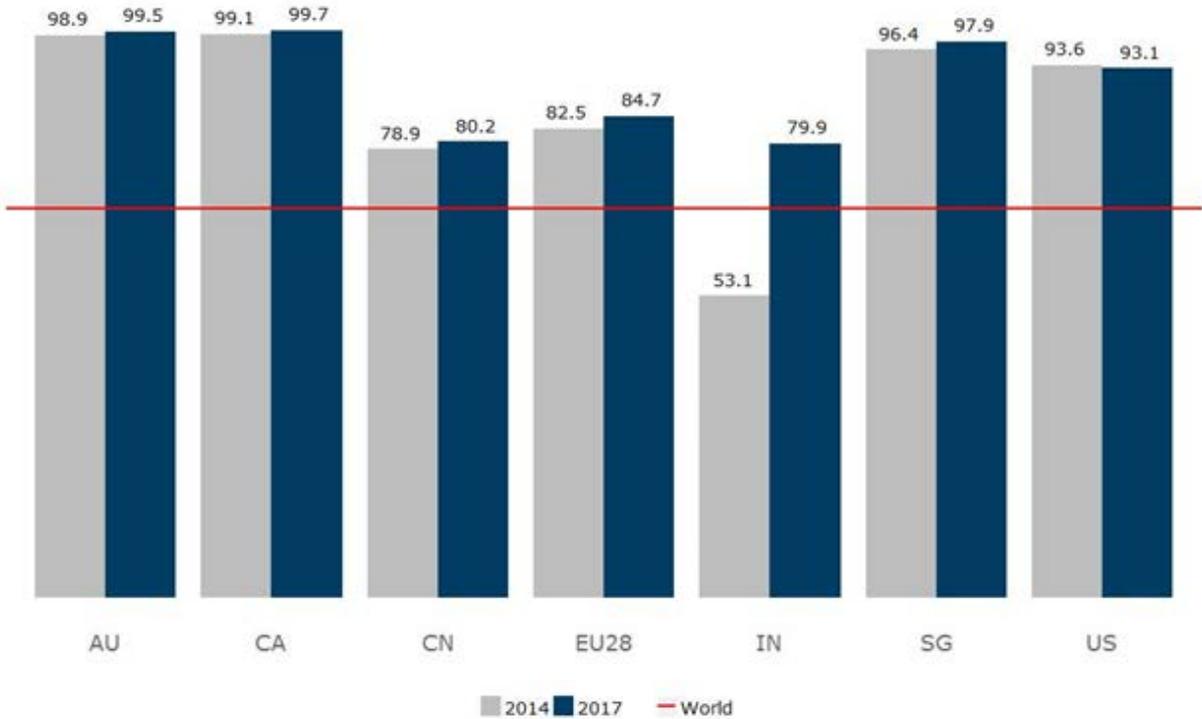
However, the lack of a clear definition of what FinTech services exactly are, raises doubts about the real penetration of these services. Estimates made by consultants such as EY or Capgemini use very general concepts related to digital services.

The widespread use of digital technologies in all areas of professional and personal spheres has undoubtedly been a key driver for the adoption of FinTech, in which users are basically looking for two things: easier access to financial services, or in some countries even just access, and a better user experience.

FinTech is considered to have an enormous potential in improving **financial inclusion**. FinTech services have the capacity to provide more accessible and affordable financial services to larger masses of the population and SMEs, especially in credits and payments. For instance, in many countries where large rural populations have traditionally been underserved by incumbents, these populations can now be covered by digital-oriented providers. Poor access to more traditional financial services is in fact one of the reasons explaining the boost of FinTech services in China and India.

Figure 7 shows the percentage of people above 15 years old holding an account at a financial institution in 2017 in selected countries and the EU. This indicator also includes those having a mobile account.

Figure 7: Percentage of people who have an account at a bank or financial institution in selected countries or regions (% age 15+)

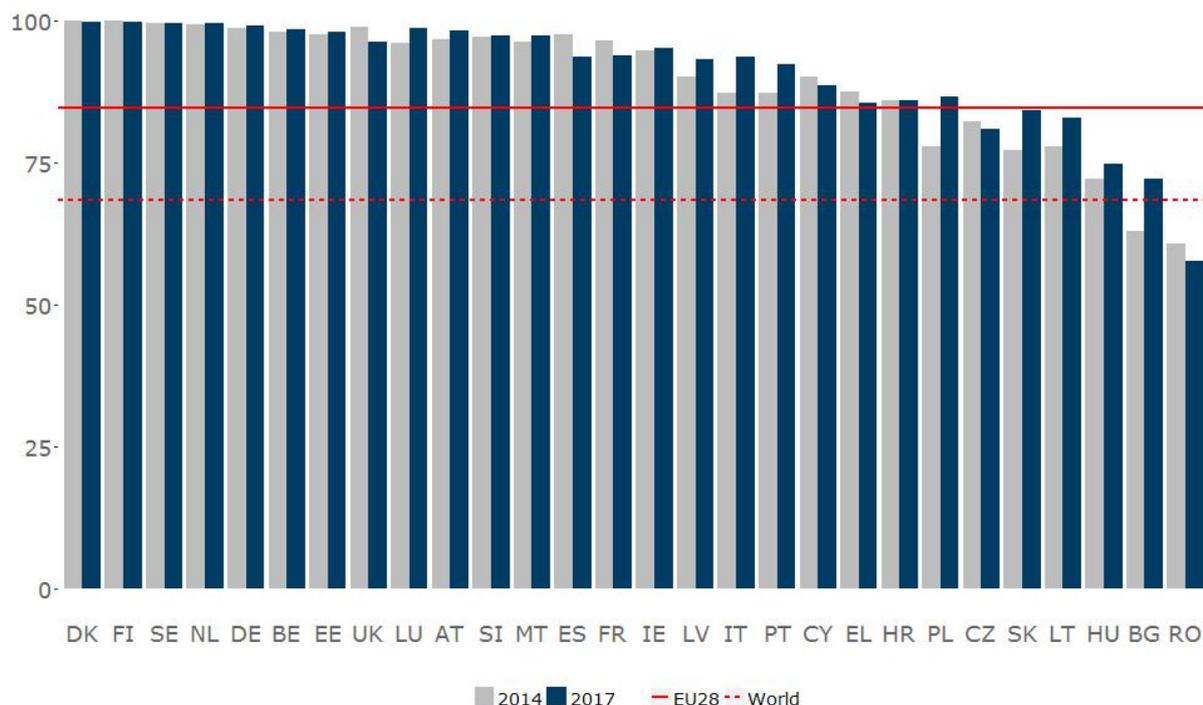


Source: Compiled by Iclaves based on the Global Financial Inclusion, World Bank. (2018).

³⁴ Finextra (2017, p. 19).
³⁵ Braun, A. & Schreiber, F. (2017).

Among the countries analysed, Canada has the highest percentage of people (99.7 %) who report having an account at a bank or another type of financial institution, followed by Australia (99.5 %), Singapore (97.9 %) and the US (93.1 %). In the EU, 84.7 % of citizens over 15 years old have a bank account. On the contrary, China and India have the smallest shares of account holders. Between 2014 and 2017, the most recent data available, China shows a slight increase in the percentage of people who have an account bank (1.3 percentage points) while India has a relevant growth (26.8 percentage points). For the first time, the penetration of bank accounts in India is above the world average (68.5 %).

Figure 8: Percentage of people who have an account at a bank or financial institution in EU28 (% age 15+)

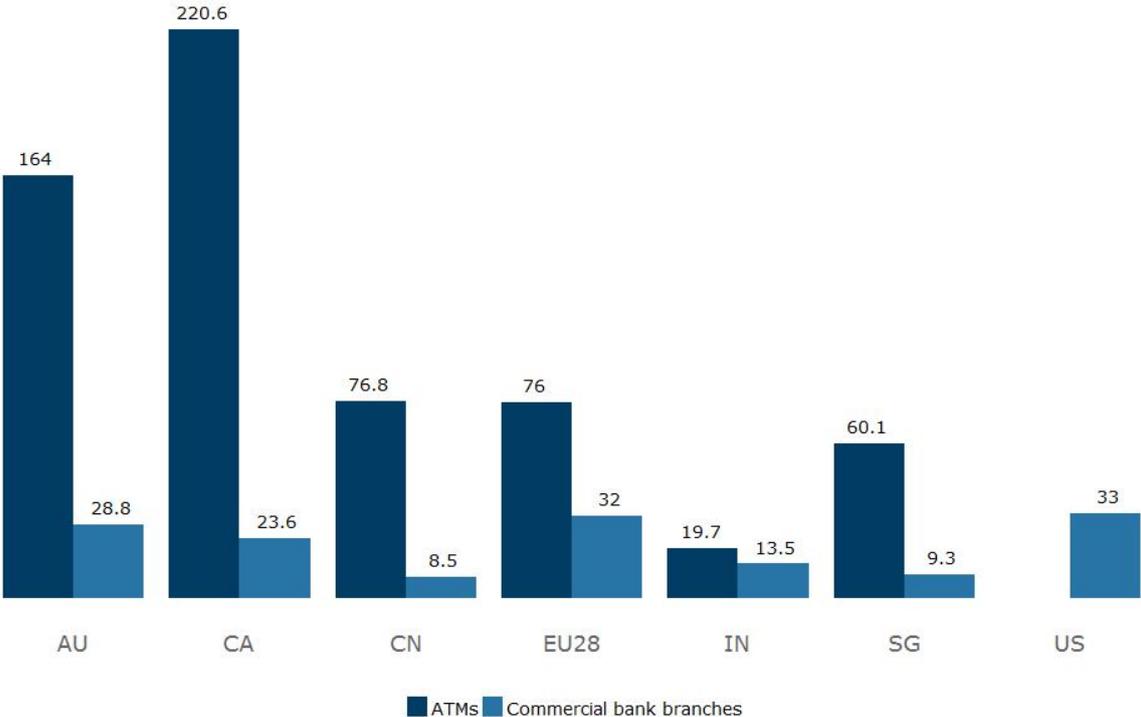


Source: Compiled by Iclaves based on the Global Financial Inclusion, World Bank (2018).

Figure 8 shows the percentage of people with an account in the EU in 2017. Denmark and Finland are the EU countries where basically the whole population over 15 years old have an account, followed by Sweden (99.7 %), the Netherlands (99.6 %) and Germany (99.1 %). All EU countries except Romania have scores above 60 % and just over half have percentages above the EU28 average in 2017 (84.7 %). Compared to the 2014 data, the increase is remarkable in Bulgaria, Poland, the Slovak Republic and Italy. Spain, Romania, France and the United Kingdom are some of the EU countries where the percentage of people who have an account decreased in 2017 compared to 2014.

The number of **branches** and **automated teller machines** (ATMs) indicate the distribution of bank outlets within a country's area and its entire population and are a good indicator of the **accessibility of traditional financial services**. Figure 9 shows the difference in penetration of these services among the countries analysed. These data have several limitations, however, due to the lack of uniformity in the concentration of these financial access points —most countries concentrate their branches and ATMs in urban areas— and that the most recent data available dates back to 2015.

Figure 9: ATMs and commercial bank branches in 2015 in selected countries or regions (per 100 000 adults)

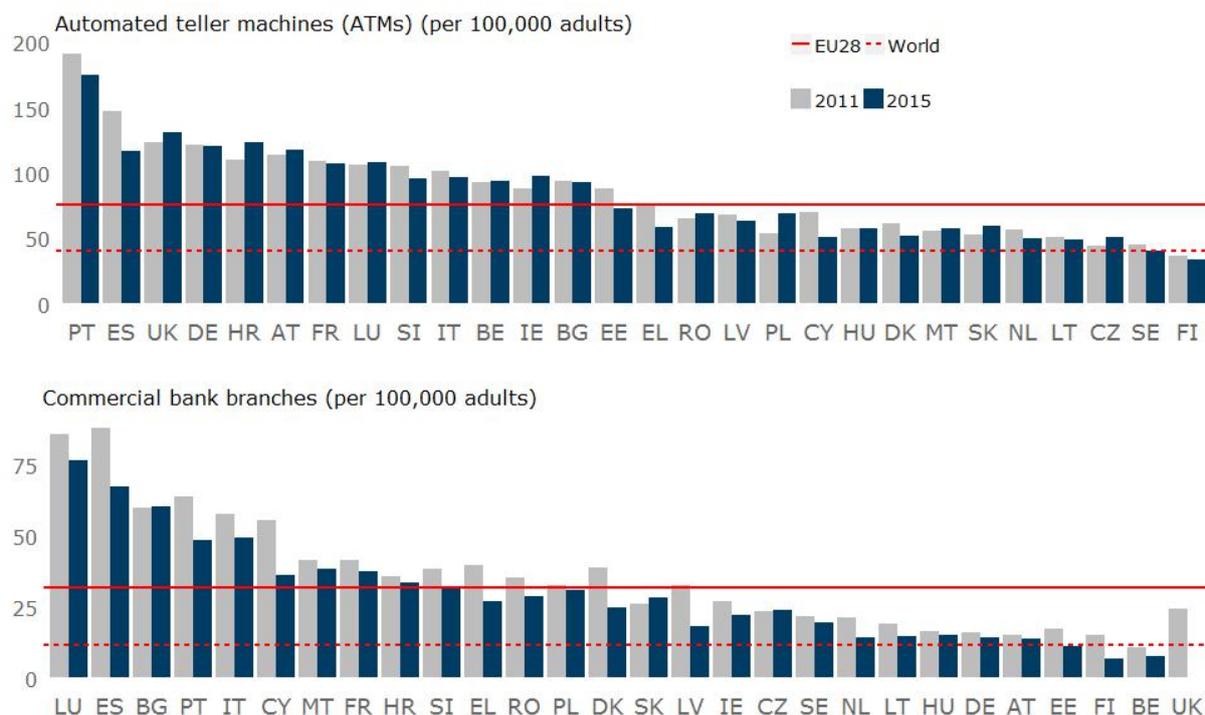


Note: Data not available for ATMs in US.

Source: Compiled by Iclaves based on the Global Financial Inclusion, World Bank (2018).

The highest penetration of ATMs is found in Canada, with 220.6 machines per 100 000 adults, followed by Australia with 164. China has 76.8 ATMs per 100 000 adults and the EU (76 ATMs per 100 000 adults). There is no data available for the US. Singapore has 60.1 machines per 100 000 adults and India 19.7, the latter being the only country with a penetration far below the world average (40.2 ATMs).

In the case of commercial bank branches, the US is the region with the largest penetration of branches (33 units per 100 000 adults), followed by the EU (32 units per 100 000 adults). In Australia and Canada, the number of branches is 28.8 and 23.6 per 100 000 adults, respectively. The penetration of commercial bank branches is below the worldwide average (11.6 commercial bank branches per 100 000 adults) in Singapore and China.

Figure 10: ATMs and commercial bank branches in EU28 (per 100 000 adults)

Note: Data not available for Commercial bank branches in the United Kingdom in 2015.

Source: Compiled by Iclaves based on the Global Financial Inclusion, World Bank (2018).

Figure 10 shows the number of ATMs and commercial bank branches per 100 000 adults in the EU28. The average penetration in the EU is 76 ATMs per 100 000 adults. Just over the half of the Member States are below this level, although all of them exceed the world average except Finland. Portugal (174.7) is the country with the highest penetration of ATMs, followed by the United Kingdom (131.3), Croatia (123.4), Germany (121), Austria (117.9) and Spain (116.8). In contrast, Finland (33.3), Sweden (40.5), Lithuania (49), the Netherlands (49.7) and the Czech Republic (50.7) are the countries with the lowest ATMs penetration in the EU.

Regarding the number of commercial bank branches, the ratio is high in Luxemburg (76.8), Spain (67.5) and Bulgaria (60.3), followed by Italy (49.6) and Portugal (48.7). These countries, along with Malta, France, Cyprus and Croatia are above the EU average (32 units per 100 000); however, as shown in the graph, most EU countries are around or below the average. Data is not available for UK. Finland (6.5) and Belgium (7.5) have the lowest penetration of commercial bank branches.

Besides financial inclusion, it is no surprise that **improving user experience** is at the heart of FinTech's services conception. Current users increasingly expect to receive better and more efficient financial services as a result of the benefits of digitisation. In fact, in 2016, 37 % of Europeans expressed their willingness to switch their financial services provider if it did not offer advanced technology services or products³⁶. As a result, the traditional loyalty that has characterised financial services providers has been affected by the penetration of FinTech services.

³⁶ Fujitsu (2016, p. 15).

The Special Eurobarometer on financial products and services for the year 2016 showed that in the previous five years only 29 % of Europeans had changed financial providers, with car insurance and bank accounts being the products to have most likely changed. The main reasons for not changing are satisfaction with the current provider (46 %), not having considered changing (30 %), the hassle of changing (8 %) and the limited potential benefit of changing (6 %) ³⁷.

It is not surprising that **younger and more tech-savvy users** are more willing to use FinTech services. According to the consultancy *Capgemini* ³⁸, younger users are 1.4 times more likely to use FinTech services than older users, and tech-savvy users are twice as likely as non-tech savvy users to make use of these services.

However, unlike what happens with other digitalised services, digital skills and access to technology are not the only major factors influencing the penetration of FinTech services. **Trust** is a key element of all financial services, and it is the same in FinTech.

Users still trust traditional firms more than newcomers, which are only trusted by one out of four users. Traditional firms are perceived as providing higher security, quality of service and transparency, while non-traditional companies are seen as offering better value for money and better efficiency ³⁹.

This reflects the **underlying strain within FinTech services** between improving the **accessibility and usability of financial services** through technology and securing **consumers' trust**, which is essential for the functioning and stability of the financial system.

1.4. The European FinTech providers

We have analysed European FinTech providers and compared them with providers from other relevant regions with the goal of assessing whether the market supply composition and structure may suggest the existence of potential competition concerns. The analysis is made by using the *Crunchbase* data base ⁴⁰, which provides information about the world's most innovative companies to analyse the industry structure, acquisitions and investments in specific sectors, as described in **Annex II**.

The first challenge in this analysis is to **delineate** the FinTech ecosystem itself. The *Crunchbase* database provides a total of 4 359 companies worldwide that are labelled as FinTech companies. After conducting a careful assessment of those companies ⁴¹, the data showed that up to 507 companies, although defined by themselves as FinTech, do not clearly engage in activities that are related to the use (or development) of innovative technologies to provide financial services. These results show how complex it is to categorise companies as belonging to the FinTech market and thus define a disruptive sector such as FinTech, posing a challenge to policy makers, competition regulators and authorities. Those companies were discarded, resulting in a **global FinTech sector of 3 852 companies** as shown in Figure 11. The US is the most relevant player in the sector with some 1 500 FinTech companies, followed by the EU as a whole with 1 020 companies. Within the EU, the UK is by far the largest contributor to the FinTech sector with 454 companies, accounting for 45 % of all EU companies.

³⁷ 'Special Eurobarometer 446' (2016).

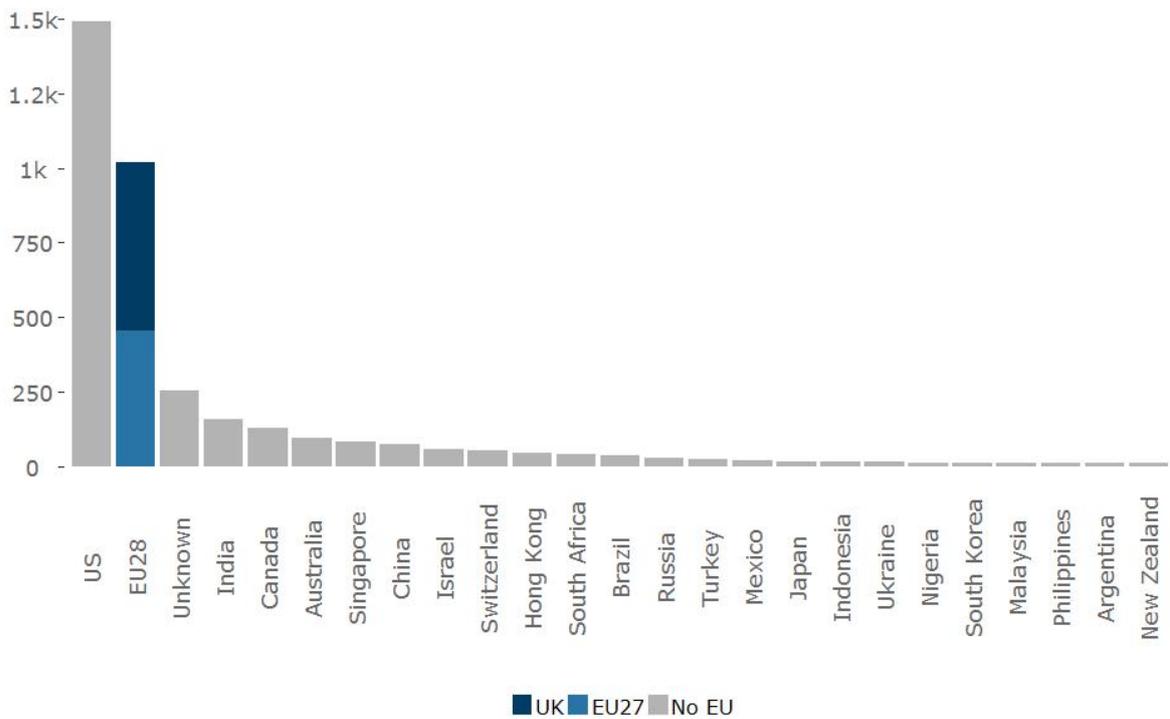
³⁸ Capgemini (2017, p. 13).

³⁹ Capgemini (2017, p. 15).

⁴⁰ Crunchbase (2018b).

⁴¹ Please see Annex II for the methodology and the applied criteria.

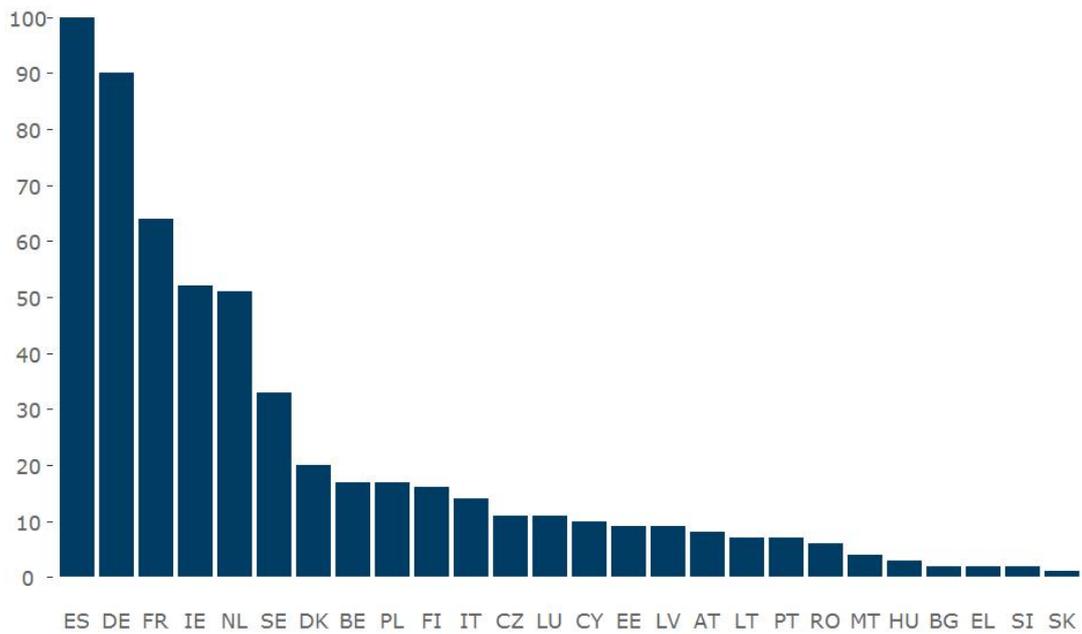
Figure 11: Number of FinTech companies worldwide by country/region



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Within the EU and excluding the UK, the largest contributor is Spain followed by Germany and France. Only seven countries have more than 20 FinTech companies, as shown in Figure 12.

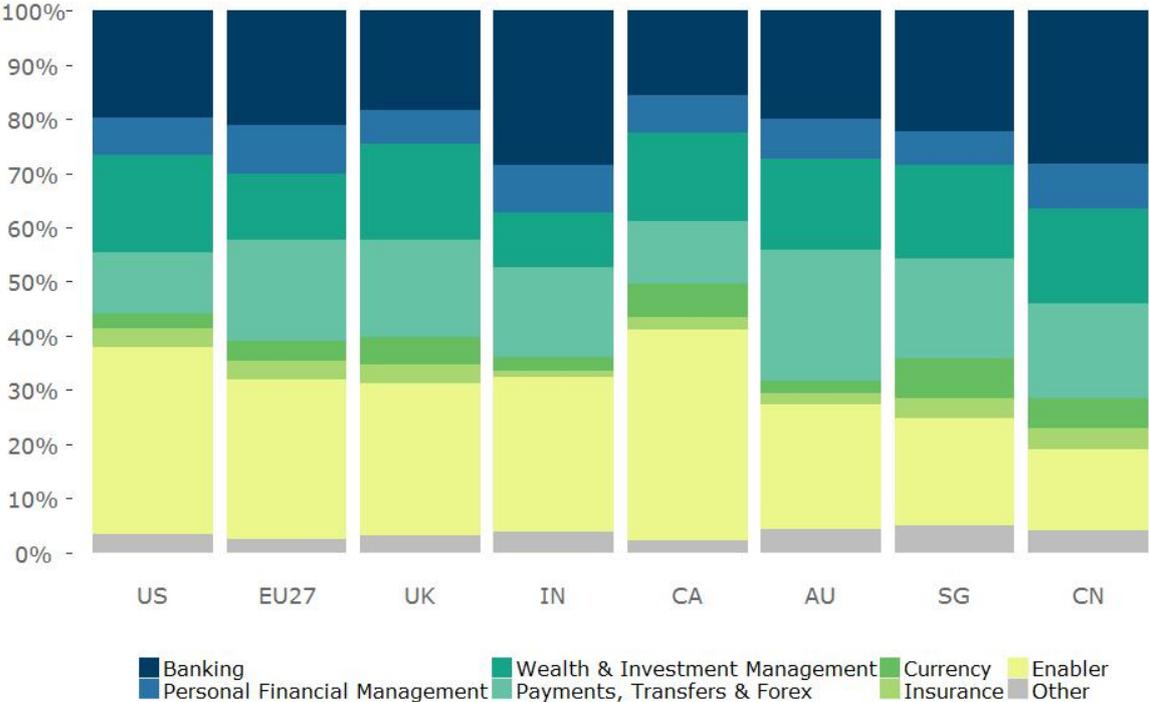
Figure 12: Number of FinTech companies by country in the EU27 (excluding the UK)



Source: Compiled by the authors based on *Crunchbase* (2018b).

For the sake of simplicity, the analysis is limited to comparing the EU with the six most relevant markets: the US, China, India, Singapore, Australia and Canada. Regarding the types of services provided, Figure 13 shows the distribution of companies depending on the category of services⁴² within each of the regions previously identified. Enabler companies are the most frequent, followed by providers of banking services. FinTech companies providing banking services are more frequent in China and India, countries that have a less developed and mature banking system, suggesting that in those markets FinTech providers are trying to fill the existing gaps. The profile of the existing financial sector in the country seems to be related to the services provided by newcomer FinTech companies. This fact is also verified when analysing the funding and size of the companies.

Figure 13: Percentage of FinTech companies by service category and region



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

The **level of investments** in the sector provides a good overview of the relevance of FinTech services in the different regions. The US leads the ranking, accounting for some USD⁴³ 29 billion of total investments followed by far by China, the UK, and India as shown in Figure 14. The EU (excluding the UK)⁴⁴ ranks 5th accounting for USD 3.6 billion, 12 % of the total amount invested in the US. As seen in Figure 15, investments began to skyrocket

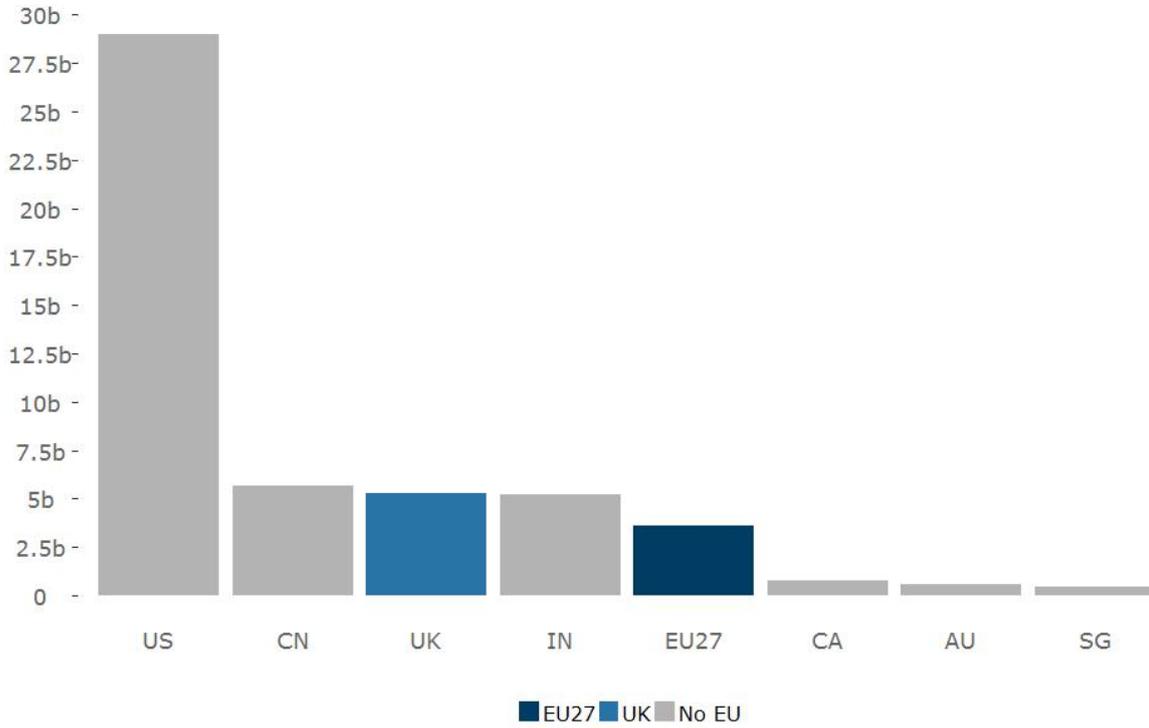
⁴² The services have been categorised according to the classification proposed in section 1.2., Figure 1, above: Banking, Payments, Transfers & Forex, Digital Currencies, Wealth & Investment Management, Personal Financial Management, Insurance and Enabling Technologies and Infrastructures. Category 'Other' includes those FinTech companies from *Crunchbase* database that do not fit well into the remaining categories.

⁴³ To minimise conversion rate errors, we have selected USD because most of the figures are provided by the source in that currency.

⁴⁴ Depending on the indicator, the analysis has been done for the EU28 or for the EU excluding the UK (EU27). This differentiation aims at providing useful insights for policy-makers in the medium-term, in view of the forthcoming exit of the UK from the European Union and given the big size of the British FinTech market, compared to the rest of Member States.

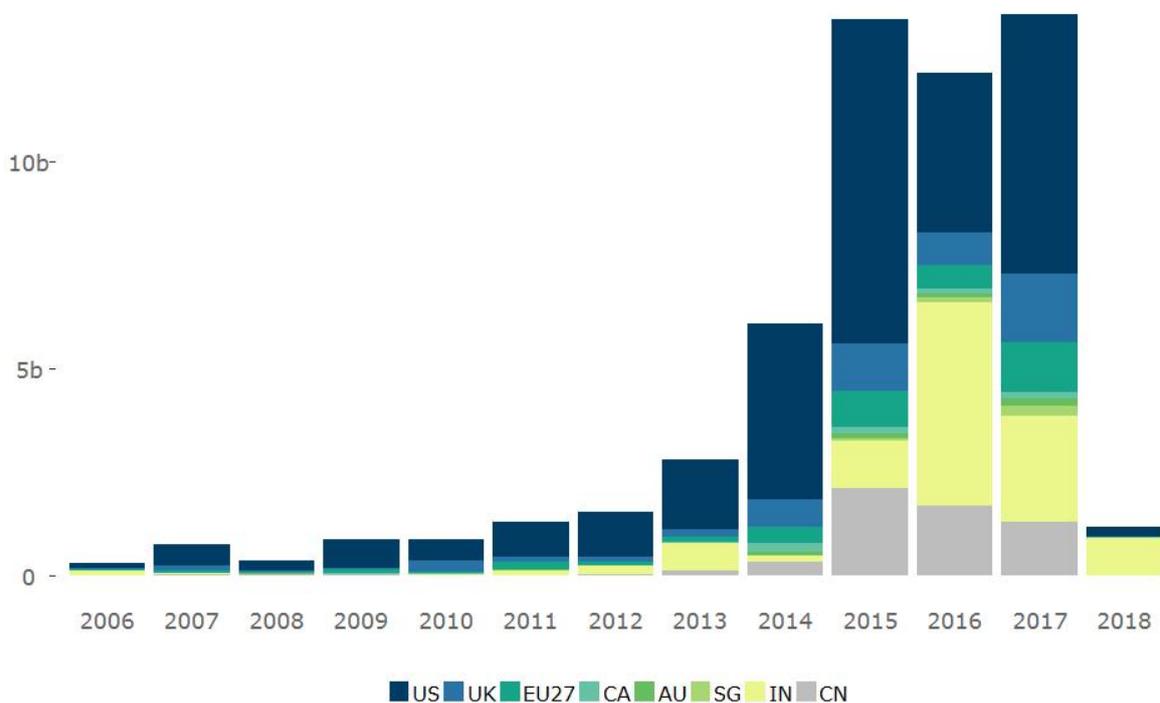
in 2013, led mainly by the US. The EU, including the UK, has been particularly active since 2014. It is especially interesting to see how investments in China and India soared from 2015 onwards. In 2016, more than 50 % of overall investments took place in those regions.

Figure 14: Total investments in FinTech companies by country/region (in USD)



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

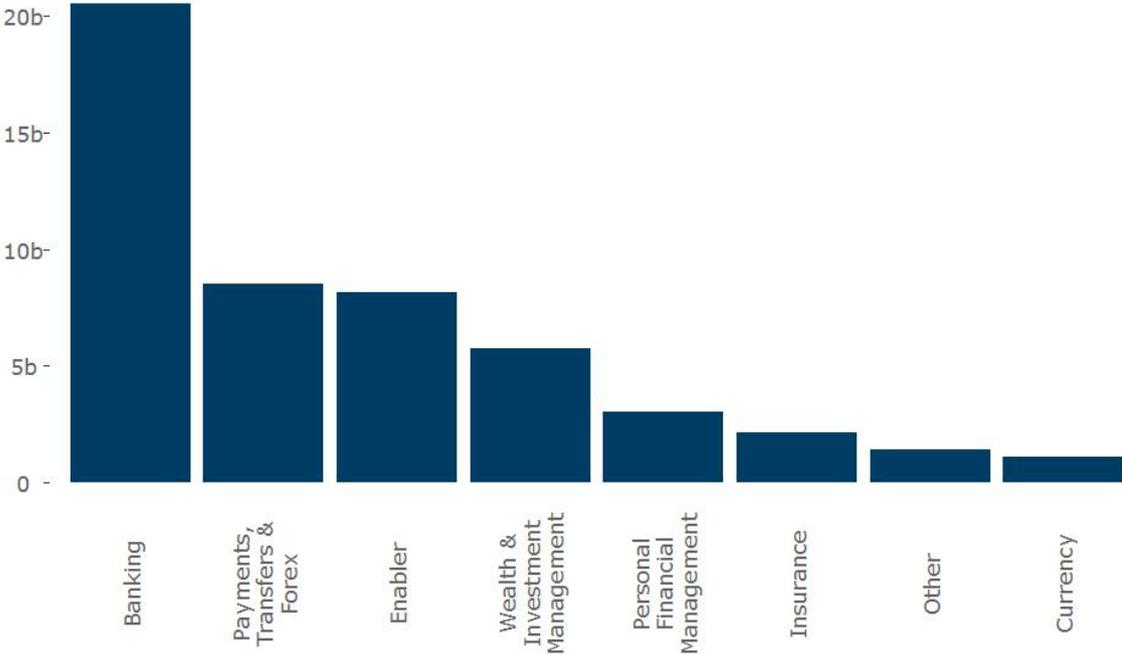
Figure 15: Yearly evolution of money raised by region/country (in USD)



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Regarding types of services offered, investment in banking services leads the ranking with more than USD 20 billion (Figure 16), with China, India and the UK being the countries that invest the most in this area. Less developed banking markets, like China and India, devote more resources to make up for the lack of a previous mature market, as can be seen in Figure 17.

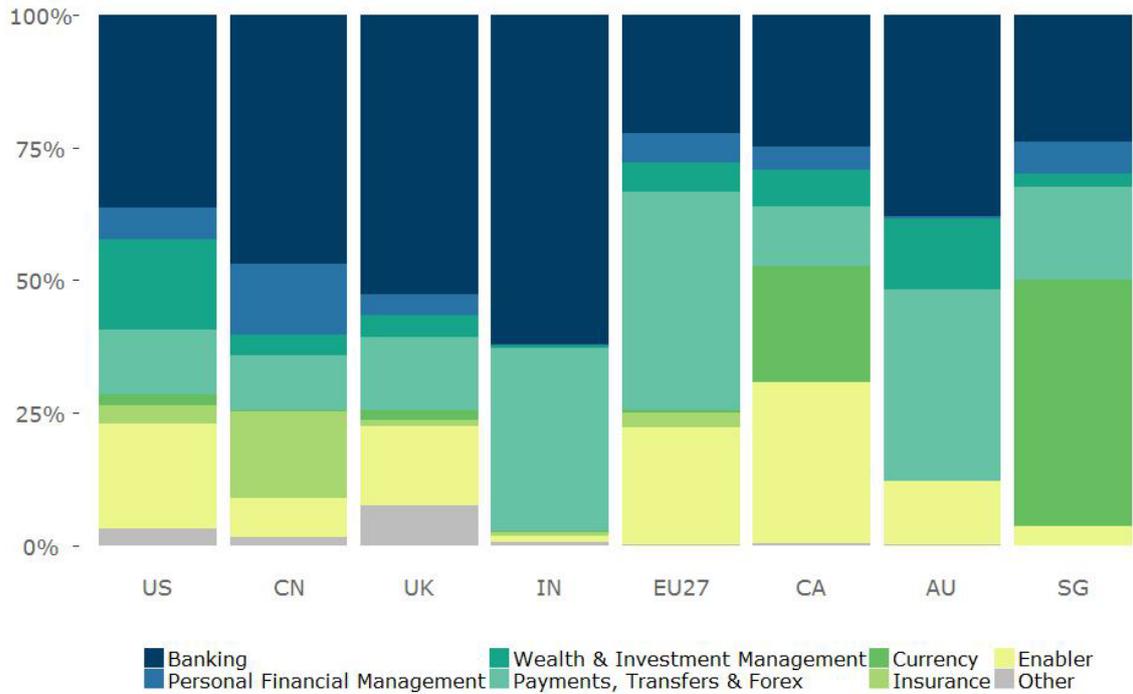
Figure 16: Total investments in the FinTech sector by service category (in USD)



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

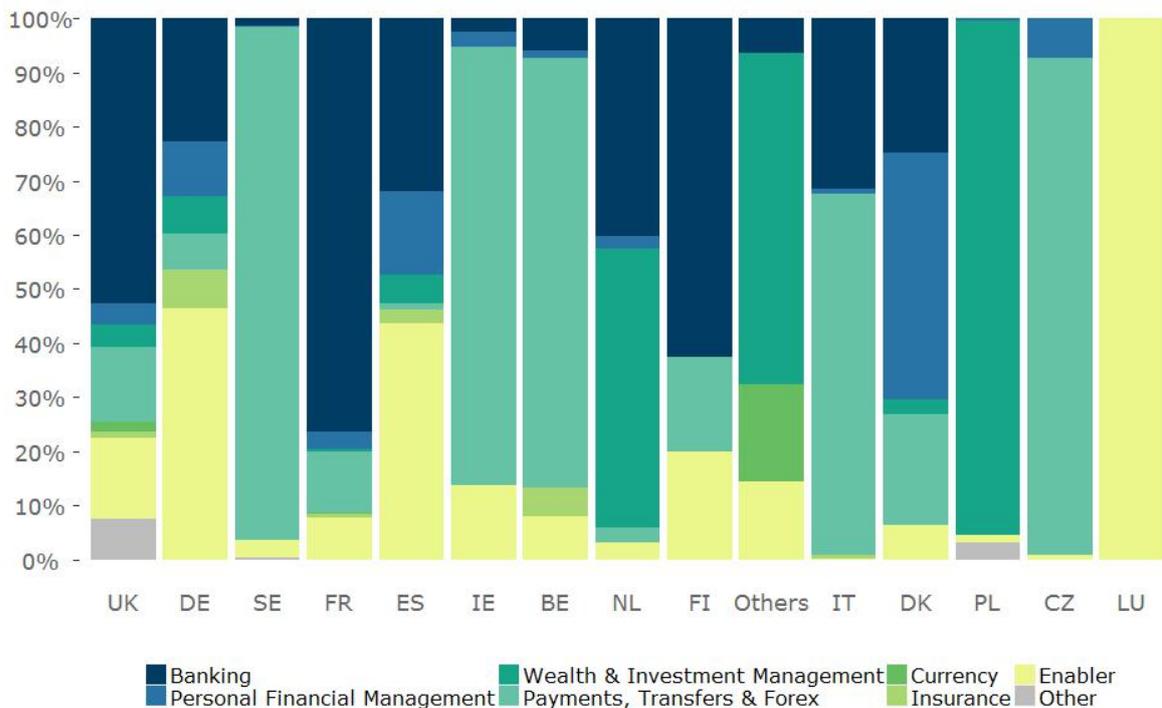
Within Europe, the situation is different and there is no clear pattern of investments based on the specific type of service depending on the country. Only the UK, France and Finland invest more than 50 % in banking services compared to other categories, while Belgium, Italy, Ireland, Sweden, and the Czech Republic invest more than 50 % in Payments, Transfers & Forex services, as can be seen in Figure 18.

Figure 17: Percentage of investments in the FinTech ecosystem by service category and region/country



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

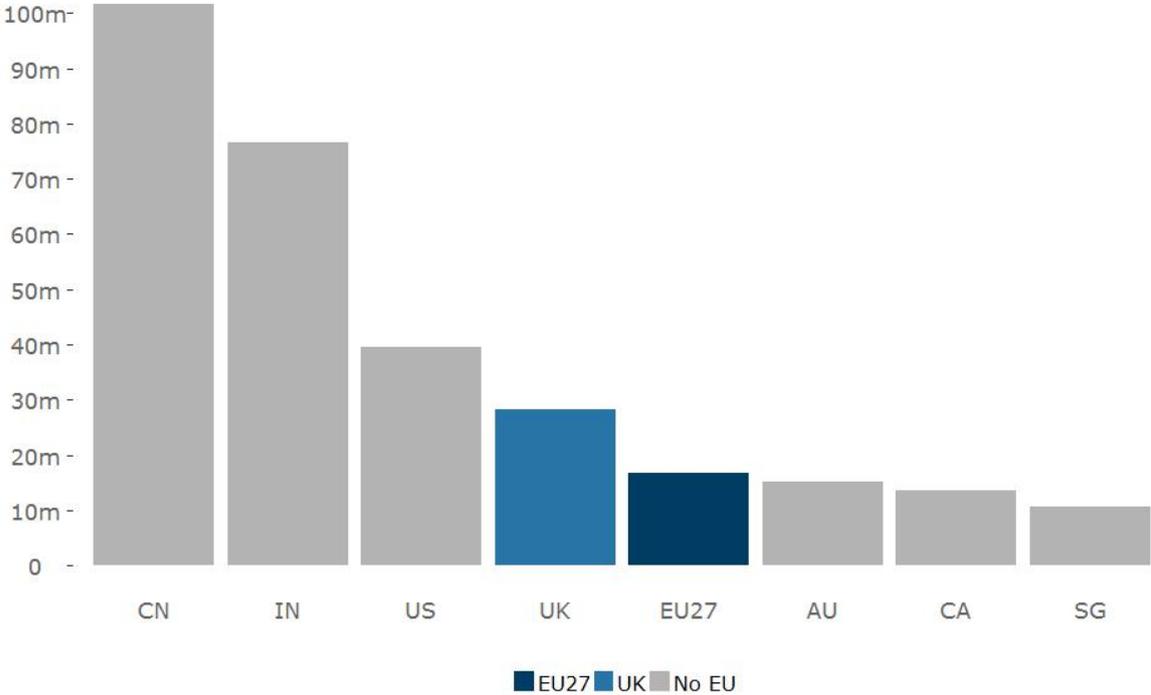
Figure 18: Percentage of investments in the FinTech sector by service category and country in the EU28



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

The economic potential of the companies that develop in each region can be assessed by analysing the average funding of each company. Underserved markets, like China and India, have a higher average amount of money invested per firm, with USD 102 million and USD 77 million, respectively, compared to USD 40 million in the US and USD 17 million in the EU (excluding the UK) as shown in Figure 19.

Figure 19: Average funding by funded company by region/country (in USD)



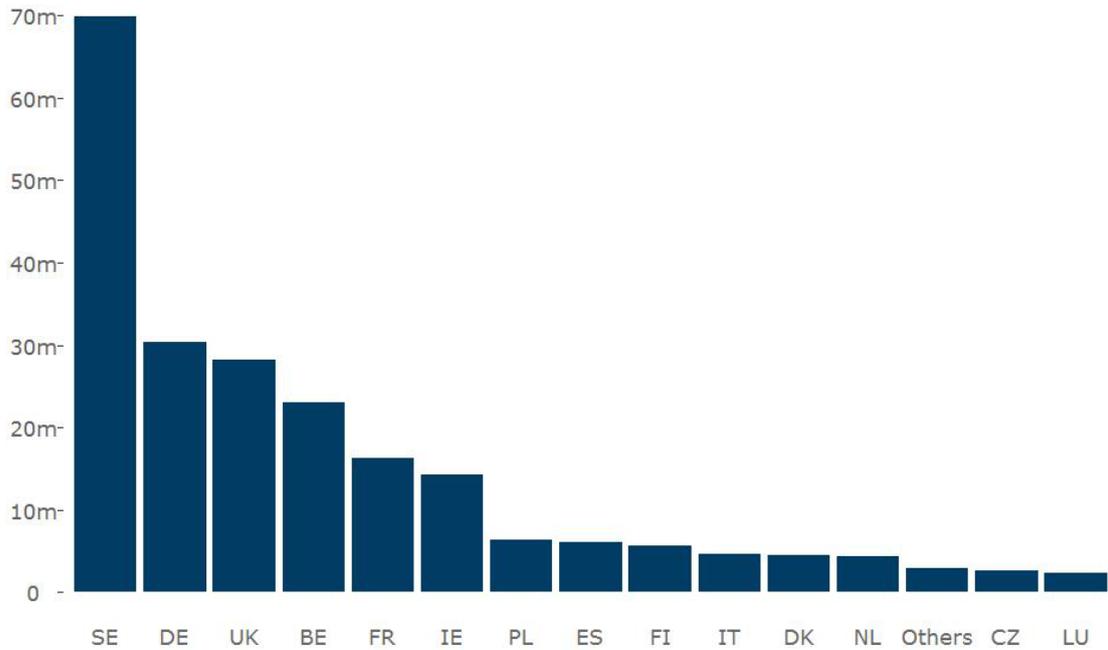
Source: Compiled by Iclaves based on *Crunchbase* (2018b).

A higher number of companies in China and India are likely to become relevant players compared to the developed regions (particularly the EU). In the EU those companies are smaller, most likely because they are a complement to the existing financial services. In fact, in the EU, only 4 countries have an average funding per funded company higher than USD 20 million, namely Sweden, Germany, the UK, and Belgium as shown in Figure 20. The small size and low average funding obtained by EU FinTech companies are characteristics shared with other digital sectors such as cybersecurity⁴⁵ or human language technologies⁴⁶. Some factors (market fragmentation, reluctance of traditional financing institutions to fund digital businesses, etc.) provide an adequate explanation for these outcomes, while others (e.g. financial crisis) have very limited impact.

⁴⁵ Rivera, R. et al. (2017).

⁴⁶ Rivera, R., Tarín, C., Villar, J.P., Badia, T., & Melero, M. (2017).

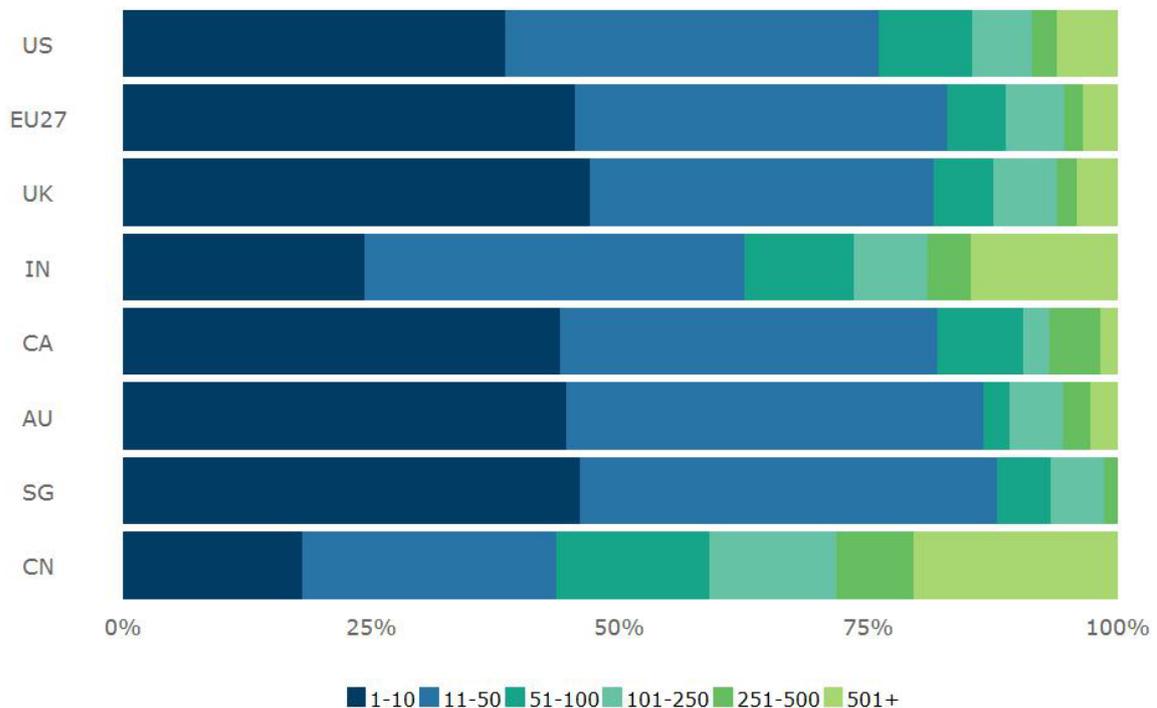
Figure 20: Average funding per funded company by country in the EU28 (in USD)



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

A similar trend is perceived regarding the size of the company. European companies (including the UK) are smaller, with a larger number of micro-enterprises with less than 10 employees. China and India have the largest percentage of big companies with more than 500 employees as shown in Figure 21. Only companies providing currency services are larger in the EU compared to the rest of the world.

Figure 21: Percentage of firms depending on the number of employees in the FinTech sector by region/country



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

FinTech European companies (excluding the UK) are also younger with an average age of 6.5 years compared to 9.8 in the US and 8.5 in India.

Figure 22: Distribution of companies by number of years since constitution by region/country

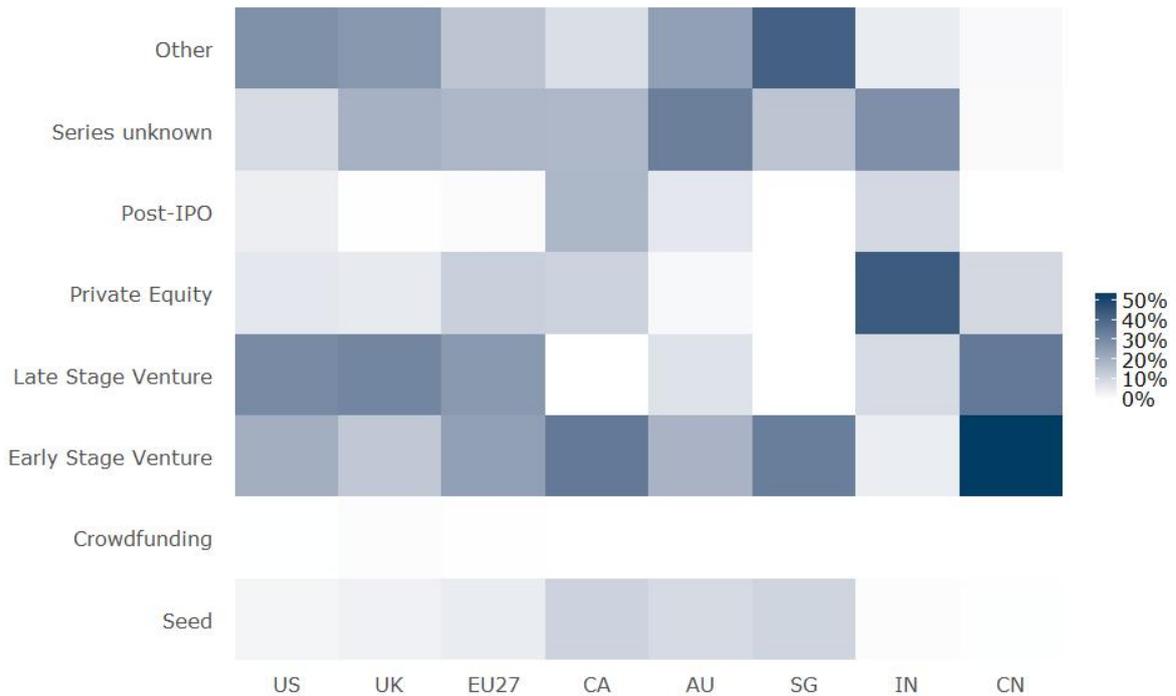


Note: Red numbers refer to the mean and black numbers to the median.

Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Regardless of the funding stage, the US has the highest number of funding rounds. There are strong differences in how companies are funded depending on the country. In analysing the percentage of money raised depending on the funding stage, FinTech companies in India are mainly funded through private equity, while in China the money is mainly raised in early stage ventures. Other regions use a wider combination of different funding mechanisms. Post-IPO funding —funding raised after a company's initial public offering of stock— is almost negligible in the EU.

Figure 23: Percentage of money raised by funding stage within the region/countries



Note: A description of the funding stages used can be found in Annex II.

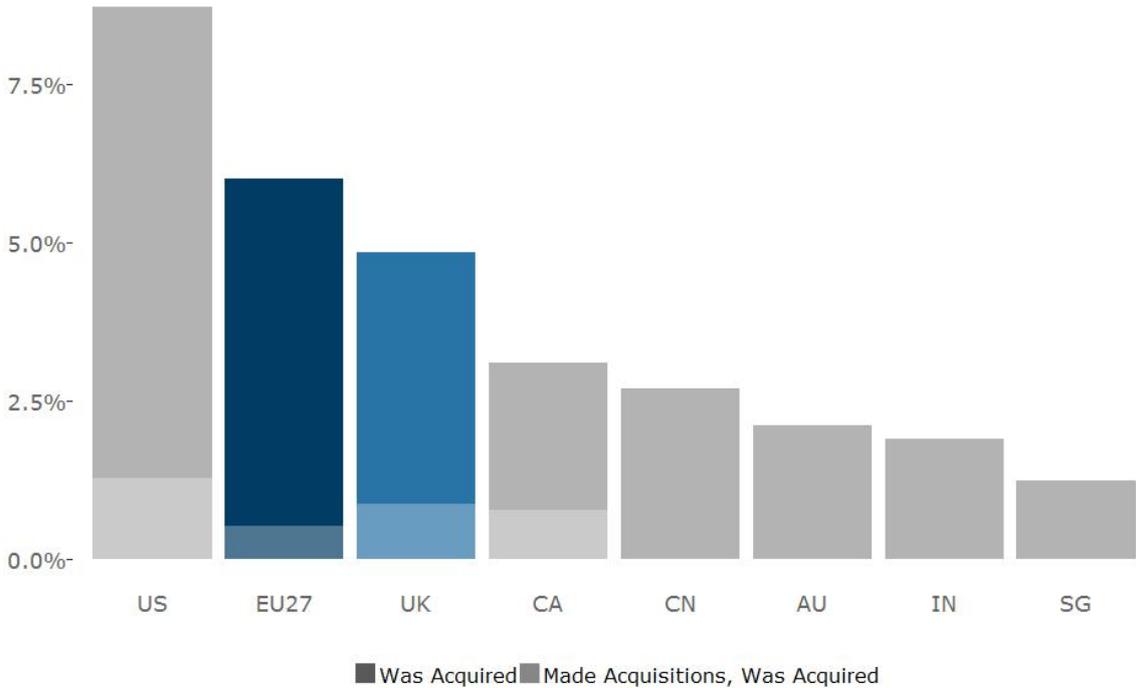
Source: Compiled by Iclaves based on *Crunchbase* (2018b).

A better understanding of the expected evolution of FinTech suppliers by region can be obtained by analysing whether new FinTech companies are acquired by third parties or whether these companies go public. Market dynamics characterised by acquisitions suggest that incumbents are incorporating new products or services developed by start-ups into their portfolios, while markets more characterised by companies going public suggest that new entrants are consolidating as financial services providers themselves.

In the EU and the US the percentage of FinTech companies that have been acquired is much higher than in other markets as shown in Figure 24. In contrast, in China and India, the percentage of companies that end up listed on the stock exchange is much higher as can be seen in Figure 25. This trend is very relevant from a competition perspective. It suggests that **market exit** of the start-up FinTech companies in the EU mainly happens through **acquisitions**. It also means that other companies from different sectors enter the FinTech market via acquisitions, which leads to the **need for a qualified merger control**.

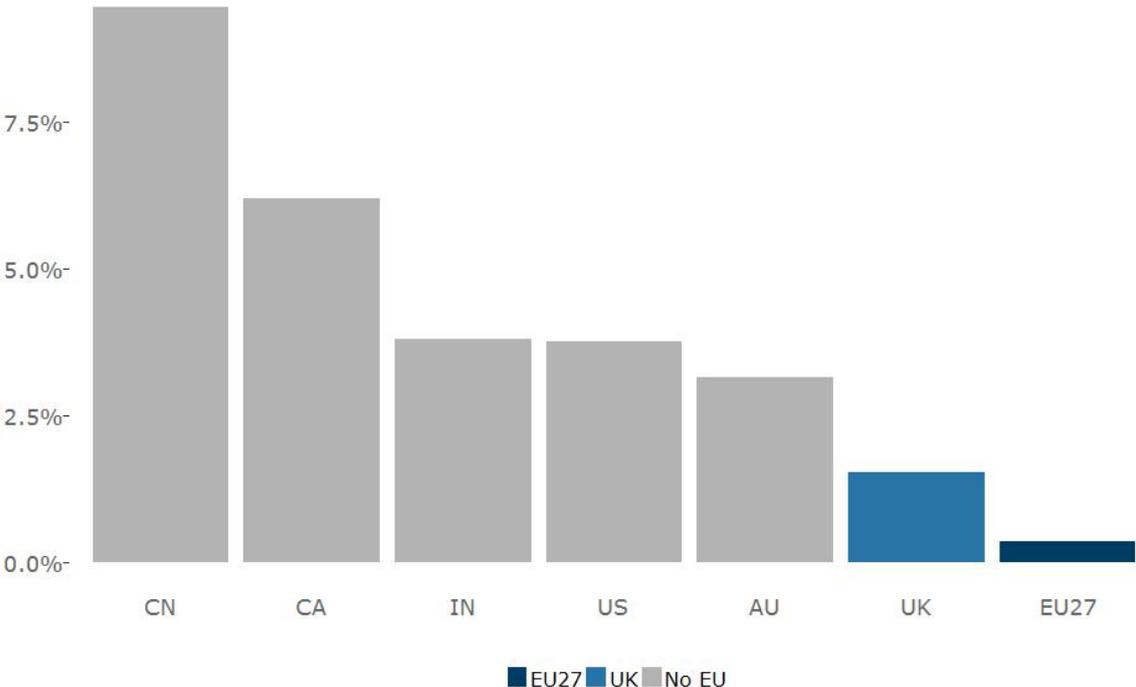
Companies in Europe are likely to be acquired by larger firms to complement their current offerings. China, however, shows a very low percentage of firms acquired and instead has the largest percentage of Initial Public Offering (IPO) companies. This suggests that a significant number of FinTech companies in China are likely to grow and become relevant stakeholders in the financial sector by themselves.

Figure 24: Percentage of companies by acquisition status within the region/countries



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

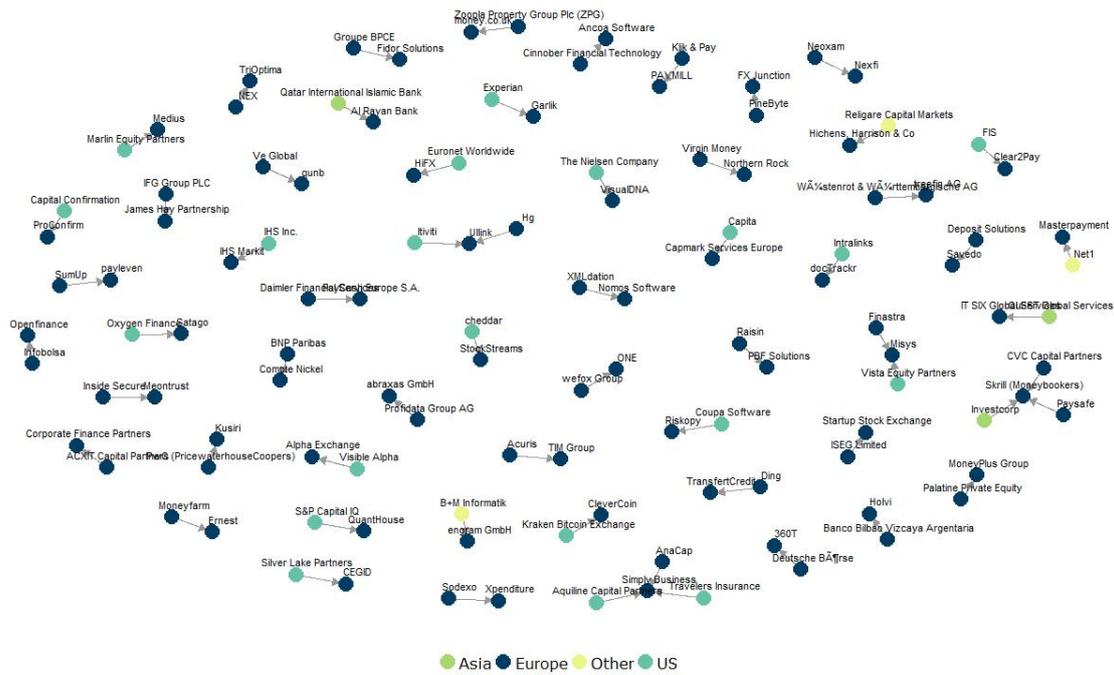
Figure 25: Percentage of IPO companies within the region/countries



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

We have also analysed the relationship between the acquiring companies and the acquired companies. The first conclusion is that there is a strong **geographical endogamy**. European companies are acquired by European companies and US companies are mainly acquired by US companies as shown in Figure 26 and Figure 27 respectively. The number of Asian companies being acquired is very low, as seen in Figure 28. This endogamy suggests that the specificities of the markets (diverse regulatory approaches, level and quality of the services available and consumer profiles/preferences) make it difficult for FinTech companies to provide their services outside their local markets. Globalisation in the FinTech market is happening at a rather low scale. Another insight is that **market concentration does not seem to be taking place**. Usually the acquiring companies only acquire one FinTech company; there are only a few cases in the US of a company acquiring more than one FinTech company.

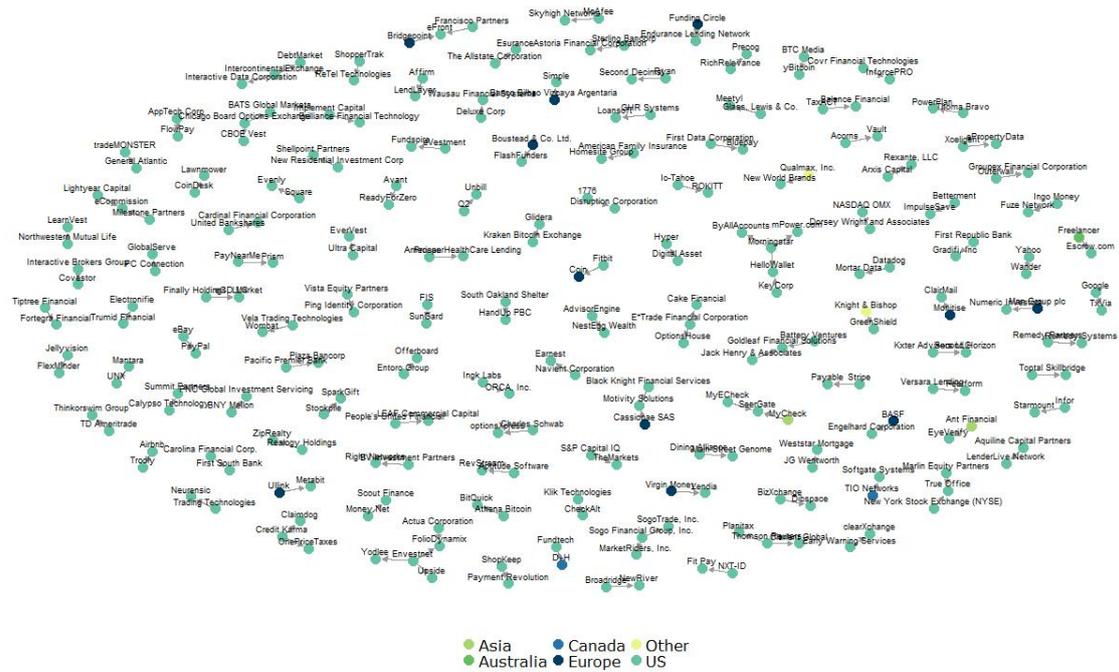
Figure 26: Network graph of acquisitions in EU28



Note: In Europe the category *acquired company* refers to EU28 companies and *acquiring company* refers to all European companies.

Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Figure 27: Network graph of acquisitions in the US



Note: European companies that acquire other companies in the US can come from any European country, not only from the EU.

Source: Compiled by Iclaves based on *Crunchbase* (2018b).

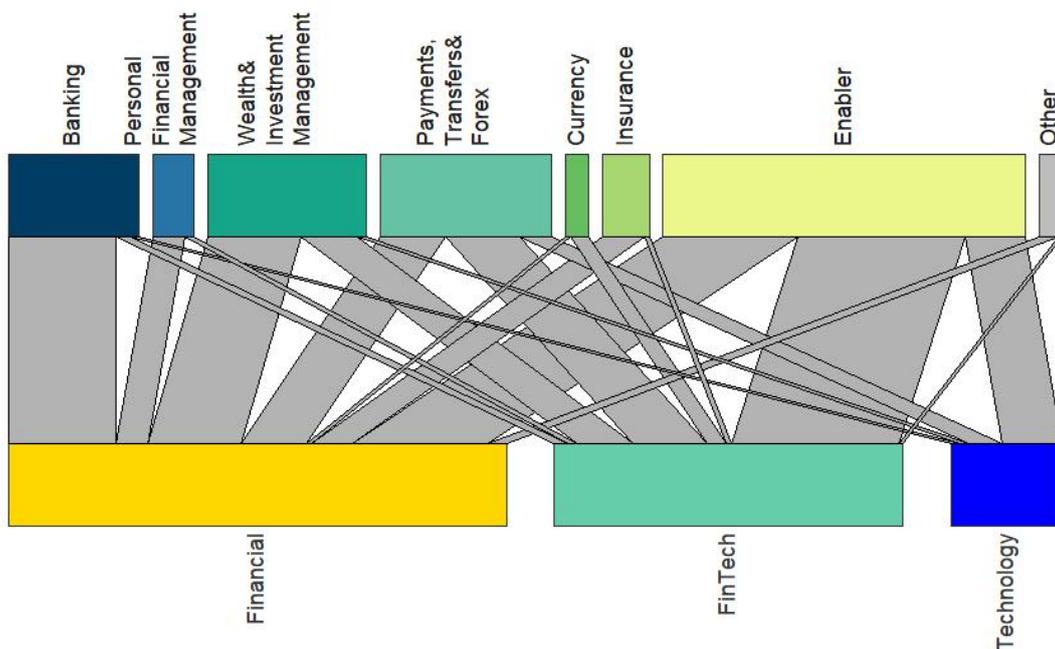
Figure 28: Network graph of acquisitions in Asia



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

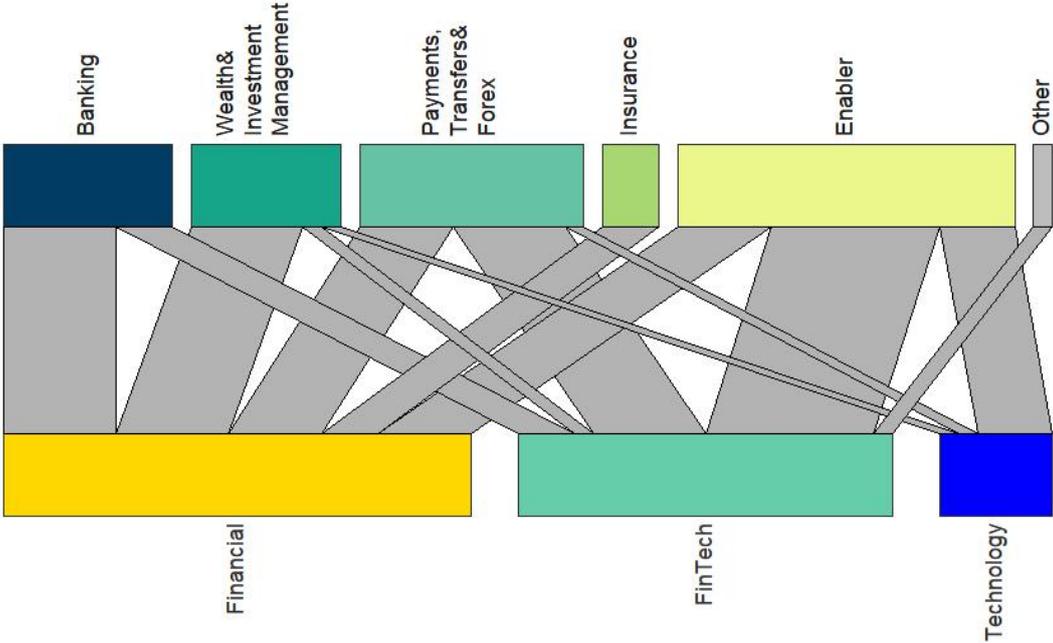
Regarding the relationship between the sector of the acquiring company (financial, FinTech, or technology) and the type of service provided by the acquired FinTech company, financial companies mainly acquire FinTech companies providing banking, PFM, wealth management, payments, insurance and enabling services. FinTech companies mainly acquire enabler companies, followed by payment and wealth management providers. Technology firms end up acquiring enabler companies and Payment service providers. The results can be seen in Figure 29 (worldwide) and Figure 30 (EU). This finding suggests that the **level of cross-services between the technology and financial sectors is still low**. Companies in the financial sector acquire mainly FinTech companies providing financial services, while technology-related companies tend to acquire FinTech companies that offer enabling technologies. The only exception is FinTech companies of Payments, Transfer and Forex services for which technology companies seems to be more interested in.

Figure 29: WebPlot of acquired companies by service category and sector of the acquiring company (worldwide)



Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Figure 30: WebPlot of acquired companies by service category and sector of the acquiring company (EU)



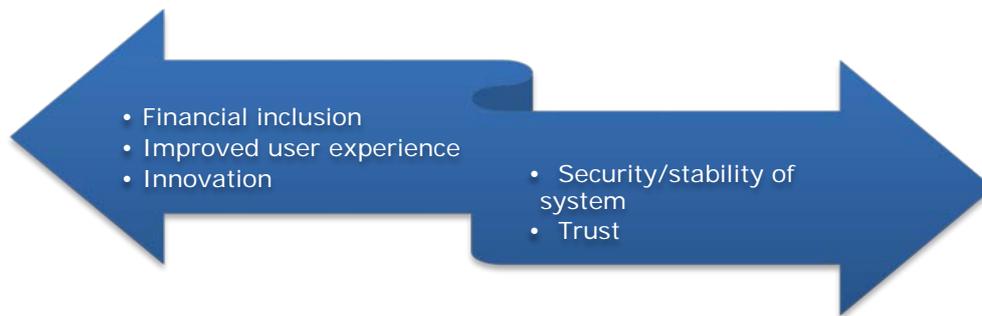
Source: Compiled by Iclaves based on *Crunchbase* (2018b).

Depending on the maturity of the existing financial sector, FinTech services pursue different goals. In **underserved markets** they are intended to promote **financial inclusion** while in **mature markets** they focus on **improving user experience** by fostering better and more efficient innovative financial services by taking advantage of the benefits of digitisation. The suppliers behave accordingly. In underserved markets, bigger companies are likely to arise with the goal of becoming relevant new players. By contrast, in more mature markets, start-up FinTech companies are likely to complement the existing offerings in many cases through acquisition processes.

After analysing the markets and the supply structure, **we have not seen any clear symptoms of competition problems**; however, FinTech services are still in their inception stage and in the medium and long term the situation might change.

What is clear, particularly in the more developed regions like the EU, is that there is an underlying **tension between** improving the **accessibility** and **usability** of financial services through technology and **assuring consumer trust**, which cannot easily be achieved by technology. This tension echoes in the balance between maximising efficiency and promoting innovation on the one hand and guaranteeing system stability and consumer protection on the other, as shown in Figure 31. This balance is usually sought by means of **prudential regulation**, particularly in banking services such as lending⁴⁷.

⁴⁷ Bank for International Settlements (2017).

Figure 31: The underlying tension in FinTech services: accessibility vs. trust

Source: Iclaves (2018).

To **summarise** the previous analysis, FinTech services can be seen as financial activities which provide an added value by means of digital technologies. As shown in section 1.1.1, FinTech services can be offered by different types of companies, so it seems more appropriate to talk about services rather than FinTech companies. What is generally called a FinTech company is actually a company that provides exclusively FinTech services.

The minimum criteria to define a FinTech service are the following:

- **It is a technology-driven financial service,**
- **which provides a new solution, a new business model or an alternative to what already exists in the financial sector,**
- **and offers a significant added value to any of the stakeholders involved in the value chain (mainly the consumer).**

For the purposes of the following analysis we consider the following classification of different FinTech services⁴⁸:

- **Banking;**
- **Payments, transfers and Forex;**
- **Digital currencies;**
- **Wealth & Asset management;**
- **Personal finance management,**
- **Insurance and**
- **Enabling technologies and infrastructures.**

⁴⁸ The classification has been already defined in section 1.2. It is described in detail in Annex I.

2. COMPETITION ISSUES IN THE FINTECH SECTOR

KEY FINDINGS

- FinTech services are **constantly evolving** and the **application of competition instruments** to analyse potential anticompetitive behaviours **faces several challenges**. Analysis of the dynamics within the new web-based **business models is the best way** to assess traditional competition concepts such as market definition and market dominance.
- Competition challenges caused by FinTech can be characterised according to a multidimensional approach: (1) From a supply-side perspective, there are two technology-related reasons that can explain competition challenges: (I) **provision of services through online platforms** and (II) the **intensive use of data**. (2) From the demand-side perspective, competition challenges depend on (III) the **access and operation** of the technology by the users and (IV) the **user perception and behaviour**.
- The combination of platform technologies and the access and operations by users can result in competition concerns related to **interoperability** and **standardisation**. User perception and behaviour help to identify challenges such as the **definition of a relevant market** and the role of **network effects** as a source of market power.
- The intensive use of data and technology related to technologies such as algorithms and AI may lead to **interoperability** concerns, **exclusion of users**, **price discrimination**, practices of **tying and bundling** and even **tacit collusion**.
- FinTech services are characterised by the confluence of start-ups, large financial institutions and large tech companies as relevant competitors. The diversity of origins, approaches and potential sources of competitive advantages means that the state of the different markets is in flux. In this context, it is **difficult to identify** advantages and **sources of power** that are **durable throughout time**, so competition-related patterns should be carefully analysed before considering them as anticompetitive behaviours.

As we have seen in the previous chapter, the provision of FinTech services is constantly **evolving**, blurring the boundaries established in the traditional financial sector. In such a scenario, which presents **commonalities** with other markets in the digital economy, the application of competition instruments to analyse potential anticompetitive behaviours **faces several challenges**, the most relevant being the difficulty in **applying traditional competition law instruments to assess competition issues to this rather new and innovative market segment**: (1) describing the relevant market; (2) defining the market power for a type of service; and (3) analysing anticompetitive behaviours and their root causes. We have already seen the difficulties of clearly defining FinTech services and, therefore, describing the relevant FinTech markets. For instance, the European Commission itself has left the mobile payments market definition open in several competition decisions⁴⁹. Moreover, the **assessment of market power cannot solely rely on**

⁴⁹ Commission Decisions in the merger cases M.6314, M.6956 and M.6967, for involved companies, please see the list of Commission decisions in the list of references at the end of this study.

traditional indicators such as market share, prices or profit margins. These indicators fail to explain the economic relationships between supply and demand in the provision of FinTech services, given that some of these services are offered at zero price or are provided through multi-sided platforms with several stakeholders intertwined⁵⁰.

In response to these challenges, a study commissioned by the European Parliament has proposed new ways to better assess the market definition and dominance of services in the digital economy, as well as potential anticompetitive behaviours. The study suggests starting with analysing the **new web-based business models**, as *'it allows to better account for interdependencies between multiple platforms and the interactions between firm conduct and market boundaries'*⁵¹. The study also proposes **adopting a cautious approach** when assessing competition issues, given the blurred boundaries of digital markets, and relying on sectorial regulation, competition instruments and even the self-regulation of digital agents.

This combined approach has been followed in order to assess the competition issues in the diverse categories of services within the FinTech ecosystem, as they are all part of the digital economy. Although each category of services presents different features that can lead to concrete competition issues, they also share common characteristics from both the supply and demand-side perspective. Therefore, prior to the specific description of each category of services, the common features and their potential impact on competition is analysed.

The following discussions on potential competition concerns, both those common to all service categories and those identified for specific ones, should be deemed **as hypothetical analyses, given that most of those competition concerns**⁵² **have not occurred**—or have not been detected by competition authorities—so far. Depending on how the diverse markets within the FinTech ecosystem evolve, however, these concerns could become a real competition issue in the mid-term, so stakeholders (competition authorities, politicians, regulators) should be aware of their implications.

2.1. The supply & demand FinTech explanatory matrix

2.1.1. The rationale of the explanatory matrix

The market description in Chapter 1 illustrates the extremely broad landscape of users, operators, services and strategies, as well as the sector's state of flux. Missing a stable market, any analysis of competition is bound to be tentative, since competition challenges could unfold in different directions depending on what turns out to be the decisive factor that provides a competitive advantage, be it on the technology side, or in the users' side. This makes a systematisation effort necessary for at least two important reasons: First, having an **overall classification of competition challenges** is necessary in order to place each of them in its proper context. Thus, if one of them becomes a cause of concern, it would be easier to understand its reasons, the instruments that could be employed for correcting it and the side effect(s) that the use of those instruments could have in other competition challenges.

Second, this study uses easily **recognisable categories of market activity**, i.e. the different categories of FinTech services provided, and **competition problems** to organise

⁵⁰ European Parliament (2015).

⁵¹ European Parliament (2015, p. 70).

⁵² However, as shown above in the area of payment services, there have already been a couple of decisions by the European Commission in merger cases. For further analysis, see section 2.3.2. below.

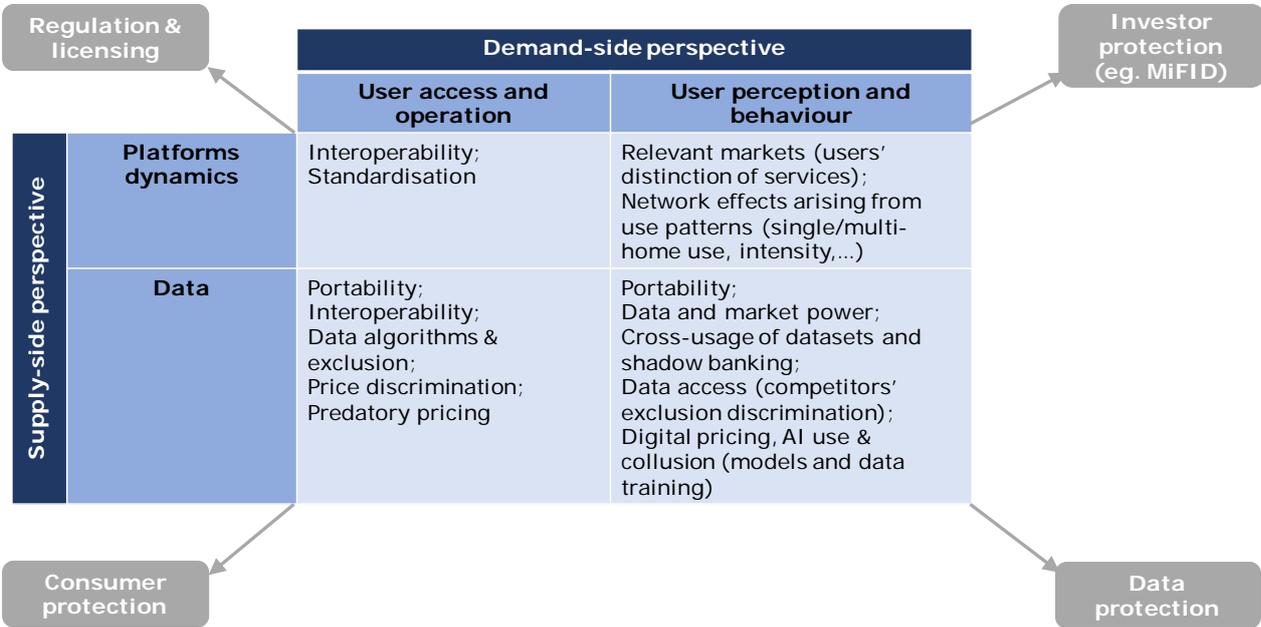
the analysis. This enhances clarity and offers a more robust structure in a field characterised by its fluidity.

Bearing in mind the advantages of respecting a more commonly accepted structure, in terms of the categories of activities and competition problems, the study identifies **common patterns** that emerge across different categories of activity. Some factors cut across services and make it more challenging to classify them by activity or competition problem. In other words, using a service-by-service approach makes the explanation more accessible, and highlights the problems that may be particularly acute in a specific field, e.g. payments. This should not, however, hide the fact that there are **strong commonalities in FinTech competition challenges** that go beyond a particular service, or operator.

Considering this, a classification that tries to offer a general and comprehensive view of FinTech’s broader competition concerns needs to take two steps. First, it needs to use categories that go beyond specific services. Second, it needs to illustrate FinTech’s unique features, to the extent that they are not fully captured by financial services’ classical categories. This will make it possible not only to understand the competition challenges that are present in the services as they stand today but to also anticipate the challenges that may arise in the future.

To accomplish the goals of explaining FinTech competition challenges, the following explanatory matrix is proposed. The matrix classifies FinTech’s competition challenges pursuant to two perspectives: the industry side, or **supply-side**, which is based on the type of technology that characterises the services, and the **demand-side**, which primarily focuses on the perspective of the user when approaching the technology, and the service rendered by it. The matrix also shows the categories of problems that fall outside the scope of competition policy (the grey boxes outside the table) and need to be addressed by other policy tools but are still related to competition.

Figure 32: The supply/demand explanatory matrix on FinTech competition issues



Source: Iclaves (2018).

2.1.2. The explanatory matrix's basic categories: supply-side (technology); demand-side (users)

The idea of the matrix is to focus on elements that help explain FinTech's existing or potential competition challenges regardless of the specific type of service or activity. These elements are related to the features of the technology used to provide the service (supply-side) and the users' interaction with the technology and the service (demand-side). The specific features of both perspectives —supply-side (technology), and demand-side (users)— and their implications in competition issues will be addressed in more detail in Chapter 3.

From a **supply-side perspective**, there are two technology-related categories that help explain competition challenges in FinTech. The first is **platform technologies**. This encompasses the services that are provided through online platforms, i.e. technologies that put parties in contact with other parties with matching needs or requirements. Platforms create unique dynamics in the way the service is defined, by involving three sides, the two parties that are matched, and the platform operator. These dynamics also affect the way market power is achieved and maintained. The second supply-side category is **data**. The intensive use of data-driven technologies for rendering financial services tends to raise a common group of competition challenges. This stems from the fact that data is a source of competitive advantage, and one that is difficult to match, measure, replicate or substitute. This helps to understand the importance of issues such as access to data or the impact of algorithms in classifying users.

From a **demand-side perspective** it is important to differentiate two categories. The first one refers to the **access and operation** of the technology. This perspective focuses on the technology's accessibility and compatibility with other technologies, its features and standardisation, as well as its functioning, e.g. how it sorts out users and devises specific prices and conditions of sale. The second demand-side category, **user perception and behaviour**, focuses on how the users view the technology *as a means* to deliver a service, how they perceive the service itself and the patterns of service usage.

These two dimensions (supply-side and demand-side) provide a **more general and stable classification** of FinTech competition challenges, which is not dependent on categories of traditional financial services or traditional competition problems. This classification helps to identify the source of competition challenges and also helps distinguish those challenges that fall completely or partially outside the realm of competition policy.

2.1.3. A preliminary list of common competition challenges based on the matrix' explanatory categories

Starting at the upper-left corner of the matrix, by looking at platform technologies (supply-side) from the perspective of access and operations (demand-side) one can identify the issue of **interoperability** as a challenge to competition. This problem arises when the lack of interoperability between two technologies is used by incumbents as an (artificial) barrier of entry for newcomers. The same combination helps to explain the opposite problem, i.e. when the **standardisation** required to facilitate interoperability becomes a source of non-competitive behaviour, because firms lack the incentive to innovate and differentiate.

Moving to the upper-right corner of the matrix, looking at platform technologies using the perspective of user perception and behaviour helps in identifying challenges such as the definition of the **relevant market**, as well as the role of **network effects**, as a source of market power. The problem of the relevant market, i.e. whether certain services must be considered as substitutes, is partly determined by the presence of platform technologies, but differs from case to case depending on how users perceive, and use, the platform. This,

in turn, results in a certain pattern of use and intensity of use, which helps to understand whether network effects in the specific case are strong. It also can give rise to durable market power and unassailable competitive positions.

If we focus on the use of data-intensive technologies (supply-side) and consider them from the perspective of the access to the technology and its operation (demand-side) —bottom-left corner of the matrix—, the same problems of **interoperability** can arise, this time combined with the issue of **portability of data**. The impact of data-driven technologies in being able to sort out users is also a relevant concern. Although the use of data-driven technology helps to gain predictive accuracy, the risk is in its use to carry out an unfair **exclusion of users**, or **price discrimination**.

Moving to the bottom-right part of the matrix, the clearest challenge is the role of access and processing data as a **source of market power**, which can give rise to an unassailable competitive position. This is relevant to detect unlawful collusion, abuse or concentrations in data-driven industries. This general concern is important in assessing other challenges, such as the relevance of **cross-usage of datasets**, as the way in which a large operator with competitive advantage in one activity, e.g. a big tech company, can use its privileged access to data obtained in that activity to leverage its position in the provision of other services, such as FinTech services. The same reasoning applies in the case of practices such as **tying and bundling**. In industries where there are established players with market power, another challenge lies in the risk of **exclusionary conduct** towards competitors, by refusing access to customer data, for example by exploiting users' need of consent. When access is open, however, another challenge lies in the role of **algorithms**, especially AI technology in promoting **tacit collusion**⁵³.

The matrix allows for a second type of distinction between the challenges that can be addressed with competition law instruments and those that are **excluded from its scope** (in the grey boxes outside the matrix). For example, access to technology can be conditioned by barriers of entry arising not from an action by incumbents, but from **regulatory requirements**, e.g. licensing and prudential rules, if they are too stringent or not harmonised. Conduct consisting in exclusion or unfair treatment of users may be an issue for **consumer protection**.

Likewise, from a perspective of user perception and behaviour, the users' awareness of the service they are subscribing to, and thus the determination of the relevant market of interchangeable services, can depend on the transparency with which those services are marketed. This, in turn, may be determined by disclosure requirements, which form part of **investor protection** rules in securities markets. Finally, how certain technologies are allowed to use the users' data do not depend on competition rules, but on **data protection** rules.

In all those cases, aspects with a critical impact on the sector's competitive structure, and competition issues, fall outside the control of competition authorities. While they fall outside the matrix, we visualise them as related factors in order to stress the need for a holistic approach, where competition policy and its tools are not seen, or used, in isolation.

Assessing competition challenges in this environment is a daunting task not only because competition policy tools sit at the cross-roads of a complex policy environment, but also due to the current state of the market in FinTech services. Unlike other fields, where markets are well-established and the relevant players and their features are well-known, FinTech services are characterised by the **confluence of start-ups, large financial**

⁵³ See section 2.5.2.

institutions and large tech companies as relevant competitors⁵⁴. The diversity of origins, approaches and potential sources of competitive advantages means that the state of the different markets is in flux. This means that firms may swiftly change their portfolio of services depending on the activities that they consider similar and susceptible to offering synergies, which, again, may depend on the type of company. At the same time, users are relatively new and slowly getting used to the different offers for these types of services. This means that their perception of which offers are comparable, and which services are substitutes, is in constant change. In this context, it is **difficult to identify advantages and sources of market power** that are **durable throughout time**, or even to talk about incumbents. In the case of strategies being in constant change and market power being contestable and contested, the default option should be caution.

The following sections describe the **business models** set out for each service category, and the concrete competition issues that might arise between the stakeholders involved.

2.2. Banking

2.2.1. Business models: replication of offline models in deposits' services and innovation in lending services

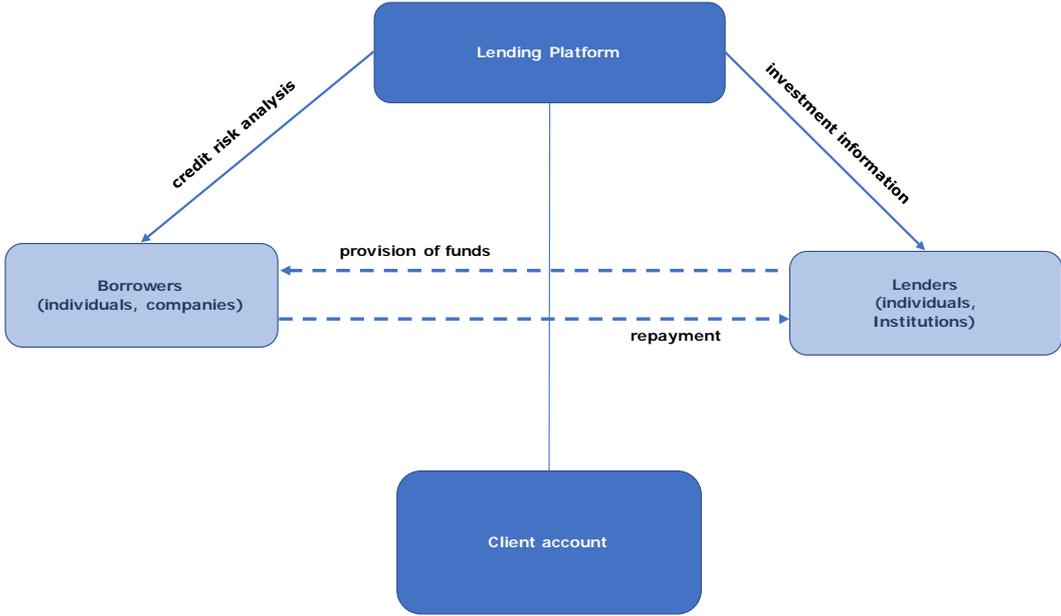
The business models for the provision of FinTech services related to deposits tend to **replicate** those used offline, while adding some improved features. FinTech banks usually operate as an **aggregator** of financial services, which can be provided by itself or third-parties through APIs, trying to improve customer experience by increasing interaction, transparency, usability and even fun. They seek to **empower customers** by giving more information and involving them in the decision-making processes related to their financial choices. In order to adopt a customer-centric approach, access to customer data becomes essential. The main business model relies on the **maturity transformation**, a traditional key function of banks wherein they borrow short-term and lend long-term, earning the difference between long and short-term rates⁵⁵.

The **most innovative business models** within the banking category are related to **lending services**. Almost all of them exploit two key concepts of the digital economy: multi-sided platforms and crowd-sourcing. They are known as '*P2P Lending*' or '*Marketplace Lending*'.

⁵⁴ See section 1.1.1.

⁵⁵ Drechsler, I., Savov, A., & Schnabl, P. (2017).

Figure 33: Marketplace lending model scheme



Source: Bank for International Settlements (2017).

The process starts when a borrower, either individuals or companies (mostly SMEs), **applies for a loan** on the platform. The platform assesses the credit risk of the borrower, based on the credit information provided, and approves or denies the application. If the application is approved, it is published in the platform, and lenders (individual investors or institutional funds) can choose to fund the loan. When the loan is completely funded, the funds are transferred to the borrowers and they begin to repay the loan. The **platform revenues** come from interest incomes and fees charged to the transaction parties⁵⁶. **Several variations** of this basic model coexist in the market **regarding the methods** used to calculate the interest rate (the borrowers fix the maximum interest rate they are willing to pay out, the platform sets out an interest rate based on the credit information, borrower and lender/s negotiate the interest rate, etc.), determine how the loans are generated or help lenders select the loans they want to fund, among others. The platforms often provide **advice** to the lenders with the aim of reducing risks by diversifying their investments over several loans.

Another widespread lending model that tries to respond to the regulatory constraints that the previous one faces in several countries is the so-called '**notary model**'⁵⁷. In this model, the platform only intermediates between borrowers and lenders, while a bank generates the loans that the platform allocates.

The lending platforms can also generate the loans and keep them in their own balance sheet ('**Balance sheet FinTech lending model**'). Unlike the former models, the platform retains credit risk and often requires credit facilities or securitisations in order to fund originations⁵⁸. There are also hybrid models ('**Composite Lending**') that combine the

⁵⁶ Bank for International Settlements (2017).

⁵⁷ Bank for International Settlements (2017, p. 13).

⁵⁸ US Department of the Treasury (2016, p. 6).

scalability and efficiency of the marketplace lending model and the stability and viability of the balance sheet lending model.

The **equity crowdfunding model** provides funding to businesses, mostly in early-stage companies, in exchange for shares in the company. The equity crowdfunding platforms assess the risks of borrowers and help them look for potential investors. The platform charges fees to the borrowers for using its services and to the investor for providing detailed information on the companies who seek funding. Similar to the marketplace lending, there are some variations of this basic model. For instance, some equity crowdfunding platforms allow investors to put down their money and have it invested according to the criteria of the deal team on that platform. The investors have neither the option to select nor the option to opt out of concrete projects. In other platforms, the deal team selects several projects that are pooled in the platform and the investors can choose what project they want to fund.

2.2.2. Competition issues in the business processes: regulatory disparities and market power of big tech companies

Marketplace lending faces several challenges that could hinder the creation of a competitive market where users, both lenders and borrowers, could benefit from the innovative business models described in section 2.2.1 in terms of efficiency (reduced timing, lower fees, etc.) from the lender side and financial inclusion from the borrower side. The most relevant one is the **diverse regulatory approaches** that lending platforms must comply with to operate in different jurisdictions. As the Bank for International Settlements states, *'There are no internationally agreed financial regulatory standards or policies for FinTech credit lending'*⁵⁹. Some countries have decided to apply the existing regulatory framework regarding licensing and prudential rules while others have enacted specific regulation for marketplace lending. The **disparity of the national regulatory approaches** may hamper the creation of transnational marketplace lending platforms⁶⁰. In a recent study, the Bank for International Settlements recognised that *'existing FinTech companies are developing mainly within individual jurisdictions'*⁶¹; however, *'if some services were provided across borders (by relegated, disintermediated or new banks), this could increase the need for coordination and cooperation, both between jurisdictions as well as across sectors'*⁶². **Regulatory disparities** between national jurisdictions could also affect competition in the FinTech lending market, as they may become a **barrier of entry** for new players. These new players would need to divert investments from innovation in order to adapt their solutions to the concrete requirements of each national jurisdiction. This regulatory barrier to competition has been addressed by the European Commission in its recent FinTech action plan⁶³.

Regulation on marketplace lending platforms aims at **controlling financial risks** and **protecting consumers** (both lenders and borrowers) from inappropriate behaviours. Regulatory burdens, however, can somehow blur the main benefits of this model, which are: (1) efficiency, which allows access to funding with lower costs provided in a timelier manner than traditional financial instruments, and (2) the digital inclusion of those collectives that face difficulties when it comes to accessing credit (low-income individuals, SMEs, etc.). Therefore, it is necessary to find the **right balance** between regulation and

⁵⁹ Bank for International Settlements (2017, p. 35).

⁶⁰ A symptom is the strong geographical endogamy when acquiring FinTech companies described in section 1.4.

⁶¹ Bank for International Settlements (2018, p. 34).

⁶² Bank for International Settlements (2018, p. 34).

⁶³ European Commission (2018b).

innovation to help foster the development of marketplace lending services while protecting consumers' rights and financial stability.

The lending services provided by digital platforms can no longer be considered pure P2P services given the growing presence of institutional investors. They may **leverage** their **market power** in the offline lending services market to **create** their own **digital platform** to sell loans, avoiding investing in other platforms and thus limiting the competition. From the technology side, the same approach might be used by the big digital companies. They might also leverage their market power in financial-related sectors, such as e-commerce, to enter the marketplace lending services, taking advantage of the customers' data they already have. They may, for instance, develop more accurate credit scoring tools and thus offer loans with lower interest rates and lower fees, leading to strategies of **predatory pricing**⁶⁴. They might also offer **rebates** to buy products if the user takes out a loan from their own digital platform. Although it is important to be cautious in defining those behaviours as anticompetitive, they are two examples of potential competition issues that could occur in the field of marketplace lending services. None of them has been noticed so far in Europe.

2.3. Payments, transfers and Forex

2.3.1. Business models: FinTech providers are entering the whole payment chain

Payment services show certain particularities that make them more attractive for FinTech providers⁶⁵:

- Financial incumbents tend to **outsource** payments and technology-related services
- **Payment habits have evolved** a lot in recent years and new payment needs are emerging
- Recent **technological advances** are especially suitable for payment services (e.g. DLTs)

FinTech-related technology allows for the achievement of **economies of scale** to provide more **efficient payments** services, in terms of price, speed and security. It makes it easier to meet the customers' needs and improve customer experience when using payment services. These services provide customers with **different payment methods**, favouring the **financial inclusion** of people with limited access to traditional payment services. FinTech providers are leveraging these drivers to position themselves as relevant actors in several stages of the payment chain. According to the Bank for International Settlements, the **payment chain** can be structured in five stages: (1) **pre-transaction**, (2) **authorisation**, (3) **clearing**, (4) **settlement** and (5) **post-transaction**⁶⁶. The pre-transaction stage involves the activities required to create the initial infrastructure to provide payment services. The authorisation stage refers to the *'processes and activities that enable a payment transaction to be authorised and approved before it can be completed'*⁶⁷. The clearing stage includes processes to reconcile payment orders between the final payer and the beneficiary. The settlement stage refers to the effective money exchange between transaction parties, posting credits and debits in their accounts. Finally,

⁶⁴ See, for instance, the **Amazon's** Lending Business strategy: <https://marketrealist.com/2017/07/a-close-look-at-amazons-lending-business>. The low interest rates Amazon can offer to its merchants and shoppers, thanks to the knowledge that Amazon has about them, might prevent other lending platforms can compete in the SME lending market.

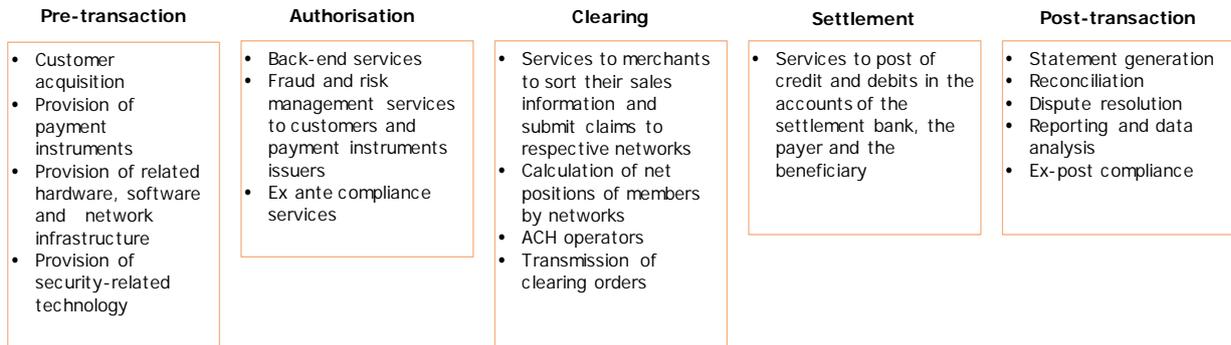
⁶⁵ Bank for International Settlements (2014, p. 1).

⁶⁶ Bank for International Settlements (2014, p. 5).

⁶⁷ Bank for International Settlements (2014, p. 40).

the post-transaction stage includes the processes related to statement generation, reconciliation, disputing resolution, reporting and ex-post compliance. The following picture details the services included in each stage.

Figure 34: Payment chain stages



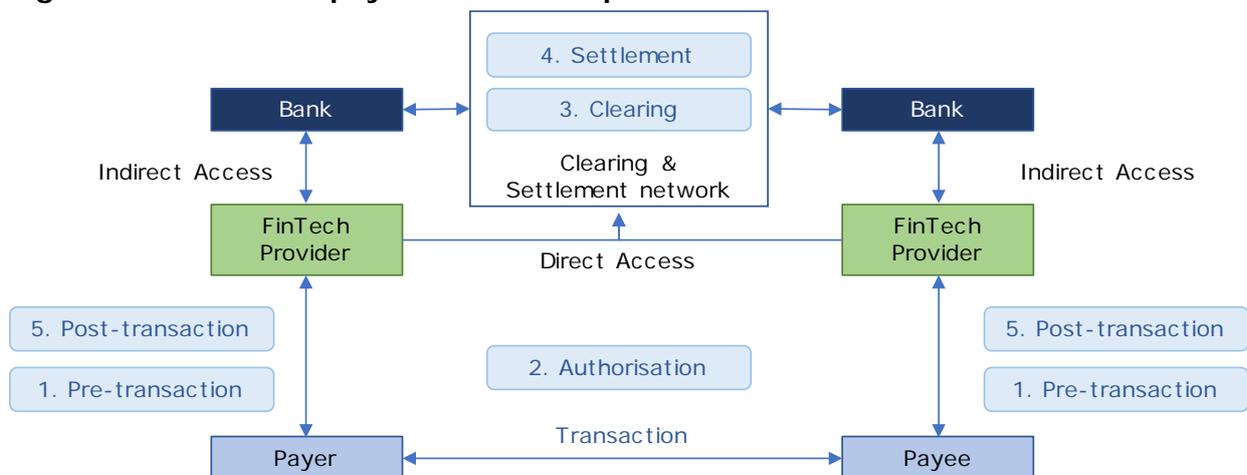
Source: Bank for International Settlements (2014).

The business models implemented within the payments landscape depend on the stage they are focused on, the type of customer they are aimed at and the type of collaboration that exists with the banks. Taking into consideration these three criteria, the Bank for International Settlements classifies the payments service providers into four categories⁶⁸, which can be assimilated into the main business models.

Front-end providers

They usually focus their activity on the (1) pre-transaction, (2) authorisation and (5) post-transaction stages, acting as an intermediary between users of payment systems, both payer and payees, and traditional providers of clearing and settlement services. They can establish a **direct access** to the clearing and settlement networks or they **can gain access through an intermediary bank**. Payment Initiation Service Providers (PISP), defined by the directive PSD2, fall into this category.

Figure 35: Front-end payment services providers



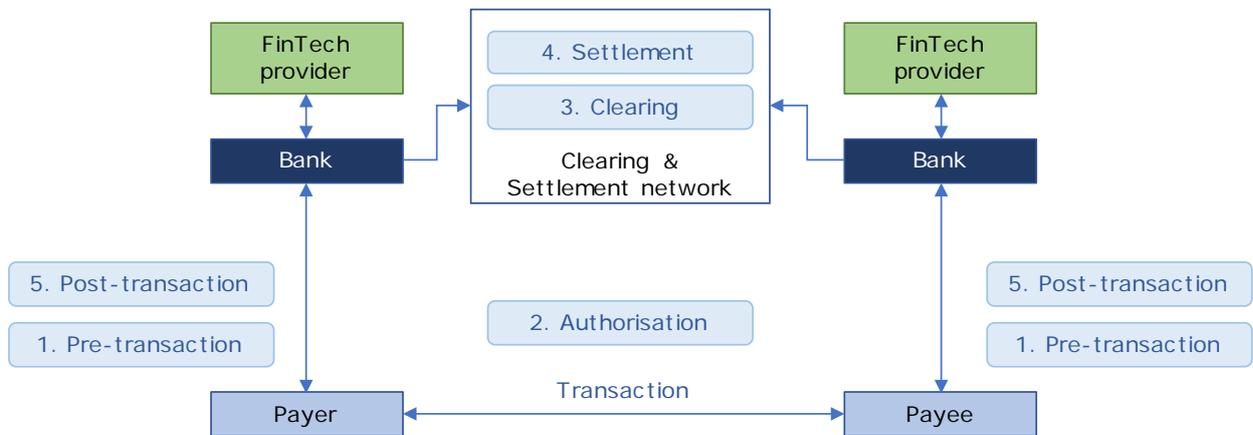
Source: Adapted from Bank for International Settlements (2014).

⁶⁸ Bank for International Settlements (2014, p. 9).

Back-end providers

They provide **back-end services to banks** (IT services, security, back-office operations, audit, compliance, etc.) without direct relationship with final customers (payers and/or payees). They collaborate with the banks via outsourcing agreements and are usually focused on a concrete stage of the payment chain.

Figure 36: Back-end payment services providers

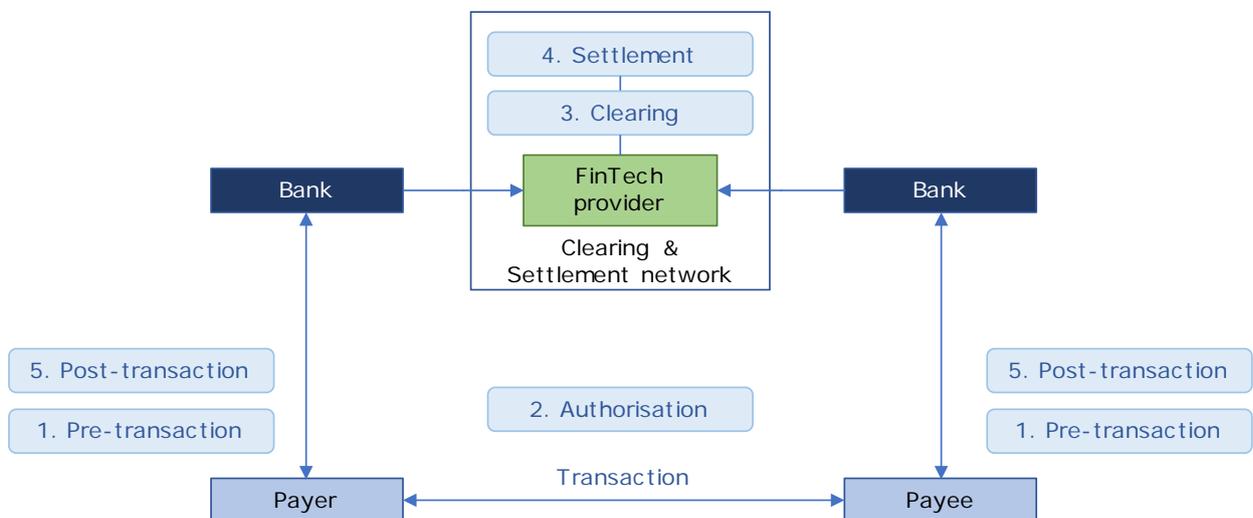


Source: Adapted from Bank for International Settlements (2014).

Operators of retail payment infrastructure

They are focused on the (3) **clearing and** (4) **settlement stages**, providing these services to banks and other payment services providers (PSPs), usually to manage different payment instruments.

Figure 37: Operators of retail payment infrastructure

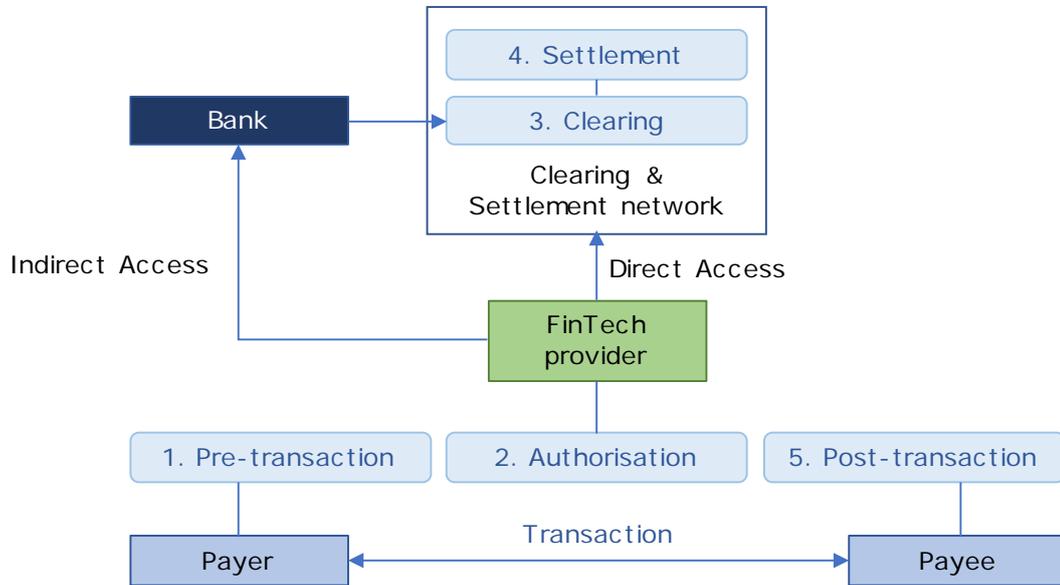


Source: Adapted from Bank for International Settlements (2014).

End-to-end providers

End-to-end providers offer both front-end services (1, 2 and 5) to final customers (payers and/or payees) and services for (3) clearing and (4) settlement processing. Therefore, **they undertake the whole payment chain**, albeit they can also rely on banks to access the retail payment infrastructure (clearing and settlement processes).

Figure 38: End-to-end payment providers



Source: Adapted from Bank for International Settlements (2014).

2.3.2. Competition issues in the business processes: the difficulty of defining payments markets and the access to critical assets

Payments services compose the FinTech category that competition authorities are paying most attention to. In recent years **some competition cases**⁶⁹ have been analysed by the European competition authorities. The cases have referred to mergers, acquisitions and mostly joint ventures between incumbents and/or technology companies to provide new payment tools (e-wallets, mobile payments)⁷⁰. Competition authorities have **cleared** all the cases so far, recognising there are sufficient **alternative** issuers of payment services in the national markets where the new services intend to operate.

The analysis of the European Commission’s decisions on competition cases related to payment services, mostly on mobile payments systems and digital wallets, highlights the **difficulty of applying traditional competition tools**. The first step to begin analysing anticompetitive behaviours, the product market definition, is a highly complex task due to a continuously evolving landscape where boundaries between services are blurring. A recent decision⁷¹ summarised this issue: *‘In the UK MCommerce decision, the [European] Commission considered that online and offline mobile payments were not likely to be part of the same relevant product market. While the Commission concluded that the situation*

⁶⁹ See Commission Decisions on References.

⁷⁰ In the analysis of the FinTech providers of section 1.4. we have found that the FinTech companies providing financial services that have been acquired by technology companies are mainly those related to payments.

⁷¹ Commission Decision in case M.8251 Bite/Tele2/Telia Lietuva/JV.

could evolve in the short to medium term, it ultimately left the product market definition open. With regard to the substitutability of remote/online mobile payments and other types of remote/online payments, the Commission concluded that they may belong to different product markets, but ultimately also left the product market definition open in that respect. The Commission reached a similar conclusion in relation to the mobile proximity/offline payments and existing proximity/offline payment solutions'. If merely defining the product market within the field of payment services is a challenge, the subsequent assessment of the market share in order to identify dominant positions is even more difficult.

Another relevant issue for competition in the provision of payment services is the **access to critical assets** such as **data** and mobile NFC **chips**. Access to customers' data is essential when payment service providers process transactions between payers and payees, as all the stages involved in the provision of the service require information from both sides. Blocking or hampering access to customers' data can **prevent the provision of these services by new entrants**, thus limiting competition. This issue has been addressed by the EU through the PSD2 Directive⁷², obliging incumbents to open access to customers' data and to allow third-parties to initiate and manage payments on behalf of such customers. Although there has been controversy between the involved stakeholders—incumbents and FinTech start-ups—regarding the Regulatory Technical Standards (RTS) as defined by the European Banking Authority (EBA) on strong customer authentication (see Box 1), the **PSD2** Directive represents a **relevant step** in enhancing competition in the provision of payment services.

Box 1: The impact on competition of the process of drafting the Regulatory Technical Standards (RTS) on strong customer authentication under the PSD2

Article 98 of the PSD2 Directive entrusted the EBA with the task of developing the RTS on **strong customer authentication** and common and secure communication, according to the requirements laid down in article 97. The EBA published the draft RTS in February 2017⁷³.

According to the manifesto signed by 74 European FinTech companies and associations, the RTS banned '*a secure proven technology such as Direct Access via the bank's existing—and well maintained—customer-facing online banking interface (sometimes derogatively referred to as screen scraping)*'⁷⁴. The draft RTS stated that screen scraping was not going to be allowed on the basis of several provisions related to security⁷⁵.

The manifesto signers claimed **restrictions to competition** if the RTS articles referred to communication between third-party payment providers (TPPs) and banks were approved: '*if the RTS articles on the communication interface were to be adopted in their current form, Europe's successful and growing Fintech industry would be severely hampered. Banks would be given technological control over Fintech businesses and would be able to ring-fence consumers' data. This will inevitably result in the very opposite of the political intentions behind PSD2: instead of enhancing competition,*

⁷² Directive (EU) 2015/2366 of the European Parliament and of the Council on payments services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010 and repealing Directive 2007/64/EC, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366>.

⁷³ European Banking Authority (2017).

⁷⁴ Future of European Fintech (2017, p. 1).

⁷⁵ European Banking Authority (2017, p. 11).

*fostering innovation and giving consumers more choice, innovation will be banned, competition will decrease and consumer choice will be significantly diminished*⁷⁶.

In a letter⁷⁷ to the EBA on May 2017, the Director-General for Financial Stability, Financial Services and Capital Markets Union expressed the Commission's intention to amend the draft RTS to include **contingency measures**, allowing access to customers' data through the user interface. These measures would take place in the case of unavailability or inadequate performance of the dedicated communication interface provided by the banks to third-party payment providers. After this letter, the EBA expressed⁷⁸ its **objections to the fall-back solution** proposed by the Commission and described several **negative consequences** (cost increase for banks, increased fragmentation compromising the development of standardised APIs, competitive disadvantages for third-party payment providers, no improvement to technical reliability, incompatibility with PSD2's security requirements, supervisory constraints and unclear consumer understanding and consent). The EBA proposed an alternative approach to substitute the fall-back solution, but the Commission amended the EBA's draft RTS⁷⁹, under the scrutiny of the European Parliament and the Council at the time of writing this study, finally including contingency measures for a dedicated interface through the user-facing interfaces that the banks use with their customers.

This controversy highlights the relevance of having access to customer's data in order to enhance competition in the field of payment services, as well as presents the misgivings that exist between banks and FinTech start-ups.

Within the payment services landscape, **mobile payments** are attracting the attention of many stakeholders, as the widespread penetration of smartphones makes them one of the best suitable tools to initiate payments. Access to the **key features** and components of smartphones that enable payments becomes crucial to develop new payment services. This is the case of the NFC chips, which allow two devices placed close to each other to exchange data in a simple way. Technological companies, such as smartphone manufactures, can exert their market power in order to limit access to those components or to impose potential anticompetitive contractual conditions (see Box 2) to other stakeholders in order to access them.

Box 2: The case of Apple Pay in Australia

In July 2016 four Australian banks (Bendigo and Adelaide Bank, Commonwealth Bank of Australia, National Australia Bank and Westpac Banking Corporation) sought authorisation from the Australian Competition and Consumer Commission (ACCC) to engage in limited **collective negotiations** with Apple on conditions related to competition, best practice standards and efficiency and transparency regarding access to the **iPhone NFC chips**. They also sought authorisation to enter into a limited form of **collective boycott** in relation to the **Apple Pay service** while collective negotiations with the firm were ongoing. They argued Apple had a significant bargaining power in negotiations related to its payment service Apple Pay due to its control of both the

⁷⁶ Future of European Fintech (2017, p. 1).

⁷⁷ European Commission (2017).

⁷⁸ European Banking Authority (2017b).

⁷⁹ European Commission (2017, p. 3).

operating system (OS) and the mobile hardware, as well as its high share of the smartphone market in Australia. Their major claim was that Apple only allowed its own integrated contactless payment option, Apple Pay, on Apple devices, **impeding access to the NFC chip** to any other applications for mobile payments developed for third parties. All banks must use Apple Pay to provide payment services to the Apple devices owners⁸⁰.

In March 2017, the ACCC **rejected** granting the authorisation to negotiate collectively with Apple, as the Commission believed the application did not pursue the best interest of consumers. The ACCC stated that Apple was not a monopoly supplier of mobile phones, facing great competition from several manufacturers and Google's Android operating system. Although the ACCC recognised that Apple had significant bargaining power in negotiations, it was the result of the **vertical integration** from device hardware to operating system software and mobile applications software⁸¹. The ACCC also stated that *'there are other features of digital wallets on which the Applicants may compete without the need for NFC access*⁸². The ACCC finally emphasised that opening access to the NFC controller could result in a **significant distortion of competition in mobile operating systems**, as it could affect Apple's current integrated hardware-software strategy for mobile payments and, more generally, OS. As a result, each bank must reach individual agreements with Apple to allow its customers to use the Apple Pay service.

2.4. Digital currencies

2.4.1. Business models: from mining to exchange services

According to the Bank of England⁸³ (BoE), a digital currency is *'a means of payment that only exists electronically. Like traditional money (such as banknotes), they can be used to buy physical goods and services.'*

The BoE distinguishes⁸⁴ between **private digital currencies**, those not issued by a central bank, and **central bank-issued digital currencies**; both of them rely on distributed ledger technologies, like blockchain⁸⁵. Examples of private digital currencies are *Bitcoin, Ethereum, LiteCoin*, and *Ripple*. The main difference between **e-money** and a digital currency⁸⁶ is that the former is based on the conventional bilateral settlement with a trusted central party, and the latter is based on the underlying peer-to-peer structure operated without any central party.

⁸⁰ Australian Competition and Consumer Commission (2016).

⁸¹ Australian Competition and Consumer Commission (2017, p. iv).

⁸² Australian Competition and Consumer Commission (2017, p. vii).

⁸³ Bank of England (2018).

⁸⁴ Bank of England (2018).

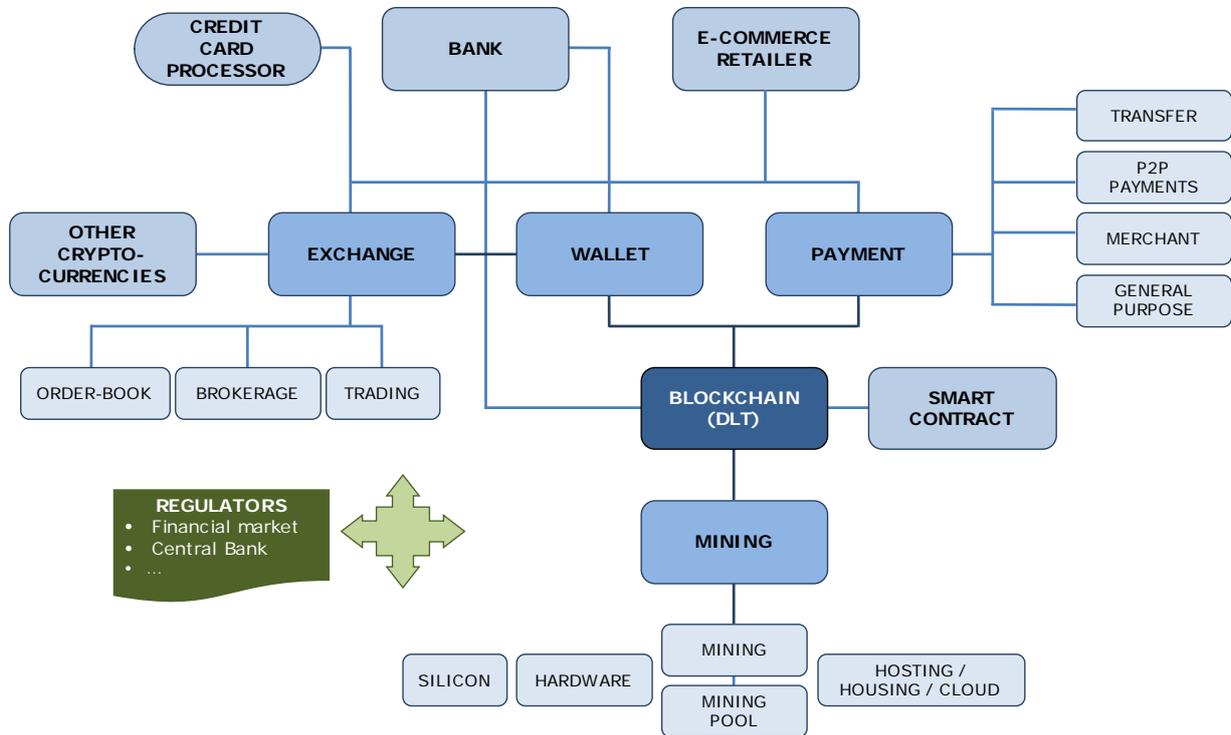
⁸⁵ **Blockchain** is a database organised in a decentralised manner, which provides a continuously growing list of transfer datasets or records called *'blocks'*. The database is chronologically extended and comparable to a chain, to which continuously new elements are added. As soon as one block is completed a new one will be started. Each block carries the verification of the previous one and typically contains a cryptographic hash. By design a blockchain is resistant to modification of data. It was first developed for Bitcoin as a web-based decentralised record for transactions. Because of using blocks blockchain is slightly different but a specific form of **distributed ledger technology** (DLT): DLT is also a database which is organised in a decentralised way to record and verify transactions, however, without writing data in blocks. All records are made at different databases. There is no central database and no central administration. For the purpose of this discussion, blockchain and DLT are essentially interchangeable terms.

⁸⁶ Bank for International Settlements (2015, p. 4).

Another term for digital currency is **cryptocurrency**, which refers to the fact that cryptographic techniques are used to preserve the essential features of any currency, namely ensuring authenticity⁸⁷ and preventing double spending⁸⁸.

The value chain of the cryptocurrency ecosystem could be described as follows:

Figure 39: The cryptocurrency ecosystem and value chain



Source: Compiled by Iclaves based on Hileman, G. & Rauchs, M. (2017).

Blockchain

The substantive element of digital currencies providing these requirements is the so-called **blockchain** or DLT, used as an embedded decentralised payment mechanism that registers any payments between parties. The specific blockchain platform used by any cryptocurrency is the central element integrating the different activities of the value chain. The operating characteristics of the DLT platform condition the whole ecosystem of the cryptocurrency; in particular, whether it is **open**⁸⁹, thus **permission-less**, or **private**, therefore **permissioned**. More specifically, in the case of a cryptocurrency promoted by traditional banks, the DLT implementation implies defining the participation of the central banks, the traditional banks, or the supervisors of the different markets involved (securities market, bank supervisor, ...).

⁸⁷ Authenticity refers to ensuring that the payer and the payee are the intended ones, regardless of their anonymity because every transaction is identified by digital codes and not by their civil names or ID card.

⁸⁸ Double spending refers to the problem of ensuring that any cryptocurrency unit transferred from one user to another is not spent again by the old holder.

⁸⁹ Open or closed, permission-less or permissioned as described by Hileman, G. & Rauchs, M. (2017b).

Blockchain is the central element of the cryptocurrency ecosystem because it specifies who can participate in the cryptocurrency system operation and how. Nevertheless, it should be kept in mind that regardless of the specific DLT implementation, the essential feature of DLT is that it is a decentralised system based on a peer-to-peer network of nodes collaborating to maintain the ledger of currency transactions.

If the cryptocurrency DLT is open, or **permission-less**, everyone can develop any of the activities without requiring any market entry authorisation, even leaving the system without any regulation. Most of the known cryptocurrencies follow this type, like *Bitcoin*, *Ethereum*, or *Litecoin*. In contrast, closed cryptocurrency systems, or **permissioned** ones, require a supervisor authorising the entry, operation and eventual departure. The central banks or traditional banks could be planning to use those permissioned cryptocurrency systems in an attempt to complement or substitute the permission-less currencies already in use.

Any blockchain system is identified by five components⁹⁰: (1) **cryptography algorithms** used; (2) **rules of the P2P network**; (3) **consensus** mechanism; (4) **ledger**; and (5) **validity rules**. The basic operations that can be performed⁹¹ in any blockchain are read, write, and commit.

Mining

The activity of committing (updating or changing) the state of the blockchain is known as **mining**. It consists of appending a new block with the last transaction held after calculating and discovering its hash code⁹², which includes the one resulting from the last block that was closed (resulting in 'a chain' of blocks and codes). The miners or miner pools compete against each other trying to be the first in discovering the hash code, therefore requiring huge computational resources and energy consumption. The miner that ascertains the current block hash code receives a reward, in the form of new cryptocurrency units added to the existing monetary base. Nowadays, in the Bitcoin model, the reward per block is BTC 12.5⁹³. The mining **sub-activities**⁹⁴ are: silicon design⁹⁵; specialised mining hardware design and manufacturing; self-mining; hosting, housing or cloud mining services for third parties; and mining pools (pools of miners collaborating with their computational resources).

⁹⁰ Hileman, G. & Rauchs, M. (2017b, p. 16): '*Cryptography. Use of a variety of cryptographic techniques including cryptographic one-way hash functions, Merkle trees and public key infrastructure (private-public key pairs). P2P Network. Network for peer discovery and data sharing in a peer-to-peer fashion. Consensus Mechanism. Algorithm that determines the ordering of transactions in an adversarial environment (i.e., assuming not every participant is honest). Ledger. List of transactions bundled together in cryptographically linked 'blocks'. Validity Rules. Common set of rules of the network (i.e., what transactions are considered valid, how the ledger gets updated, etc.)*.'

⁹¹ Hileman, G. & Rauchs, M. (2017b, p. 22): '*Read (who can access the ledger and see transactions), Write (who can generate transactions and send them to the network), and Commit (who can update the state of the ledger)*.'

⁹² A 'hash code' is a sophisticated cryptographic mathematical function aimed at verifying the integrity and securing a financial operation (for instance a bank book entry), which operates with an input that can be any string of characters of any size (e.g. the bank book entry), and produces an output of a fixed size number, for example, a 256-bit output. This output number or code univocally represents the input string of characters (e.g. the bank book entry). An example of hash function is the SHA-256 utilised by Bitcoin. See Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016).

⁹³ The Bitcoin monetary base is increased every time the hash code of the present block is discovered by means the hash-discovering miner reward. In any public cryptocurrency, there is no central bank controlling the monetary supply; its growth is self-controlled as a block is closed, which occurs approximately every 10 minutes in the case of Bitcoin. The maximum monetary base of bitcoins is BTC 21 million. The reward is halved every approximately four years; nowadays we are in the BTC 12.5 reward cycle up to year 2021, then the reward will be a half of the current, BTC 6.125. See '*Controlled supply*' entry at https://en.bitcoin.it/wiki/Controlled_supply.

⁹⁴ Hileman, G. & Rauchs, M. (2017a, p. 13).

⁹⁵ Design specific chips to mining bitcoins. See Wong J. I. (2017).

Wallets, exchanges and payments

The transactions appended to the preceding and current blocks come from wallet or payments agents. The wallet⁹⁶ is the final user application used to securely manage and use their coins (see Table 4). Each cryptocurrency has its own wallet reference implementation (e.g. Bitcoin Core⁹⁷) to be used by developers. In turn, payment services⁹⁸ are related to the transfer of cryptocurrency units and payments to other holders or e-commerce parties. The final users need **exchange** services⁹⁹ to buy and sell cryptocurrencies, exchanging it from and to their national currencies (i.e. EUR/Bitcoin exchanges), or from and to other cryptocurrencies (Bitcoin/Ethereum exchanges).

Smart contracts feature

An important additional element of the cryptocurrency value chain is the **smart contract** feature which allows the parties to implement any contract payment covenants to be self-executed when the event succeeds. For example, a monthly payment of a house rental, or the guarantee release linked to the rental contract when the flat is let out according to the stipulated conditions.

Banks and credit card processors

Finally, the value chain also includes **banks** and **credit card processors** as key players in the cryptocurrency value chain, as they play a very active role in developing closed or permissioned blockchains, like *Enterprise Ethereum Alliance*¹⁰⁰, *Hyperledger project*¹⁰¹, *R3 Consortium with Corda*¹⁰², *UBS bank* and its *Utility Settlement Coin (USC)*¹⁰³, *JP Morgan* and its *Quorum project*¹⁰⁴ or *Ripple* collaboration with *Santander Bank* and *American Express*¹⁰⁵. They keep relations with central banks and regulators as a way to provide their own solutions to the cryptocurrency world.

2.4.2. Competition issues in the business processes: diverse markets with different competition issues

The desk research conducted has found very few literature references dealing with current market restrictions to competition in the cryptocurrency ecosystem. This is mainly due to the fact that cryptocurrency is a **new, sophisticated and fragmented market**. Therefore, the following analysis can be considered as an exercise of envisioning potential problems based on the existing data and trends and the market structure. Competition issues can be analysed¹⁰⁶ according to their impact on: concentration (market share), contestability (network externalities, entry barriers) and composition (bundling of services).

Competition in the cryptocurrency markets has been characterised¹⁰⁷ in the context of competition between **currencies** and competition between **exchanges**. Therefore, two different markets can be identified: the **inter-cryptocurrency** market, where different cryptocurrencies compete against each other with diverse strategic behaviours, and the

⁹⁶ Hileman, G. & Rauchs, M. (2017a, p. 50).

⁹⁷ <https://bitcoin.org/en/download>.

⁹⁸ Hileman, G. & Rauchs, M. (2017a, p. 68).

⁹⁹ Hileman, G. & Rauchs, M. (2017a, p. 30).

¹⁰⁰ <https://entethalliance.org/>.

¹⁰¹ <https://www.hyperledger.org/>.

¹⁰² <https://www.r3.com/>.

¹⁰³ Detrixhe, J. (2017).

¹⁰⁴ <https://www.jpmorgan.com/global/Quorum>.

¹⁰⁵ Browne, R. (2017).

¹⁰⁶ Financial Stability Board (2017, p. 11).

¹⁰⁷ Halaburda, H. & Gandal, N. (2014, p. iii).

intra-cryptocurrency market, where different service providers (mining, wallet, exchange and payment services) compete¹⁰⁸.

Inter-cryptocurrency market: potential market problems

Some data can help set the stage for the analysis of inter-cryptocurrency market competition issues. According to a recent study¹⁰⁹, **competition** between cryptocurrencies is still **limited**, although it is growing. While Bitcoin accounted for 86 % of the total cryptocurrency market capitalisation in March 2015, it decreased to 72 % in March 2017. Ethereum accounted for 16 % of the market capitalisation in March 2017, which is the only data we have since this cryptocurrency did not exist in 2015¹¹⁰. Nevertheless, these two cryptocurrencies accounted for 88 % of the total cryptocurrency market capitalisation in March 2017, a relevant indicator of the current **market concentration**.

Competition problems of the inter-cryptocurrency market are quite sophisticated, given the complex activities that are part of the value chain. One of the most significant is the **presence of network effects**¹¹¹ related to the network and platform nature of cryptocurrencies. This prevents a currency from being substituted by another competing one and resulting in *'a substantial barrier to entry and, at the same time, give incumbents large market power'*¹¹². An increasingly higher number of users of a cryptocurrency and its use as a payment instrument create barriers of entry to new cryptocurrencies due to the lack of adhesion to its use in merchants, wallets, or exchanges. In the future, network effects may lead to potential **collusive agreements** between members of hypothetical cartels.

The question of the implementation of **vertical integration strategies**, either in intra-cryptocurrency and inter-cryptocurrency markets, comes to mind when considering additional concerns. Exchange, wallet and payment providers may design behaviour **practices to exclude** each other from the market, e.g. by receiving incentives from miners favouring a specific cryptocurrency, or from certain dominant players trying to exclude competitors in other activities.

The arrival of **permissioned cryptocurrencies promoted by banks**, even by central banks, will reshape the current competition level in the inter-cryptocurrency market, broadening the number of competitors¹¹³. A potential inadequacy of traditional competition policy to address competition issues in the cryptocurrency markets can be found¹¹⁴, suggesting direct public participation through a central-bank digital currency as a remedy.

The **international nature** of cryptocurrency markets¹¹⁵ is also a challenge to competition policy at the European level. Many of the players operate from global locations outside the jurisdiction of European competition authorities, which makes investigation or prosecution on anticompetitive behaviours more difficult. Europe leads, at international level¹¹⁶, the supply of wallet and exchange services, with 42 % and 37 % in terms of number of players. It is also the principal actor in payments (33 %). Nevertheless, the main weakness of Europe is the concentration of the mining activity on non-European countries (Europe only capture just 13 % of the current mining market). Mining is the most strategic, sophisticated

¹⁰⁸ See Figure 39.

¹⁰⁹ Hileman, G. & Rauchs, M. (2017a).

¹¹⁰ Hileman, G. & Rauchs, M., (2017a, p. 16).

¹¹¹ Østbye, P. (2017, p. 16).

¹¹² Fung, B. & Halaburda, H. (2016, p. 10).

¹¹³ Fiedler, S., Gern, K., Kooths, S., & Stolzenburg, U. (2017).

¹¹⁴ Østbye, P. (2017).

¹¹⁵ Østbye, P. (2017, p. 29).

¹¹⁶ Hileman, G. & Rauchs, M. (2017a, p. 90).

and technology dependent activity in the cryptocurrency market, and there currently appears to be a significant concentration of mining activities occurring in certain Chinese provinces.

Intra-cryptocurrency market: potential competitive misconducts

Market power of incumbent banks might be used to **limit competition** in the intra-cryptocurrency market through **pre-emptive acquisitions** or **predatory pricing** schemes. Incumbent banks may also engage in anticompetitive practices by denying access to their gateways for exchange or wallet services, such as bank payment and transfer systems or card processor schemes. This **denial of access** may be conducted by means of low service quality, delays in negotiation, proprietary technical standards or excessive pricing. These practices may deter consumers from using the permission-less cryptocurrencies in favour of the permissioned ones promoted by banks.

Another potential anticompetitive factor is the **standardisation of DLT** and other technical protocols. Private or public consortia agreements in relation to technical standards may affect the market entry or impact current costs. In fact, 70 % of the large miners rate their influence on protocol development as high or very high¹¹⁷.

The mining market

The mining market has evolved from *'a hobby activity in the early days to a professional industry where large amounts of capital are at stake'*¹¹⁸. The mining market cannot be considered a truly traditional market where prices would be determined by supply and demand, because price —mining reward— is self-scheduled by the cryptocurrency own algorithm at fixed rewards per four-year periods. Thus, **there is not an efficient pricing system** of mining activities. Their lack of cost orientation or market pricing creates disincentives to miners, either by having excessive pricing or by pricing below real costs.

Mining can currently be considered a **non-contestable market** because of the presence of high barriers of entry derived from the existing economies of scale in processing power, energy efficiency¹¹⁹ (intra-cryptocurrency market) and scope (inter-cryptocurrency market). Cartels may arise¹²⁰ in mining pools, but the lack of price coordination due to the use of a short-term fixed mining reward is a negative proof of their existence.

The market is currently dominated by a low number of mining pools —the five leading mining pools accounted for 79 % of the total market share in Q4/2016¹²¹—, although none of them exert a dominant position (the leading mining pool, AntPool, accounted for 23 % of the total market share). Thus, future **horizontal mergers and acquisitions between mining firms** should be assessed in terms of market competition and efficiency gains.

The wallet, exchange and payment market

Wallet and payment markets are characterised by a high number of providers¹²², thus it demonstrates that, nowadays, there are **low barriers to entry**. The exchange market presents the highest number of providers of all cryptocurrency markets¹²³. The **exchange market**, however, presents a **high degree of concentration**, with five providers accounting for 75 % of the total Bitcoin exchange market share and the leader reaching a

¹¹⁷ Hileman, G. & Rauchs, M. (2017a, p. 90).

¹¹⁸ Hileman, G. & Rauchs, M. (2017a, p. 87).

¹¹⁹ Bank for International Settlements (2015).

¹²⁰ Østbye, P. (2017, p. 26).

¹²¹ Hileman, G. & Rauchs, M. (2017a, p. 90).

¹²² The market shares of the major wallet players are: Bifinex (16 %), Bitflyer (15 %), Kraken (10 %), OKCoin (9%), Bitstamp (7 %), and Coinbase (7 %). See Hileman, G. & Rauchs, M. (2017a).

¹²³ Hileman, G. & Rauchs, M. (2017a, p. 27).

market share of 30 %¹²⁴. Nevertheless, as explained before, the three markets are subject to potential network effects which can deter competition.

A general competition problem of **excessive pricing** as a result of market power can arise in any of these markets if users cannot easily move their currencies from one supplier to another (exchange services when buying or selling a cryptocurrency, in wallet maintenance or payment transactions). These competition problems arise in relation to multi-homing or single-homing sceneries¹²⁵ if switching costs or technical restrictions prevent users from moving from one wallet or exchange app to another.

Albeit the wallet, exchange and payment markets may be considered separated markets, the boundaries between them are **increasingly blurring**. For instance, 52 % of wallets provide an integrated currency exchange feature¹²⁶. Thus, **vertical integrated players** ranging from wallet to mining activities may design anticompetitive exclusionary practices¹²⁷ to foreclose the individual markets, for instance, by **cross-subsidising** their mining activities with their rewards. In this sense, **vertical mergers** should be paid attention to.

2.5. Wealth & Asset management

2.5.1. Business models: online platforms for advisory and management services

The introduction of the concept of platforms is reshaping the way the wealth and asset management services are being provided. New business models are mainly developed around **platforms** that connect customers who seek advice and want to know where to invest their assets with wealth and asset managers offering their financial products. IOSCO¹²⁸ identifies up to five different business models related to the provision of wealth and asset management services:

- Comparison websites
- Financial aggregator platforms
- Robo-advisors
- Social trading and investing platforms
- Social media sentiment analysis, research and networking platforms

While comparison websites, social media sentiment analysis services and research and networking platforms **provide information** to customers to help them select the most appropriate investment vehicle, robo-advisors and social trading platforms **allow for the management of investments** through online tools. Financial aggregator platforms are considered by IOSCO as instruments to inform customers about their daily spending, savings and investments, so they are going to be analysed within the category of PFM.

Comparison websites

These services allow customers to **find** financial products. Some of them offer access to a broad set of services, ranging from banking services (bank accounts, loans, etc.) to investment management (pension funds, investment funds, etc.), although they tend to focus on concrete categories. Comparison websites are conceived as **two-sided platforms**

¹²⁴ Bitcoinity (2018).

¹²⁵ Østbye, P. (2017).

¹²⁶ Hileman, G. & Rauchs, M. (2017a, p. 47).

¹²⁷ Østbye, P. (2017, p. 26).

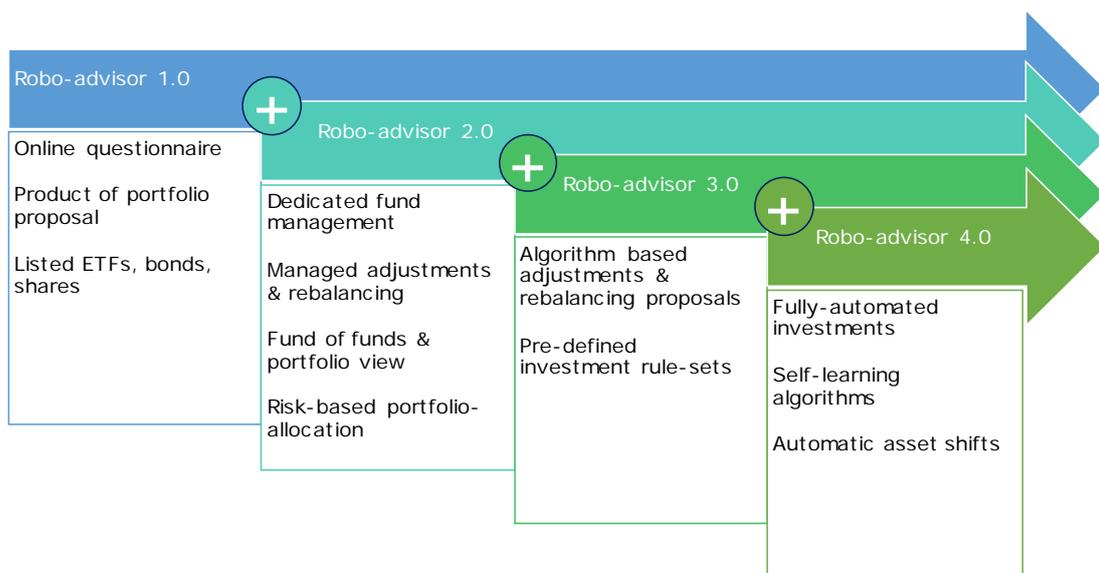
¹²⁸ IOSCO (2017, p. 23).

and the revenues usually come from '*cost-per-action*' models. In these models, the merchant pays a fee when the customer carries out an action via the website —clicking the link, viewing the advertising, filling out a form to require information or contracting a service, among others.

Robo-advisors

Robo-advisors provide **automated advice** for investors. They are based on algorithms that use the information provided by the investors to determine their risk tolerance and to propose an investment portfolio according to it. They also manage and rebalance the proposed portfolio to adapt it to the investor's expectations and objectives. The consultancy *Deloitte*¹²⁹ outlines a four-step evolution of the current robo-advisors regarding their features and the services provided.

Figure 40: Robo-advisory evolution



Source: Adapted from Deloitte (2016).

Providers of robo-advisor platforms charge a fee to their customers, typically a percentage of the assets managed through the platform.

Social trading and investor platforms

Social trading and investor platforms allow customers to **connect to other investors** and **replicate** their investment strategies. These platforms combine the features of social networks, integrating information sharing and social interaction, with online trading. They are also known as '*copy trading platforms*' or '*mirror trading platforms*', although several minor differences exist between them. The platforms usually offer a wide range of investment products, such as exchange-traded funds (ETFs), stocks, commodity currencies, derivatives and so on. The platforms' revenues come from the fees charged to the customers.

¹²⁹ Deloitte (2016b, p. 2).

Social media sentiment, research and networking platforms

These platforms are focused on **generating and aggregating intelligence** to help financial institutions (banks, hedge funds, investing platforms) and individual investors make their investment decisions. They provide services such as sentiment analysis, using natural language processing (NLP) techniques and machine learning, crowdsourced research, which seeks ideas from diverse sources such as retail customers and financial services providers, or social networking tools to discuss investing ideas among users. The aggregated information is sold to investment firms.

2.5.2. Competition issues in the business processes: the impact of algorithms

A recent study¹³⁰ conducted by the Financial Conduct Authority (FCA) on the asset management market in the UK, the second largest in the world, highlights several competition issues, which may be extrapolated to the EU. The FCA points out that **price competition** is not working as adequately as it should be in several areas of the asset management market, partially derived from a **price clustering** with charge schemes almost unaltered over the last 10 years and **high levels of profitability** of asset management firms. Albeit the introduction of innovative services thanks to the technological development, customers might not be obtaining better prices from these innovations. This also has to do with a certain **lack of transparency** on the fees charged to investors, an issue that has been addressed by MiFID II¹³¹ through its cost disclosure requirements for investment firms.

The diverse nature of the services, with blurred lines between information, advisory and management functionalities, poses challenges to regulatory bodies and financial supervisors on the licensing regime to apply to each provider. Furthermore, each national jurisdiction may require different conditions to grant licenses, hindering the provision of cross-border services and thus **limiting the competition on national markets** to national providers.

The blurred boundaries between services and the growing relevance of the investment management platforms in the market might also lead to certain **conflicts of interest**. The automated advisory services provided to investors via algorithms might not be based on their risk profile and other objective variables, but oriented by the platform operator towards concrete investment solutions or intermediaries that offer higher commission fees¹³².

Algorithms are at the heart of the provision of investment advice and management and they have become the key feature of many FinTech services in recent years. In a general approach, not only restricted to FinTech services, algorithms pose several pro-competitive effects¹³³:

- On the supply-side, they contribute to increase transparency and to the development of more efficient services and products (lower production costs, enhanced quality and more efficient resources management).
- On the demand-side, algorithms provide better structured information to customers, helping them make their decisions. They help customers learn how to act not only based

¹³⁰ Financial Conduct Authority (2017).

¹³¹ European Parliament (2014). Articles 24, 25 and 27 of MiFID.

¹³² IOSCO (2017, p. 31).

¹³³ OECD (2017, p. 12).

on competition-related facets such as price, but also based on quality and other consumers' experiences.

Notwithstanding their benefits, **algorithms also pose several risks to the competition process**. According to the Organisation for Economic Cooperation and Development (OECD), *'a particular concern highlighted in the literature is the risk that algorithms may work as a facilitating factor for collusion and may enable new forms of co-ordination that were not observed or even possible before. This is referred to as "algorithmic collusion"'*¹³⁴.

The OECD defines four roles algorithms can play in digital markets as facilitators of collusion¹³⁵:

- **Monitoring algorithms:** they collect and process information from competitors' behaviours and can be used to enforce previous collusive agreements.
- **Parallel algorithms:** they react to any change in market conditions replicating a concrete pattern. They can be shared by firms and be programmed not to compete among them, but to set a coordinated pricing strategy.
- **Signalling algorithms:** they offer signals (for instance a temporary price increase) and process the signals emitted by competitors to set the prices after all of them agree on those prices by sending the same signal.
- **Self-learning algorithms:** these algorithms, based on machine learning and deep learning technologies, can produce collusive outcomes by themselves, without human intervention, as they can learn and conclude that the best way to maximise profits is to develop collusive practices.

Regarding wealth and asset management services, all these algorithms could be implemented. While competition issues derived from the first three might be adequately addressed through traditional competition enforcement tools, it remains unclear if these tools are enough to cope with competition problems issued by self-learning algorithms, as human intervention seems to somehow fade because the initial programme is modified by self-learning.

2.6. Personal finance management

2.6.1. Business models: analytical and visualisation tools to help customers to understand their financial situation

Personal finance management services are services that facilitate the way in which people manage their money. These services are dominated by **mobile apps** and are aimed to **improve the financial wellness of users**, by providing useful information on their personal financial situations. By accessing the banking and financial information of the user, these apps improve the user's understanding of his/her own situation, allowing him/her to create and manage budgets, debts and savings. In practice they do not provide financial services, but instead offer analytical and visualisation tools, provide useful information and address queries through programs such as chatbots (software that allows users to interact with their providers through natural language —both written and spoken— without human intervention from the provider-side).

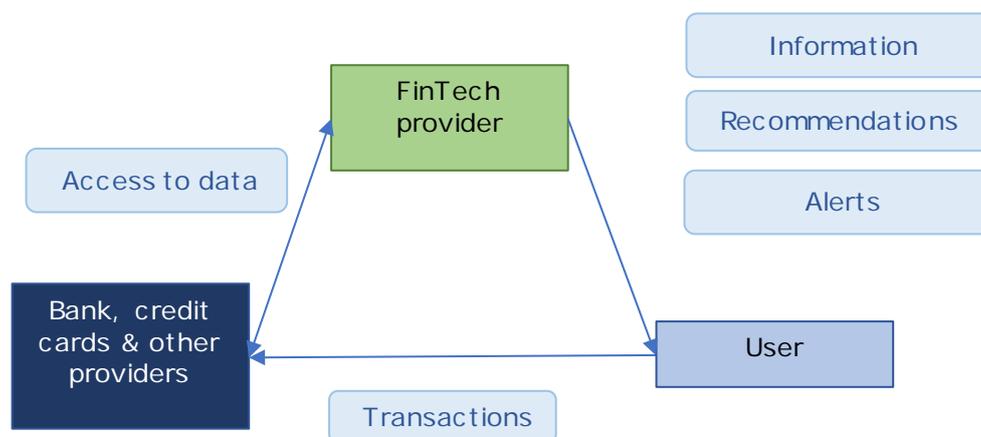
Although some apps include features from other FinTech services, such as tools for paying bills, in general, transactions are done by users in direct contact with their financial services provider. Services from the financial manager only include information and data gathering,

¹³⁴ OECD (2017, p. 16).

¹³⁵ OECD (2017 pp. 24–32).

as well as analysis, alerts and recommendations. Therefore, PFM services **do not replace** incumbents or other non-traditional FinTech service providers but instead **complement** their services by improving management and facilitating the visualisation of information, serving as an interface between financial services and products.

Figure 41: Personal finance business model



Source: Iclaves (2018).

Revenue and monetisation models for this type of services are essentially the same as those for mobile applications:

- **Free models:** users do not pay to download or use the services. Monetisation comes from the display of ads within the site or app or recommendations of products based on the user's data and activity. Normally revenues depend on the clicks made by users in ads or recommended services or products.
- **Freemium model:** users do not pay to download the app and have limited access to the functionalities of the services. Users must pay to access advanced, premium or certain services within the app, or to use the services more than a certain number of times.
- **Pay models:** users pay to download the app or they pay an amount regularly to use the service, normally in monthly or annual fees.

2.6.2. Competition issues in the business processes: customer's data access and security

Competition issues regarding digital PFM services arise mainly in the field of **customers' data access**. Historically, many traditional financial services providers, such as banks, imposed restrictions on FinTech providers trying to access customers' account information. Security reasons were usually used to limit this access, creating **technical entry barriers** for some service providers. Such limitations have been addressed by the PSD2 Directive, which defines the '*Account Information Services Provider*' (AISP)¹³⁶ as a type of payment service provider and obliges the '*Account Servicing Payment Service Provider*' (ASPSP), usually banking institutions, to open the access to customer accounts' data to AISPs.

¹³⁶ Article 33 Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payments services in the internal market
<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366&from=EN>.

Although there has been some controversy between AISPs and ASPSPs on the ways to access data¹³⁷, in this case, the potential competition issues have been addressed using a specific regulation.

Box 3: The Open Banking initiative in the UK

In September 2015, HM Treasury created the **Open Banking Working Group**, which included representatives and experts from the banking sector, FinTech companies, consumer organisations and the government, in order to define a framework for the development of an open standard for APIs to make non-personal data owned by banks publicly available.

In 2016, the Competition and Markets Authority (CMA) proposed the **Open Banking approach** as a remedy to incentivise competition in the UK banking sector. The CMA has set up the Open Banking Implementation Entity (OBIE), a company in charge of the effective implementation of Open Banking in the UK. The OBIE is governed by the CMA and funded by the UK's nine largest banks. The OBIE has the following objectives¹³⁸:

- *'Design the specifications for the APIs*
- *Support regulated third party providers and banks to use Open Banking standards*
- *Create security and messaging standards*
- *Manage the Open Banking Directory*
- *Produce guidelines for participants in the Open Banking ecosystem*
- *Set out the process for managing disputes and complaints'*

Under this initiative the UK competition authority has compelled incumbent banks to adopt the **Open Banking standards**, fostering competition in banking services and allowing customers to better manage their money.

Security and data privacy are key elements of these services, since by using these services users allow third parties to access their account information regarding deposits, credit cards or debts. They do not, however, represent potential threats for competition.

Other issues, although not linked to competition, that might affect consumers' protection are transparency and neutrality of the recommendations made by these sites and apps.

2.7. Insurance

2.7.1. Business models: disintermediating customers and risk carriers

Digital transformation is disrupting the insurance sector by introducing innovations in all the links of its value chain.

Although most of the innovations so far have affected the *'front part of the insurance ecosystem'*, that is, the parts related to communication with the clients, new business

¹³⁷ See Box 1.

¹³⁸ Open Banking Implementation Entity (2018).

models are arising that might threaten the role of traditional insurers and result in a total **disintermediation**¹³⁹.

Technological innovations such as data analytics and AI, blockchain, robotics and IoT are leading to the opening-up of new customer segments and even new markets, allowing the coverage of new products, the creation of new ways of interacting with the customer and new ways of managing the business. Consumer engagement and retention has been one of the most affected areas by **InsurTech** hatching. As a result, the sector is also experiencing a **shift from reaction to prevention**, with new tools for assessing risks and setting prices for premiums. This allows for greater personalisation, for example, by linking policies to personal data through new devices such as wearables.

Figure 42: InsurTech value chain



Source: Adapted from McKinsey & Company (2017).

The impact of new technologies can be seen in all steps of the value chain:

- **Product development:** new technologies have fostered the emergence of new products in the insurance market, allowing the coverage of previously underserved consumers and the creation of new products, tailored or personalised. Some of these new products are:
 - Micro insurance
 - Pay-per-use insurance
 - P2P Insurance
 - On-demand product insurance
- **Marketing, Distribution & Sales:** digitisation and InsurTech have so far offered the most added value in these processes. Digital channels have the potential of reshaping marketing in the insurance sector. Technology allows for the simplification of buying processes and the reduction in distribution costs.
 - Personalisation
 - AI targeting
 - Product comparison
 - Digital brokers
 - Purchase interfaces
- **Pricing & Policies:** new technologies have a great potential in the processes related to risk assessment, identification and management, which allows companies to

¹³⁹ Braun, A. & Schreiber, F. (2017).

reduce uncertainty, adjust prices and increase resilience when underwriting insurances¹⁴⁰.

- Real time risk mitigation
- Personalised premiums
- Compliance
- **Claims management & assistance:** online and mobile services, AI, chatbots¹⁴¹ and geolocation are innovations that allow new ways of engaging with customers and improve the efficiency of the claim and assistance processes. These technologies help reduce costs and improve responsiveness along with providing effective communication with clients.
 - Digital claims
 - Fraud detection

InsurTech services providers have most often focused on only one step of the value chain¹⁴² instead of covering many of them. Partnerships between incumbents and new entrants, particularly start-ups, have been frequent. Incoming start-ups have posed more of a threat to **intermediaries** in the sector, such as brokers, than to insurers, since risk carrying has mainly remained in the hands of incumbents. Disintermediation, however, may allow non-traditional InsurTech providers to control the whole process¹⁴³.

2.7.2. Competition issues in the business processes: commonalities with FinTech competition concerns

The insurance sector has been one of the few sectors in the EU that has benefited from a **block exemption regulation**¹⁴⁴. The last renewal¹⁴⁵ of the Insurance Block Exemption Regulation¹⁴⁶ (IBER) came into force in March 2010 and expired in March 2017. It granted exemptions on the application of Article 101(1) of the Treaty on the Functioning of the European Union (TFEU)¹⁴⁷ to two types of agreements between insurance companies:

¹⁴⁰ EIOPA (2017).

¹⁴¹ For the definition see section 2.6.1. Some examples can be found in the following link: <https://insuranceblog.accenture.com/how-chatbots-are-transforming-insurance-eight-examples>.

¹⁴² See Figure 42.

¹⁴³ Braun, A. & Schreiber, F. (2017).

¹⁴⁴ European Commission (2016).

¹⁴⁵ The first Insurance Block Exemption Regulation was adopted in 1992.

¹⁴⁶ Commission Regulation (EU) No 267/2010 of 24 March 2010 on the application of the Article 101(3) of the Treaty on the Functioning of the European Union to certain categories of agreements, decisions and concerted practices in the insurance sector <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0267&from=EN>.

¹⁴⁷ Article 101(1) TFEU: 'The following shall be prohibited as incompatible with the internal market: all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market, and in particular those which:

(a) directly or indirectly fix purchase or selling prices or any other trading conditions;

(b) limit or control production, markets, technical development, or investment;

(c) share markets or sources of supply;

(d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;

(e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.'

- Information exchange agreements to share joint compilations, tables and studies in order to make more accurate predictions of the potential impact of risks and their associate costs.
- Common coverage of certain types of risks by a pool of insurance undertakings.

In 2016, the EC assessed the need of a new renewal of the IBER¹⁴⁸. The Commission concluded that the exemption was no longer necessary, as the Commission's Horizontal Agreements Guidelines provided a comprehensive set of competition principles to self-evaluate the adequacy of information exchange agreements. Albeit the decision not to renew the IBER was not based on technological reasons, the possibilities opened by big data technologies to better predict the risk probability and its potential cost influenced the Commission's decision.

The competition issues in the provision of InsurTech services have similarities to those experienced in the field of FinTech. **Access to customers' data** and the impact of **algorithms** on pricing strategies are the main factors that can lead to anticompetitive practices. The distribution ledger technologies, mainly blockchain, are also going to have a prominent role in several processes of the InsurTech value chain, particularly on record keeping, transfer value, peer-to-peer insurance and supporting smart contracts¹⁴⁹. Given its relevance, the standardisation of private blockchains¹⁵⁰ might create entry barriers if the standardisation process lacks the required transparency.

2.8. Enabling technologies and infrastructures

The enabling technologies described in section 1.2.7. are not specific to FinTech services. Even if DLT was born within the FinTech world, it is increasingly used in other sectors. Each technology/infrastructure identified is positioned in the market with specific characteristics.

2.8.1. Business models: from consulting services to Software as a Service

Four different technologies and infrastructures can be considered as enablers of FinTech services.

Distributed Ledger Technologies / blockchain

These technologies have emerged from financial applications (i.e. accounting, payments, and transactions) but they are also valuable for other applications such as:

- Commercialisation of assets that require strict control: legal trade of drugs for medical purposes, diamonds, etc. DLT can bring the required guarantees that transactions are clean, registered and all parties are identified.
- E-voting: DLT are used to ensure transparency.

It is possible to implement DLT/blockchain using available IT technologies and most IT consulting firms can offer the service. From the business/competition perspective, this technology falls into the larger category of specialised software implementation and services.

¹⁴⁸ European Commission (2016).

¹⁴⁹ EIOPA (2017, p. 10).

¹⁵⁰ Blockchain networks can be divided into '*public blockchains*', where anybody can join the network (the main example is Bitcoin), and '*private blockchains*', with restricted access to known participants. EIOPA (2017).

AI & Data analytics

In the last decade data analytics and AI have been made broadly available. This has eased the creation of many companies in this area. Moreover, large IT consulting firms have created specific areas to bring this service to their customers. According to *Crunchbase*, there are more than 10 500 companies registered within the categories of '*Analytics*' and '*Artificial Intelligence*'.

Initially, Data Analytics and AI companies provided cross-sectorial services. Over time, however, companies have focused on concrete sectors or knowledge areas¹⁵¹.

The incorporation of AI into FinTech services may be done in several ways:

- **Professional services**, collaborating in the development of the FinTech product/service.
- **Integration** of modules/components into the FinTech product/service.
- Using AI as an **external service**. In this case they fall into the category of '*Advanced Services from Cloud Infrastructures*'.

Cybersecurity

Cybersecurity is one of the most vibrant digital sectors nowadays, and it is foreseen that it will continue growing in the coming years. All activity areas within the FinTech environment are concerned with the implementation of the appropriate cybersecurity measures to protect their operations.

Companies in this area fall into three categories:

- **Specialised firms**, normally SMEs that focus their activity to provide high added value.
- **Department of large consulting firms**, providing security as part of a complete portfolio of IT professional services.
- **Product vendors** that commercialise off-the-shelf products; for instance, antivirus, firewall products, etc.

There is a sufficient number of companies in the market to ensure fair competition.

Advanced Services from Cloud Infrastructures

There are many companies providing basic cloud services, but the **provision of advanced cloud services** (data analytics and AI) is **limited** to the large actors of the cloud market: IBM, Amazon, Google and Microsoft. Only these few companies provide advanced services for huge data analytics, AI algorithms available on demand and many other added value services. These big cloud companies leverage economies of scale to provide these advanced services at a reasonable price. There is a strong competition among them and more and more services are included in their respective portfolios.

In the last few years, there have been new companies that have provided specialised services based on A.I., as providers of real time summaries of text¹⁵², text classifiers¹⁵³ or automated translation¹⁵⁴. In spite of these examples, and many others that could be mentioned, the reality is that the position in the market of the four major players mentioned

¹⁵¹ CB Insights reported, in December 2017, the list of 100 start-ups in AI arena, already segmented into sectorial areas. See CB Insights (2017). There are many other examples structuring the AI market in specialised niches.

¹⁵² <https://orbit.ai/>.

¹⁵³ <https://www.paralleldots.com/>.

¹⁵⁴ <https://www.deepl.com/>.

makes competition very hard for other companies. Any new company willing to compete in the market needs to clearly define its competitive advantage and gather huge investments. This is the only enabling technology/infrastructure that might be considered in doubt with respect to competition issues, as its market shows the characteristics of an oligopoly.

Business models implemented for each enabling technology

The aforementioned technologies and infrastructures are provided through different business models. In all cases, the FinTech company supports the cost of the service in its cost structure by direct payment to the technology/infrastructure provider. Enabling technologies/infrastructures are transparent to the final user who gets the service regardless of internal implementation details.

The next table shows the main business models and their relationship with the enabling technologies of FinTech services.

Table 2: Business models for the provision of FinTech enabling technologies

Business Models	DLT	AI companies	Cyber-security	Advanced Cloud Services
Consulting and Professional Services	X	X	X	X
Products			X	
OEM	X	X	X	X
Software as a Service		X		X

Source: Iclaves (2018).

Consulting and Professional Services

Most technology and infrastructure providers offer their customers the possibility to hire specialised services. Customers can approach specialised professionals to help them in the creation and evolution of their business.

The business model is a **direct sale of the services** from the consulting firm to the FinTech company. This is an area where competition is open and there are many options for a firm to hire these specialised services. The current market is not dominated by any specific consulting firm.

Products

Full-fledged products as such are only available in the cybersecurity market: from anti-virus software, to firewall or attack detection.

Again, the business model is a **direct purchase** of the product by the FinTech company. Products are normally sold on a yearly licence basis with periodic updating. No specific obstacles for competition have been detected so far in this area.

OEM (Original Equipment Manufacturer)

The OEM model implies the **integration** of a product or service (text analysis, translation, etc.) from an external vendor into the solution provided by the FinTech company. These services can be provided as components that are integrated into the FinTech

product/service or as a call to an external IT service hosted outside the FinTech IT infrastructure. In the last case, the integration can be considered an implementation of the Software as a Service model. No specific barrier for competition is found in this area.

Software as a Service

This model is complementary to the previous one. It can be considered a particular case of OEM, where the service is incorporated into the FinTech application in order to provide the service to the customer.

The business model is a **direct payment** from the FinTech company to the service providers, which may be in the form of monthly or yearly subscription periods. The FinTech company must then evaluate the impact of incorporating the service into its application and the cost involved in integrating the service in order to consider if a change of provider is required in the future. No company has a dominant position in this market, but the *de facto* oligopoly of the big tech companies already mentioned might create barriers of entry for new players.

2.8.2. Competition issues in the business processes: oligopoly in the advanced cloud services market

Most of the enabling technologies and infrastructures of FinTech services, particularly DLTs, AI and Data Analytics, are still in their infancy, with many providers competing in fragmented markets. Although they are also subject to several factors that might result in anticompetitive behaviours —standardisation processes, network effects, mergers and acquisitions—, **none of them has materialised** so far.

In the field of cybersecurity, the provision of services in Europe also remains very fragmented¹⁵⁵. Under the umbrella of '*cybersecurity services*', however, there are some specific technology niches where **market concentration** and potential competition concerns might occur.

Box 4: Payment smart card market concentration in France

In April 2017, the European Commission cleared the acquisition of the security solutions provider *Morpho* based in France by the US equity firm *Advent International*, although subject to conditions¹⁵⁶. The acquisition of *Morpho* would have reduced the **number of competitors** in the French payment smart card market to two, as *Oberthur*, another payment smart card provider, was also controlled by *Advent International*. The Commission also highlighted in its decision the difficulties to enter this specific market in France, given the certification and standardisation requirements set out by French authorities (manufacturers of payment smart cards must obtain and maintain a certification for the domestic debit card scheme *Cartes Bancaires*, as well as the global EMV —Europay Mastercard Visa— certification standard). As a result, the Commission expressed its concerns on how the operation could affect competition in the French payment smart card market. The Commission finally cleared the acquisition after the parties' offer of divesting *Morpho's* French subsidiary *CPS* in order to maintain a certain level of competition in that market.

¹⁵⁵ Rivera, R. et al. (2017).

¹⁵⁶ Case M.8258 – Advent International/Morpho
http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=2_M_8258.

Another area where **competition** could be **threatened** is the provision of **advanced cloud services**. As mentioned in section 2.8.1, this market is dominated by a few number of big tech companies and, furthermore, the barriers for new actors to access are huge (the required investments are very high and the return is not yet clear as the offer is becoming nearly a commodity). The major problem in evaluating potential anticompetitive behaviours is, again, the **market definition**. Advanced cloud services can include many diverse functionalities with blurred boundaries, which hinder the assessment of market shares, pricing policies, etc.

3. AN ASSESSMENT OF COMPETITION CHALLENGES AND THE USE OF COMPETITION INSTRUMENTS

KEY FINDINGS

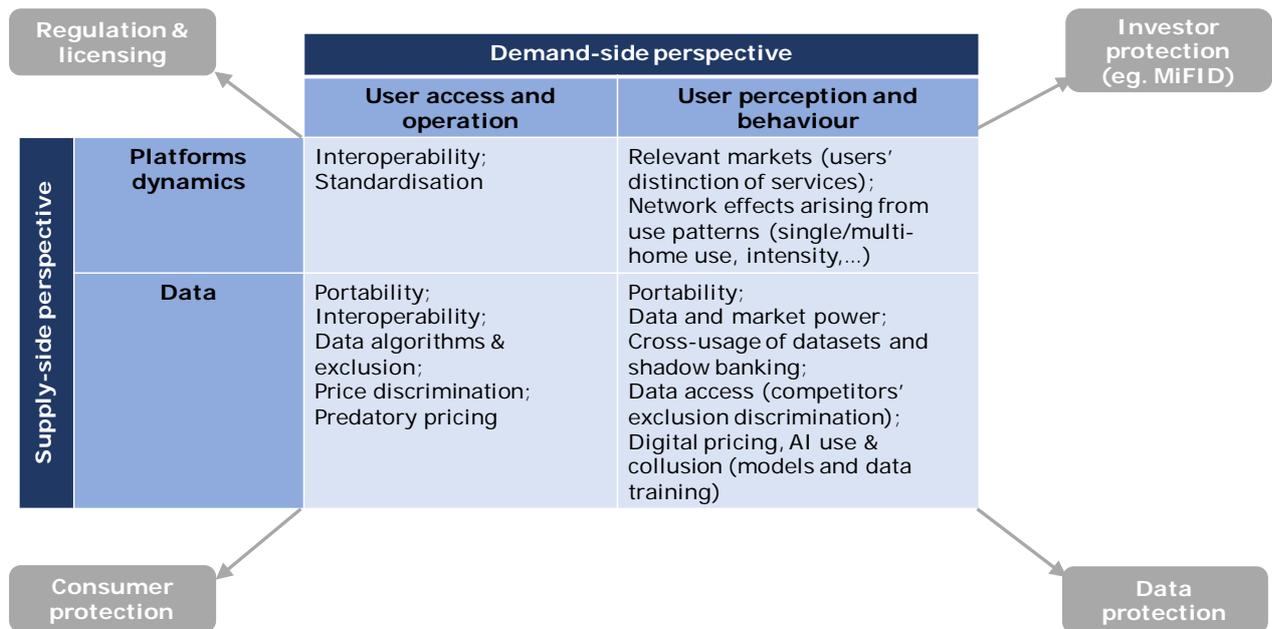
- Multi-sided markets, such as FinTech platforms, imply that the definition of the **relevant market** cannot be undertaken following traditional models built on the premises of '*pipeline*' businesses where value is generated by the supplier of a product or a service.
- FinTech platforms are not as regulated as financial trading platforms, and therefore the challenges arising from **network effects** need to be assessed as a competition challenge. Network effects enable a large platform to be insulated from competition from smaller platforms with fewer participants and can create barriers of entry. Yet, network effects are not indicative *per se* of the existence of competition problems that need to be addressed.
- An active pursuit of **non-interoperability** in the provision of FinTech services can act as a deterrent with anticompetitive effects if access to the market is difficult or costly, or can even cause foreclosure effects when barriers are insurmountable.
- The **role of data** to establish a competitive advantage, which can give rise to exclusionary conducts such as refusal of access or exclusive contracts, needs to be borne in mind as one of the elements when assessing the position of a company resulting from a merger.
- Some of the competition challenges described in this section **fall outside the scope of competition tools**, and they should be addressed by specific regulations of the financial sector (investor protection rules, licensing scheme, prudential rules), data protection and privacy laws or consumer protection laws.

3.1. The landscape of competition challenges, and the use of competition instruments: descriptive and normative tools

3.1.1. The explanatory matrix as a descriptive tool

In this section the explanatory matrix introduced in Chapter 2 is used again to systematise each competition challenge by focusing on the main **technological features** defining the service (**supply-side**), and on the **users' perspective (demand-side)**. We consider that the combination of these two factors is a better predictor of the risk of competition challenges than the specific features of the service itself. The competition challenges tend to depend more on certain technological features, such as the provision of services through online platforms or the access to data, and on the intensity of customers' interaction with the service, than on whether that service is defined as '*banking*', '*payment*' or '*advice*'.

Figure 43: The supply/demand explanatory matrix on FinTech competition issues



Source: Iclaves (2018).

The benefit of using this matrix is twofold. First, it provides a **conceptual anchor** and a tool to anticipate problems in a field subject to fast changes, where it is not possible to anticipate whether technologies or services will evolve first. For example, today it is useful to explain separately the services of banking and payments because they are offered and requested distinctly from each other; however, they might converge in the future. By using platform technology or big data as key features, it is still possible to anticipate which competition issue could potentially occur in each case¹⁵⁷.

Second, the classification helps to anticipate the areas of policy action (regulation and licensing, investor and consumer protection, or data protection) that may overlap with competition policy. This is a necessary first step in **differentiating** which instances of competition challenges might require the use of **competition policy tools**, because they fall squarely within one of the light blue cells of the matrix, from those challenges which result from factors **outside the reach of competition policy**. That is, whether the competition challenge is merely a problem that stems from the lack or inadequacy of tools in other fields, or the problem can be addressed using both competition policy tools and other policy tools¹⁵⁸.

Still, this framework of analysis has some **limitations**. First, the matrix does not intend to create mutually exclusive categories. Many FinTech services will be characterised by the use of platforms, but also by data-intensive technology, and they will likely lead to competition challenges typically associated with both. In a similar way, one service may involve issues regarding both aspects of the demand-side perspective. Secondly, the **classification is not based on closed compartments**. The operation of a certain

¹⁵⁷ Sections 3.1.2 and 3.1.5 discuss the specific competition issues following the structure of the matrix.

¹⁵⁸ In Section 3.1.4 we discuss these in more detail, and in section 3.1.5 we offer a decision-tree as the analytical tool to calibrate the appropriateness of using competition tools and other tools in addressing each competitive challenge.

technology may often be difficult to disentangle from aspects related to the users' behaviour and their awareness of the process. For instance, the degree and necessity of standardisation may be linked to the users' stable and predictable preferences and expectations about how a process should work. Consistent, exclusionary or discriminatory patterns in an algorithm's operation may relate to certain factors in the users' behaviour with strong predictive power. Even in those cases, the matrix helps to distinguish between different angles of a single problem as a first step in identifying the best tools to deal with each of those angles.

Third, this is an explanatory matrix that helps to classify the issues but has **no independent normative force**. That is, the matrix can help to classify the causes and elements of a specific problem, but, by itself, can neither diagnose whether the problem involves a specific pathology that needs to be addressed, nor point to a specific tool, or combination of tools, to address the problem. The tools used will depend on whether the problem is real or potential, the intensity with which it materialises, its accompanying facts in each specific context, the authorities' goals and priorities and the suitability and limitations of the different tools to address the issue. These aspects need a more in-depth discussion, not limit to bi-dimensional classifications.

3.1.2. Platform-based technologies

Platform-based technologies have specific features that have attracted the attention of the European Commission¹⁵⁹ (from the perspective of competition policy¹⁶⁰, but also of consumer policy and other fields¹⁶¹) and they have also been explored by national competition authorities¹⁶². In general, '*platforms*' are '*two-sided*' or '*multi-sided*' markets¹⁶³, where a platform operator brings users together to facilitate an interaction, such as an exchange of information, or a commercial transaction¹⁶⁴. Some distinguish between '*market-makers*', which bring together two distinct groups that are interested in trading, '*audience makers*', which match advertisers to audiences, and '*demand coordinators*', which coordinate the necessary infrastructure for the system to clear, e.g. payments¹⁶⁵.

Platforms in FinTech services are linked with the access to information, e.g. comparison websites, and to commercial transactions, as in the case of crowdfunding or crowdlending. The latter also generally fit within the category of '*market-makers*', whilst the former belong to that of '*audience-makers*'. Some operators of payment services could be characterised as '*demand coordinators*', although strictly speaking, they do not coordinate demand themselves, but rather its clearing.

Unlike more linear business models, in platforms one group of users delivers value to another group and vice versa; in so doing, they create value for the platform itself. This fluidity of interactions, and the need to adopt a multi-sided perspective, means that platforms can pose unique competition challenges.

Due to its multi-sided character, the **relevant market** cannot be defined following traditional models built on the premises of '*pipeline*' businesses where value is generated by the supplier of a product or a service. This causes problems because the relevant market

¹⁵⁹ <https://ec.europa.eu/digital-single-market/en/policies/online-platforms>.

¹⁶⁰ European Commission (2016a) & European Commission (2016b).

¹⁶¹ Ecorys (2017) & European Commission (2017).

¹⁶² Bundeskartellamt (2016).

¹⁶³ Rochet, J. & Tirole, J. (2003). See also Katz, M. & Shapiro, C. (1985).

¹⁶⁴ European Commission (2016a, p. 1).

¹⁶⁵ Evans, D. (2003). See also Evans, D. & Schmalensee, R. (2007).

is defined by combining the product and geographical markets, and the relevant product market '*comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use*'¹⁶⁶. In multi-sided markets the link between users affects the price elasticity on either side, i.e. a price increase (or the corresponding reduction in quality) on one side reduces the value on the other side¹⁶⁷. This creates a '*chicken and egg problem*', where both sides need to be attracted to the platform simultaneously, and in reasonable proportions¹⁶⁸.

Thus, at least in transaction platforms, an argument can be made to consider the existence of only one market, i.e. the intermediation market related to the underlying product or service, rather than a separate market for each product or service¹⁶⁹. This approach has been followed in various cases¹⁷⁰ by the Commission¹⁷¹, and it is the position of national competition authorities¹⁷².

In the case of FinTech services the challenge of defining the relevant market may arise, for instance, in relation with mobile payments, as the European Commission has highlighted in several competition decisions¹⁷³.

The second competition challenge resulting from the combination between platform dynamics and users' perception and behaviour is the generation of **network effects**. This is possibly the most widely accepted phenomenon associated with platforms, and the one that has been used as a, if not '*the*', defining feature of these markets¹⁷⁴. Positive network effects are present when the value of a product or service increases with the number of other users (positive direct network effect), but also when users in one group benefit from an increased presence of users from a different group (positive indirect network effects). Whereas platforms present direct network effects, indirect network effects are their more distinctive feature, especially in the case of multi-sided platforms. This feature sets them apart from other types of markets and carries with it important implications from a competition perspective¹⁷⁵.

Platform dynamics are well-known in the field of '*traditional*' financial services, such as **stock exchanges and other trading venues**, '*Indirect network effects*' are a major factor of '*market liquidity*', defined as the ease with which assets are traded, which depends on the number of parties ready to buy or sell. This, in turn, is a critical component of financial stability¹⁷⁶. In that context, however, the tension between liquidity and stability and competition between platforms to provide a better service is dealt with as an issue of financial regulation¹⁷⁷, rather than a competition issue. The fact that it forms a key part of

¹⁶⁶ European Commission, 1997, para. 7.

¹⁶⁷ Robles, A. (2017, p. 3).

¹⁶⁸ Caillaud, B. & Jullien, B. (2003).

¹⁶⁹ Bundeskartellamt (2016, p. 6).

¹⁷⁰ Robles, A. (2017, p. 7).

¹⁷¹ In the Commission Decision of 21 August 2007, M.4523– *Travelport/Worldspan*, the Commission considered that the relevant market was the market for electronic travel distribution services, which intermediated between travel services providers and travel agencies. In its Decision of 11 March 2008, M.4731 – *Google/DoubleClick*, the Commission considered that the relevant market was the market for online advertising.

¹⁷² Bundeskartellamt (2016, pp. 7–8).

¹⁷³ Commission Decisions in cases M.6314, M.6956 and M.6967.

¹⁷⁴ European Commission (2016a, pp. 2–5); Evans, D. (2003); Filistrucchi, L., Geradin, D., & Van Damme, E. (2012).

¹⁷⁵ Rochet, J. & Tirole, J. (2003).

¹⁷⁶ Brunnermeier, M. & Pedersen, L. (2009).

¹⁷⁷ Ferrarini, G. & Moloney, N. (2012); Ferrarini, G. & Saguato, P. (2013).

the markets' regulatory design, rather than being left to competition tools, which generally operate on an *ex post* basis to correct misconducts, is a testimony to its importance and recurrence.

FinTech platforms are not as regulated as financial trading platforms and, therefore, the challenges arising from network effects constitute a competition challenge that needs to be addressed without the benefit of a fully developed body of rules. These challenges include the risk that multi-sided network effects enable a large platform to be insulated from competition from smaller platforms with fewer participants¹⁷⁸ and can create barriers of entry¹⁷⁹. Yet, network effects do not *per se* determine the existence of competition problems in need of specific action. Other factors may modulate the intensity and features of these network effects, in a way that makes intervention unnecessary. The nature of network effects depends on the use of the platform. It is particularly relevant whether users tend to choose one provider only or several providers (*'single-homing'* vs *'multi-homing'*). The decision may be influenced by factors such as the asymmetry of network effects on different sides of the platform, the degree of differentiation, and the cost to switch. Multi-home platform markets lower the barriers of entry, and reduce market power¹⁸⁰, even if there is a dominant player¹⁸¹.

The **ease of switching** between services is one of the advantages offered by Fintech services over traditional financial services; this lowers the intensity of use. Keeping in mind the typically cautious approach by users on different sides, the context tends to favour a *'multi-homing'* system where neither fund-seekers nor fund-providers *'put all their eggs in a single basket'*, as is the case in the field of banking through crowdfunding and crowdlending. Additionally, the presence of FinTech services providers reduces the market power of established players in traditional services. Since these players have not opted for a FinTech model to provide their own services, they have not been able to exploit their incumbency power, which makes it difficult to observe any imminent problem of market power acquired through network effects.

In services characterised by a more intensive use, such as payments, there is a greater tendency towards single-home platforms. Since FinTech services have not yet replaced traditional services, however, users have a wider range of options. Thus, a discussion of the potential acquisition of market power by newcomers using platform technology remains premature. Nonetheless, the **risk lies in the exploitation of their position by incumbents**, be it large financial institutions or big technology companies, to deny newcomers access to the market. Yet this risk arises more because of access to data, rather than the use of platforms, as will be explained below.

The importance of network effects also helps when it comes to understanding the kind of competition challenges related to the users' perspective of **access and operations**. Since network effects increase with the intensity of use and with single-home platforms, operators have a strong incentive to move towards a single-home environment. If this is done by improving the service and catering to the user's needs, it is a pro-competitive effect. Single-home, however, can also be achieved by, or result in, anticompetitive forces.

¹⁷⁸ Federal Trade Commission (2016, p. 26).

¹⁷⁹ Robles, A. (2017, p. 78).

¹⁸⁰ Evans, D. & Schmalensee, R. (2007); Armstrong, M. (2006).

¹⁸¹ Commission Decision Travelport/Worldspan (Case No COMP/M.4523 para. 17. http://ec.europa.eu/competition/mergers/cases/decisions/m4523_20070821_20682_en.pdf). See also Commission Decision Facebook/Whatsapp (Case No COMP/M.7217 http://ec.europa.eu/competition/mergers/cases/decisions/m7217_20141003_20310_3962132_EN.pdf).

Platform operators can increase switching costs by modifying the platforms' **interoperability**¹⁸². Interoperability normally requires a converter software that functions as an adapter or gateway¹⁸³, which imposes extra costs with no clear benefits. An easily interoperable platform is more open and provides easier user access, but it also makes the platform more vulnerable. Larger firms have fewer incentives to make their networks compatible¹⁸⁴. Especially in young markets with potentially high growth, established players will try to avoid interoperability with smaller rivals. Established players will attempt interoperability only if the entry is easy and the new entrants have a superior proprietary technology, in which case it may be desirable for the incumbent to pursue an oligopoly with compatibility¹⁸⁵. An active pursuit of non-interoperability, e.g. through a credible commitment to non-interoperability, can act as a deterrent with anticompetitive effects if access to the market is difficult or costly.

The reverse, however, is not necessarily true. Full interoperability and compatibility do not always lead to a better service or have pro-competitive effects. If interoperability is achieved through technical compromises this may hinder the quality of service¹⁸⁶. In other cases, firms may pursue a strategy of **standardisation** to lower the costs of interoperability. If standardisation lowers entry costs and prices and/or allows firms to compete on more '*core*' parts of the service, it has a positive effect. Standardisation, however, may also result in a restriction of competition between the technologies used for the provision of the service and an oligopoly¹⁸⁷ where providers may take the opportunity to split the market between them.

Box 5: Antitrust investigation on the standardisation process for e-payments

In September 2011, the European Commission opened an antitrust investigation to evaluate the standardisation process of e-payments, undertaken by the European Payments Council (EPC). The EPC is an international organisation created in 2002 and formed of PSPs, mostly banks, and associations of PSPs. The EPC sought to develop standards to ensure the interoperability between e-payments schemes within the Single Euro Payments Area (SEPA). According to the European Commission, it '*had concerns that through its work on standards for e-payments, and in particular the e-Payments Framework, the EPC could exclude new entrants not linked to a bank from the e-payments market*'¹⁸⁸. In 2012, the EPC abandoned the developments of the draft SEPA e-Payments Framework to launch a wider debate among all stakeholders on how to create a secure e-payment ecosystem in the SEPA area¹⁸⁹. As a result, the plaintiff company, *Sofort AG*, withdrew its complaint and the Commission decided to close the investigation.

¹⁸² Katz, M. & Shapiro, C. (1985).

¹⁸³ Eisenmann, T., Parker, G., & Van Alstyne, M. (2009, pp. 6–7).

¹⁸⁴ Robles, A. (2017, p. 8). See also Commission Decision *MCI WorldCom/Sprint* (Case No COMP/M.1741. para, 154 http://ec.europa.eu/competition/mergers/cases/decisions/m1741_en.pdf).

¹⁸⁵ Xie, J. & Sirbu, M. (1995).

¹⁸⁶ Farrell, J. & Saloner, G. (1992).

¹⁸⁷ Matutes, C. & Regibeau, P (1996).

¹⁸⁸ European Commission (2013).

¹⁸⁹ Perria, S. (2012).

3.1.3. Data and data-intensive technologies

The second technology feature that characterises FinTech services from a supply-side perspective is the use of data-intensive technologies. The use of data has attracted the attention of the European Commission¹⁹⁰ and national competition authorities, both inside¹⁹¹ and outside the EU, most notably the US¹⁹². Big data, or, more generally, technologies for the massive processing and analysis of data, have been identified as a prevalent source of competition challenges. Still, three precisions are important:

- (1) Aside from these challenges, data technologies have also been considered the root cause of other socially relevant issues related to, but not fully captured by, competition, e.g. social inclusion/exclusion¹⁹³.
- (2) Specific studies by competition authorities tend to mix problems that are characteristic to data-intensive technologies with problems involving the technology, typically platform technology¹⁹⁴, used to gather the data.
- (3) From a user's perspective in the field of data technologies, the challenges associated with the technology's operation are more deeply intertwined with the challenges associated with the users' behaviour, since the way the technology operates will depend on the user's behavioural patterns.

Starting from the perspective of **users' perception and behaviour**, the first competition challenge is the status of data as a **source of market power**. This is the origin of most other challenges. In many services an increased availability of data improves the accuracy of predictions about user's preferences, profitability and risk. This makes it easier to cater to their needs, and devise tailor-made pricing strategies that mitigate adverse selection, i.e. avoid driving 'good' customers away with onerous conditions, while keeping the riskier ones.

In this context it is important to differentiate between '*first-party data*', which are directly gathered by the services provider because they are voluntarily given by an actual or prospective customer or as a result of an observation of interactions with that customer, and '*third-party data*', which are collected by a third party¹⁹⁵.

While buying third-party data is possible in theory, it may be impossible to match the data trove of certain incumbents, e.g. search engines or other big tech companies. These companies may use their privileged data access to acquire a dominant position in any field of services that requires such data, including financial services. Together with other barriers of entry, such as network effects¹⁹⁶, a privileged access to data can protect certain incumbents from competition¹⁹⁷, an insulation that may be perpetuated by the need of constant investment in technology to create ever more perfect algorithms.

Thus, the potential of data to help incumbents establish an unassailable competitive advantage needs to be borne in mind as a relevant factor when assessing a merger, e.g. if the **combination of datasets** would give access to such a unique data trove that it could

¹⁹⁰ Vestager, M. (2016b); Vestager, M. (2016a).

¹⁹¹ Autorité de la concurrence & Bundeskartellamt (2016).

¹⁹² Federal Trade Commission (2016a).

¹⁹³ Federal Trade Commission (2016a).

¹⁹⁴ Autorité de la concurrence & Bundeskartellamt (2016, pp. 27–30).

¹⁹⁵ Autorité de la concurrence & Bundeskartellamt (2016, p. 12).

¹⁹⁶ See section 3.1.2.

¹⁹⁷ Department of Justice (2014). On these grounds, the DoJ sought to unwind the acquisition of PowerReviews, Inc, by Bazaarvoice.

give rise to competition concerns¹⁹⁸. This can also be a cause of concern when such access results from a pre-existing regulatory privilege, e.g. if the entity is a former monopoly, as outlined by the German and French competition authorities¹⁹⁹.

Control over unique data troves, resulting from the combination of datasets from multiple sources, should also be one of the main factors in assessing potentially anticompetitive conduct, for example the conclusion of **exclusive contracts**, or **tying and bundling** of services, if the incumbent uses its control over a particularly valuable dataset to create a network of contracts that forecloses competition, or to leverage its position and impose the use of other services²⁰⁰.

These considerations raise two other sources of concern, from opposite angles. One is the risk that incumbents could manipulate user behaviour to not make data available to competitors, and the other is **exclusionary conducts**.

Incumbents can exploit the need of **users' consent** to restrict competitors' access to customer data. In the case of payment services, banks are obliged by recent rules to facilitate access to customer data to PSPs, including FinTech companies, as described in section 2.3.2. The practice of 'screen-scraping', however, is prohibited (see Box 1), i.e. PSPs cannot access data from the customer payment account beyond those explicitly authorised by the customer. This means that banks may confront their customers with the possibility to choose to consent access to their data in unfavourable terms, so that customers refuse, and competitors are excluded.

Another way to create a lock-in of users by preventing competitors' access to data may be to put up obstacles to **data portability** so that users are incapable of migrating their profile from one services provider to a different one²⁰¹. Incumbents would have an incentive to present obstacles to data portability as a necessary part of the service to ensure quality and security, and users could be persuaded of the need for a more intensive use, in order to receive a better service. This, in turn, may make the system more closed.

It is important to stress that competition rules by themselves may be insufficient to ensure that incumbents are not insulated from competition. Under competition rules, a refusal of access only constitutes anticompetitive conduct in cases of '**essential facilities**', or '**indispensable**' products or services²⁰². These concepts are quite restrictive and may not apply to datasets. For instance, in the *Bronner* case, the Court of Justice ruled that a product or service is indispensable if there are no alternative products or services and there are obstacles, technical or otherwise, which make it impossible, or unreasonably difficult, for the firm operating in the downstream market to develop products or services without access to the indispensable ones in the upstream market²⁰³. In the age of big data, where advanced data capture techniques allow for the creation of valuable datasets at a reasonable cost, it is difficult to consider a dataset as '**indispensable**'. In the field of payment

¹⁹⁸ This was an important factor in the European Commission Decision in the Merger Control Procedure Case No COMP/M.6314 – *Telefónica UK/ Vodafone UK/ Everything Everywhere JV*, 4 September 2012, where several competitors would combine datasets in a joint venture.

¹⁹⁹ Autorité de la concurrence & Bundeskartellamt (2016, p. 20). The French authority already had a position on this. See French Competition Authority, Opinion 10-A-13 on the cross-usage of customer databases—Autorité de la concurrence (2010). On this basis, it imposed specific duties on access to data to GDF—Suez. See French Competition Authority, Decision 14-MC-02 of 09.09.2014 <http://www.autoritedelaconcurrence.fr/pdf/avis/14mc02.pdf>.

²⁰⁰ Competition and Markets Authority (2015, p. 89).

²⁰¹ Diker, A. & Ünver, M. (2017).

²⁰² Court of Justice of the European Union (1998); see Evrard, S. (2004). In the United States, see also Pitofsky, R., Patterson, D., & Hooks (J., 2002).

²⁰³ Court of Justice of the European Union (1998); see also Autorité de la concurrence & Bundeskartellamt (2016).

services, for example, access to data by competitors is a matter addressed by financial regulatory rules (see Box 1).

The second set of concerns can arise in the opposite case, i.e. where the market is transparent and user data is relatively easy available. In such a case the problem may arise because of the use of **computer algorithms** in a way that promotes express and **tacit collusion**: algorithms can be used to find non-competitive price equilibria²⁰⁴, implement agreements, detect deviations and implement automatic reactions to market conditions²⁰⁵. Such conduct may even result not from the conscious behaviour of competitors but from other circumstances, such as using the same services provider for the data-based algorithms²⁰⁶. In the extreme, with constant technological advances, the use of machine-learning, or AI algorithms, to determine prices and services conditions can result in parallel practices. This is not because of any express or tacit, horizontal or vertical agreement, but because of the interdependency between operators²⁰⁷.

The aforementioned challenges are identifiable as problems related to users' behaviour and the data resulting from it. Yet these are intimately related with the challenges identifiable from a perspective of the users' **access and operation** of the technology. Since data is a source of market power, incumbents have an incentive to make it difficult for others to access and use the technology of newcomers, by introducing **obstacles to interoperability**.

This can be considered in the case of payment services²⁰⁸, where banks have to grant access to their customers' data to PSPs. Since '*screen scraping*' is prohibited, banks must have a communication channel in place that allows TPPs to access data, identify each other and communicate through secure channels. This may be accomplished by adapting bank customers' online interfaces or creating a new dedicated interface²⁰⁹. In either case, a bank has no clear incentive to make the necessary investments to ensure that the interface works swiftly or that its technology and the technology of the TPP operate smoothly with each other.

In practice, obstacles to access users' data by competitors can be combined with obstacles for users to access another providers' technology²¹⁰. The **portability** of data can be manipulated to influence user behaviour.

A different problem from the exclusion of competitors is the **exclusion of users** themselves. This is a particular concern in the US, where the use of Consumer Reporting Agencies (CRAs) to determine eligibility for access to credit, employment, insurance, housing, etc, based on credit scoring, is widespread²¹¹. Big data can help some users to access services that would not be available for '*un-scorable*' users. Yet it can also result in unjustified exclusions due to the actions of the group where the user is classified or existing inequalities being reinforced²¹².

²⁰⁴ In the United States, see US Department of Justice (2015). See also Ezrachi, A. & Stucke, M. (2015).

²⁰⁵ Autorité de la concurrence & Bundeskartellamt (2016, p. 15).

²⁰⁶ Autorité de la concurrence & Bundeskartellamt (2016, p. 15).

²⁰⁷ Ezrachi, A. & Stucke, M. (2015).

²⁰⁸ See section 2.3.2.

²⁰⁹ European Commission (2017b).

²¹⁰ See, e.g. French Competition Authority, Decision n° 14-D-06 08 July 2014, where the French Competition Authority deemed anticompetitive the conduct of *Cegedim*, the leading provider of medical databases in France, which refused to sell its database to customers using the software of *Euris*, a competitor of *Cegedim* on another market (the market of customer relationship management).

²¹¹ Federal Trade Commission (2016a).

²¹² Federal Trade Commission (2016a, pp. 6–11).

More difficult to assess than user exclusion is **price discrimination**. The same data algorithms that exclude users or reinforce disparities can result in differentiated prices, including maximum prices, i.e. the maximum price that a user is ready to pay, depending on user characteristics. This can be worrying if algorithms discriminate in accordance with features unrelated to the service or job, e.g. zip code²¹³, or features that act as a proxy for other factors that result in illegal discrimination, e.g. race or religion. Price discrimination, however, can also grant access to services to certain users who would otherwise have no such possibility, say, by lowering the interest rate of credit contracts to users exhibiting certain features that predict a higher probability of returning a loan²¹⁴. This also allows for enhanced competition, since providers can offer lower prices to users that show preference for other services as a strategy to compete for those customers²¹⁵.

3.1.4. Competition challenges falling outside competition policy tools

The explanatory matrix also helps to identify the **instances** where there may be an **overlap between competition tools and other tools**, and thus might have to be solved by other instruments which lie beyond the scope of competition policy. Beginning with the top right corner, in FinTech services based on **platform technologies** (supply-side) the challenges of defining the relevant market, and network effects are largely determined by the (demand-side) factors of **user perception**, e.g. about the substitutability between different services, and **user behaviour**, e.g. intensity of use, or single-home vs. multi-home use. Such factors can be addressed through competition policy tools, but also by non-competition policy tools. User's perception of a certain service can depend on the transparency of the provider, which, in turn, depends on the disclosure duties applicable to service providers. Likewise, these duties can influence user behaviour, e.g. more complex disclosure protocols can foster intensity of use and single-homing. However, these are **investor protection** provisions, which impose certain duties on financial intermediaries, such as MiFID II²¹⁶, or comparable regulations.

Moving to the top left corner of the matrix, and thus still within the field of platform technologies, **user access and operation** of the technology depend on **entry costs**. Yet, a major part of entry costs is related to **regulatory requirements** if they impose a burden on operators, or, conversely, if their absence creates a situation of uncertainty and unpredictability. Rules on payment services, for example, stipulate a licensing process, but provide certain safeguards that must be respected, and which customers can take for granted when accessing the service. Mandatory rules can also require the compatibility and interoperability between different types of services, like financial market rules impose the interoperability of trading, clearing and settlement services. All these elements, however, are part of **licensing and regulatory requirements** and do not belong to the field of competition law instruments.

Considering the bottom right corner of the matrix, where **data-intensive technologies** are analysed from the perspective of user behaviour, we discussed that the role of data as a source of market power is largely influenced by users' decisions to provide their data. Regardless of the solution that may be more appropriate for fostering competition, this will always be subject to the provisions of **data protection and privacy laws**²¹⁷, and thus the

²¹³ Federal Trade Commission (2016a, p. 11).

²¹⁴ This is particularly important, since disadvantaged collectives tend to be more price sensitive. See Executive Office of the President of the United States (2015).

²¹⁵ Autorité de la concurrence & Bundeskartellamt (2016, p. 22).

²¹⁶ Directive 2004/39/EC —Markets in Financial Instruments Directive (MiFID) — and Directive 2014/65/EU (MiFID II).

²¹⁷ Data protection is considered a fundamental right in the EU. See article 8 of the EU Charter of Fundamental Rights. The safeguards for the protection of the right are contained in Regulation 2016/679 of 27 April 2016

full scope of the issue exceeds the boundaries of competition policy tools²¹⁸. Privacy and data protection rules must ensure that user consent is central to the system. This does not mean mere formal consent: users need to understand and be made aware of all relevant information to give their consent²¹⁹.

Increased awareness does not need to lead to more restriction in accessing data (by providers) and services (by users). Better information can facilitate consumer access to additional services if the providers have access to the data stored by incumbents. In some cases, the balance between the interest of the new entrant, the incumbent and the user is complex enough to have been the subject of **specific regulations** outside data protection. An example are the financial regulatory provisions for PSPs, which also regulate the access by PSPs to the data stored by established financial institutions, e.g. the bank where the client has his/her current account and mortgage loan and receives his/her salary payments²²⁰. The rules try to ensure access to customers' payment data to TPPs. The consequences of the application of these rules are relevant for competition, and competition law instruments can be a useful mechanism to foster compliance with regulatory rules²²¹. The rules themselves, however, exceed the scope of competition policy and thus the scope of the present study.

Finally, within data-intensive technologies, when we consider the perspective of **user access**, the ease of access and operation by the user is determined by pure technical factors, e.g. how well the technologies of a bank and a payment services provider interoperate, as well as more subjective factors, such as whether the payment interface is user-friendly. Issues such as the layout of the information and the transparency of the conditions are a matter where **consumer protection laws**²²² and similar transparency-oriented rules applicable to providers of information society services²²³ weigh heavily.

Then, the restrictions on the design of the technology, especially the algorithms, in ways that do not unfairly exclude, or discriminate against, certain types of consumers are not exclusive, or predominantly, a matter for competition tools. **Fundamental rights** are at stake, especially the right to **non-discrimination**²²⁴.

3.1.5. The competition policy decision tree as a normative tool to assess the challenges and the instruments to address them

The **explanatory matrix** classifies the different competition challenges from a supply-side and demand-side perspective, but, as said before²²⁵, it has **no independent normative force**. That is, the matrix itself cannot help to determine whether the challenge is real or

on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation).

²¹⁸ Court of Justice of the European Union (2006).

²¹⁹ Recital (32) of the General Data Protection Regulation states that: '*Consent* should be given by a clear affirmative act establishing a freely given, specific, informed and unambiguous indication of the data subject's agreement to the processing of personal data relating to him or her, such as by a written statement, including by electronic means, or an oral statement.'

²²⁰ See articles 64-77 of Directive (EU) 2015/2366 of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC (Payment Services Directive II).

²²¹ Khan, M. & Shotter, J. (2017).

²²² See, e.g. Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts; Directive 2011/83/EU, of 25 October 2011 on consumer rights; or the European Commission Code of EU Online Rights, 2012.

²²³ Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('*Directive on electronic commerce*').

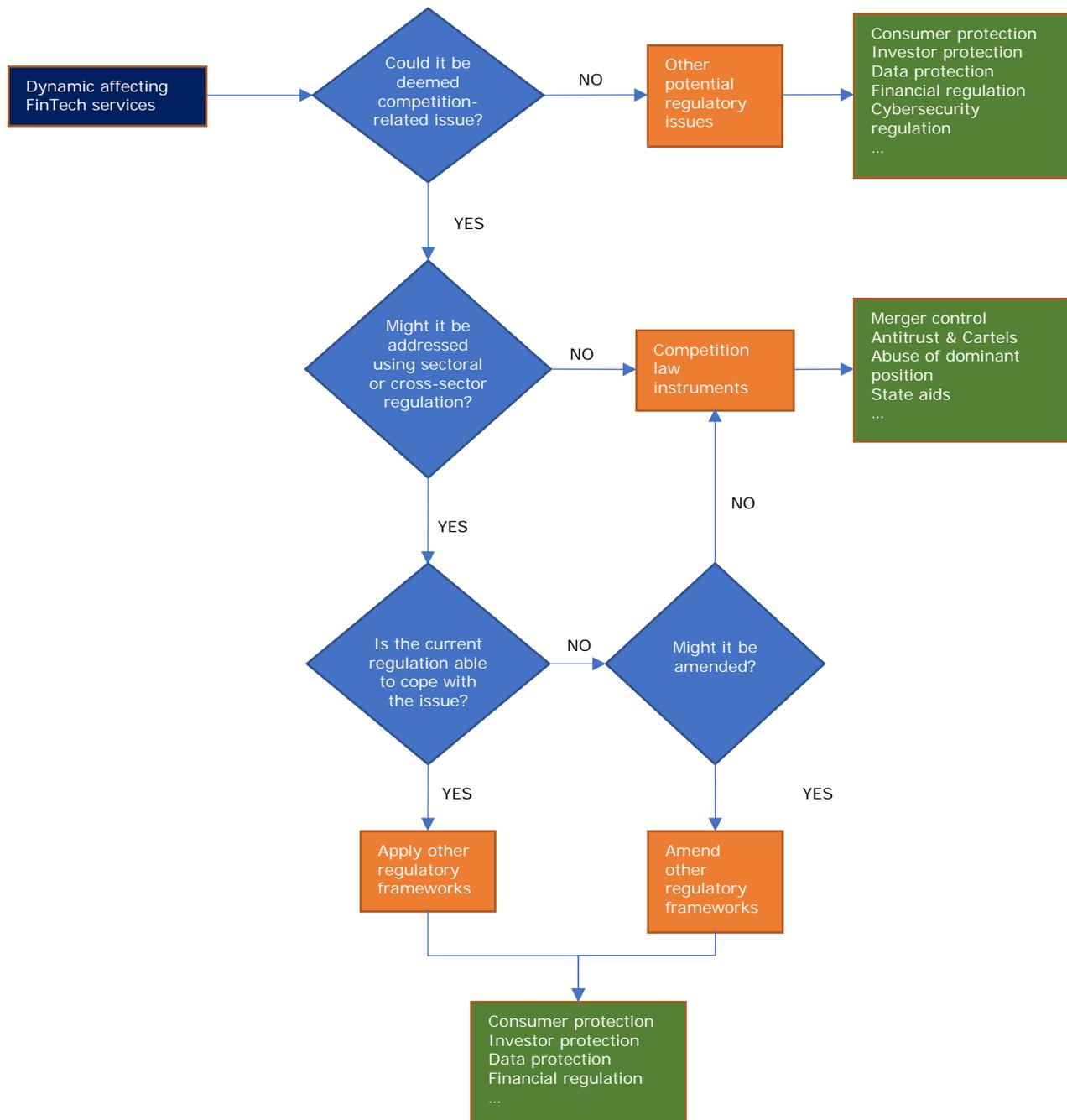
²²⁴ Article 21 of the Charter of Fundamental Rights of the European Union.

²²⁵ See section 3.1.1.

merely potential, whether it is mitigated by other factors and whether it may be alleviated by using known competition tools or if other tools (regulation, consumer protection etc.) are needed. To do that, **a normative process is needed**.

This should include a systematic assessment of the competition challenges and the potential use of competition law instruments, in contrast to other legal, regulatory or policy tools, which may be appropriate in each case. Figure 44 shows the key questions that must be answered to decide the best way for addressing each dynamic, which together form the 'competition policy decision tree'.

Figure 44: Regulatory assessment process of the dynamics affecting the FinTech services



Source: : Compiled by Iclaves based on European Parliament (2015).

The first question is whether the application of the specific supply-side and demand-side categories results in any identifiable competition **challenge**.

Even if one answers this first question in the affirmative, it is necessary to ask **whether the challenge is an actual competition challenge**, or whether it falls squarely into other categories of challenge. A negative answer to the question would place the specific issue squarely into other domains, such as regulation, data protection, etc. In the case of the answer to the question being mixed, the answer should be counted as a 'yes'.

The next question, particularly for those cases that are mixed in nature, is whether the challenge may be addressed using sectoral or cross-sectoral regulatory tools, and/or competition policy tools.

For those cases where the challenge may be addressed by specific sectoral or cross-sectoral regulation, the next question is **whether the current sector specific regulatory framework is suitable to cope with the issue**. If the answer is 'yes', the difficulty may be in the application and enforcement of the rules, in which case that process should be improved. If the answer is 'no', the problem will be the inadequacy of the regulatory framework, in which case the solution should be the amendment of that framework in a way that addresses existing challenges. In either case, the specific **solution** would need to be discussed in more depth in relation to the specific service, and it would be **complementary to a solution based on competition tools**.

For those cases where the answer to the regulatory question is 'no', there will be a competition challenge, which may not be addressed with regulatory tools. This means that **competition tools** will be the **best**, if not the only, available **instrument** to address the challenge. The type of competition tool depends on the characteristics of the problem: standardisation challenges or collusion resulting from algorithms or AI can be tackled through the tools used for collusive agreements or behaviour, market power challenges arising from platform technology or the use of data may be best addressed through merger control, exclusionary conduct can be removed using the tools for collusion or abuse of dominant position, etc.

In most cases, the conclusion to the first two questions seems to be 'no', or a tentative and tepid 'yes'. The market for certain types of services is in its infancy, or in a state of flux, which makes it difficult to reach a conclusion as to the existence of clear challenges that may, or should, be addressed by competition tools. There are, however, several examples where regulatory tools, or other types of non-competition tools, seem warranted.

3.2. The use of descriptive and normative tools to assess challenges and possible courses of action on a service by service basis

3.2.1. Deploying descriptive and normative tools on the service-by-service analysis: the resulting competition dynamics

The key to describing the existing competitive landscape in FinTech services and assessing present and potential challenges entails several steps. The most relevant step involves combining the **more abstract view** of competition issues, based on a supply-side that captures the characteristic technologies and a demand-side that takes into account how a service or technology is accessed and operated and how the consumers perceive, and behave in relation to it, **with a more concrete view** that considers the actual services involved, based on the categories employed in section 2. This gives rise to a series of competition dynamics, which are discussed in subsequent points. The following table may serve as a summary. The column '*Problems*' reflects classic competition issues that can occur in any economic sector and that can also affect the FinTech services. The column '*Causes*' includes the potential dynamics with a sector-specific approach that might lead to

the anticompetitive practices listed in the column '*Problems*'. The subsequent columns indicate what competition issues could affect each services' category the most.

Table 3: Competition-related dynamics in the provision of FinTech services²²⁶

Causes		Problems	Banking		Payments, transfers & FOREX	Digital currencies	Wealth & Asset management	Personal financial management	Insurance	Enabling tech & infrastructure
			Lending & equity	Deposits						
Provision of FinTech services through online platforms	User's data access	Licenses	Entry costs and maintenance obligations (compliance)							
		Prudential and conduct rules								
		Regulatory asymmetry								
		Technical standardisation	Collusive agreements							
		Tying and bundling agreements								
		Information exchange agreements								
		Network effects	Dominant position and its abuse							
		Pricing strategies (predatory, excessive...)								
		Denial of access								
		Intellectual and industrial property – proprietary technologies								
	Network effects	Market concentration (M&A)								

Source: Iclaves (2018).

²²⁶ The green colour implies that the causes of competition problems —defined in the rows— impact (currently or potentially) in the concrete category of services —defined in the columns. The light grey colour indicates that the cause of the competition problem does not currently affect, and it is not expected to affect in the future, the concrete category of services.

3.2.2. Banking – marketplace lending

Our analysis shows that marketplace lending faces significant challenges that may hinder the development of a competitive market. The perception is that **the main obstacles are not a result of anticompetitive behaviour**, but a **lack of clear regulatory standards** applicable to this type of activity. This poses at least three different concerns. First, in some cases new entities may have to confront multiple and often **conflicting regulations** which prevent them from scaling up within the Digital Single Market. Second, in other cases, incumbents may face important regulatory costs, while their unregulated competitors can provide services functionally equivalent to theirs without having to bear the same costs, leveraging an **uneven playing field**. Third, leaving the cost dimension aside, regulatory rules help to safeguard important interests, such as investor protection or financial stability, which may be jeopardised by the presence of unregulated activities growing unchecked.

These views seem to be shared across EU institutions and agencies. The FinTech Action plan recently unveiled by the European Commission, for example, frames the issue in regulatory terms, emphasizing the patchwork of regulations currently applied to FinTech companies (first concern) and promoting a passport-based system of common rules for those market players that decide to operate as European crowdfunding service providers²²⁷. The recent EBA's Roadmap on FinTech, for its part, emphasises the **need to monitor the regulatory perimeter and emerging trends** that may impact institutions' prudential risks, as well as the need to address consumer issues (second and third concerns)²²⁸. Both the Commission and the EBA emphasise the need to identify best practices in the use of sandboxes as the best way to achieve innovation while mitigating FinTech risk²²⁹. The plans, though, do not circumscribe their use to platform-based lending or any particular type of Fintech service.

These and similar challenges are not ones that may be addressed by competition tools, or where competition tools may play a decisive role. The problem lies in the inadequacy and uncertainty of the substantive content of regulatory rules and can only be addressed by means of regulatory policies²³⁰.

That does not mean that issues typically associated with competition tools are irrelevant for banking FinTech services. Being platform-based technologies, their activity is characterised by the kind of challenges generally associated with this type of technology, i.e. the definition of the **relevant market**, as well as **network effects**.

At present, crowdlending platforms not only compete with other platforms, but also with incumbent players, such as banks, which enjoy much larger volumes and name recognition, an opinion shared by different market players. This results in **platform markets that are primarily multi-home and do not have a high intensity of use**, i.e. neither borrowers nor investors use a single platform for purposes of raising or investing money, nor do platforms require a high intensity of use, which may promote the gradual captivity of clients. If such trends were to become more worrisome they would be in specific niche markets, which is why the diversity of crowdlending should be regularly monitored.

Of potential importance for marketplace lending in the medium term could be the current emphasis on **interoperability and standardisation** in current proposals²³¹. The European Commission is currently focusing on promoting interoperability in FinTech services. Present

²²⁷ European Commission (2018b, pp. 5–6). Hereafter, Commission FinTech action plan.

²²⁸ European Banking Authority (2018, pp. 19-23,25-26). Hereafter, EBA's Fintech Roadmap.

²²⁹ European Commission (2018b, pp. 8–9); European Banking Authority (2018, pp. 20–21).

²³⁰ See section 2.2.2.

²³¹ European Commission (2018b, p. 7).

efforts, however, seem more focused in the field of payment services (see below), and it is unclear how far interoperability (or its absence) is a competitive concern in the field of marketplace lending, which is why it is necessary to wait for further developments.

Finally, as the market for marketplace lending becomes a more established feature in financial services, **the use of algorithms can also lead to phenomena of financial exclusion**²³². As of now, **it is unclear how competition policy tools**, rather than regulatory tools, e.g. fair access to credit rules²³³, or consumer protection tools, **may be the more suitable instruments to deal with the issue**.

3.2.3. Payments, transfers and Forex

Payments services are the category of FinTech services that appears more clearly in the authorities' radar, as shown by the recurring presence of payment operators in competition cases. FinTech payment services technologies are **platform-based and data-based** and, as such, exhibit the kinds of challenges to be expected from each of them. Furthermore, due to their **greater frequency of use**, payment services are more prone to intensive, **single-home models** and are a large source of data for behavioural patterns that can be used by the payment services provider to lever its position. Firms with an established position in the market for payment services have a **greater incentive to lock-in customers** and use payment services as the entry point to offer other services, tailored to customer needs. This influences the type of competition challenges that can already be observed, those that may still be incipient, and those that may be expected in the (not-too-distant) future.

The first type of issue, considered from the perspective of user perception and behaviour, is **market definition**. In addition to this, another relevant challenge is the **dynamics of market power**. Being both platform-based and data-based, there are different channels by which an operator can acquire, or enhance, its market power. One is by further **fostering intensive, single-home use patterns**. The other, even more evident channel, is using **customer data to lever the competitor's position**, including the **cross-usage** of datasets to offer other services through **tying and bundling**. This could be the case for large technology companies and large financial companies.

This risk seems to be greater in the case of large tech companies, whose advanced data technology looks suited to entrench their position. In payment services large tech companies face an important competitive pressure from large financial companies, but once they acquire an established position they are likely to exploit it. Recent **experience with other services** seems to display this very behaviour. Google's practices in the distribution of mobile devices, through its Mobile Application Distribution Agreement (MADA) show a tendency to foreclose competition, to favour Android as the OS, which is then used as the port to install Google-made applications (apps) and prevent the installation of other applications that can compete with its own²³⁴. This resulted in proceedings by the European Commission, which ended in the imposition of fines worth EUR 2.4 billion, among other measures, for foreclosing competition in the field of comparison shopping services²³⁵. If a large technology firm, such as Google, which is dominant in the field of OS for mobile

²³² See section 3.1.3.

²³³ See, e.g. the US Equal Credit Opportunity Act (ECOA), 15 U.S.C. §§ 1691 et seq; Fair Credit Reporting Act (FCRA), 15 U.S.C. §§ 1681-1681x; or Title VII of the Civil Rights Act 1964.

²³⁴ Edelman, B. & Geradin, D. (2016).

²³⁵ European Commission Antitrust procedure Article 7 Regulation (EC) 1/2003. Case AT.39740 *Google Search* (Shopping), 27 June 2017.

devices, also becomes dominant in the field of payment services, the pattern seems easy to replicate.

In the case of **large financial companies**, it is unclear whether, and how far, FinTech payment services pose a new challenge, or are simply a new field where companies may try to entrench their position. The clearer and more immediate challenge is **the use by large financial companies of an incumbency position gained offline to engage in exclusionary conduct towards FinTech competitors**²³⁶. This poses an interesting interplay between regulatory and competition rules regarding data access. **The key policies that act as countervailing weight to the need to promote competition are the needs to promote security and to protect customers' right to consent over and control their data.** Since security and data protection issues exceed the boundaries of FinTech services, from a competition or regulatory perspective, the Commission's approach consists of ensuring that the issue is the subject of further study through the creation of an expert group to assess the existence of unjustified regulatory obstacles²³⁷. At present, however, it is concentrating its regulatory efforts on the development of **market solutions for standardised APIs** compliant with PSD2 and the General Data Protection Regulation (GDPR) as a basis for a European open banking eco-system as well as for more coordinated approaches on standards for FinTech²³⁸. Fostering an **open banking ecosystem** has been an initiative undertaken by national regulators, such as the FCA in the UK²³⁹, but it is unclear what implications it would have on an EU-wide scale, especially in terms of regulatory requirements to ensure access. For the moment, **competition policy tools seem to be used to enforce minimum standards**, i.e. the Commission's use of competition tools seems to be the '*stick*' to dissuade from pure exclusionary behaviour, against the '*carrot*' of aiding market standard-setting efforts. It is still unclear, however, how competition tools may work in a context primarily characterised by regulatory solutions.

In the medium term, and as standardised solutions are developed to ensure APIs interoperability, it is important to be aware of the opposite kind of risk, i.e. the use of standardisation as a means to engage in collusive behaviour, one example being the Commission investigation on the EPC (See Box 5).

3.2.4. Digital currencies

Our research shows that the market for digital currencies is characterised by competition between currencies (**inter-cryptocurrency market**) and competition between exchanges (**intra-cryptocurrency market**)²⁴⁰.

The inter-cryptocurrency market is characterised by both **platforms** and **the presence of network effects**,²⁴¹ which **creates entry barriers and enhances market power**²⁴². Further research would be needed to determine whether this is accompanied by collusive behaviour or abuse of dominant positions in order to dissuade merchants, wallets or exchanges from adhering to new currencies.

When choosing to closely monitor specific market developments in order to discover potential competition issues, the **standardisation of DLT** and other technical protocols is a firm candidate. More worrisome may be the use of **cryptocurrencies promoted by banks**, even by central banks, which may reshape the current competition level in the

²³⁶ Khan, M. & Shotter, J. (2017).

²³⁷ European Commission (2018b, p. 11).

²³⁸ European Commission (2018b, p. 8).

²³⁹ See section 2.6.2.

²⁴⁰ See section 2.4.2.

²⁴¹ Østbye, P. (2017).

²⁴² Fung, B. & Halaburda, H. (2016, p. 6).

cryptocurrency market. These types of cryptocurrencies may broaden the number of competitors²⁴³, but could also help leverage the market power of banks in traditional banking services. If banks decide to enter the field of cryptocurrency payments, they may try to block access on interoperability grounds, in a similar way to that observed in the market for payment services. Cryptocurrencies developed by large financial players, however, are still at a relatively early stage, and it is not possible to assess with any degree of certainty the type of competition challenges that they may pose in the medium term.

The implications of the **mining market** for competition are hard to gauge. First, it is a **non-contestable market with few established players**. Second, **it is not a traditional market**, since price is self-scheduled by the cryptocurrency's own algorithm.

The **wallet and payment market** in digital currencies (which can be considered together, given the increasingly blurred boundaries between them) **does not seem to pose current competitive challenges**. Switching costs or technical restrictions could prevent users from moving from one wallet or exchange app to another; however, the high number of providers and low barriers of entry²⁴⁴ mean that such actions would have a relatively low impact in the market. The **exchange market**, for its part, could potentially be more worrisome since it **is subject to a degree of concentration similar to the mining market**. This requires a careful monitoring of developments such as vertical or horizontal integration processes, as well as exclusionary conduct towards other cryptocurrencies or their players.

3.2.5. Wealth and asset management

A study of the field of wealth and asset management services shows that the potentially troublesome issues, from a competition perspective, concern (1) the **fee policies of different service providers**, which seem adamantly high; (2) the **blurring of the boundaries between different types of services** (information, advisory, management); and (3) the **implications of the use of algorithms**²⁴⁵.

In the explanatory matrix, these are issues primarily related to the interaction between data-intensive technologies and the users' perceptions and behaviours. From the normative perspective of the decision tree, however, the main difficulty lies in the initial questions, i.e. whether and to what extent these are '*competition issues*' which '*might not*' (or should not) be addressed via regulatory tools.

The first example, i.e. the high fees charged by advisory services, is closely related to the users' lack of awareness of fee structures and mechanisms and their inability to compare, which is a consequence of the lack of transparency in the field. **Lack of transparency and conflicts of interest** in fee structures, however, is hardly a new issue created by FinTech, or a pure competition issue. It was the subject of some of the more important modifications of the regime applicable to financial intermediaries resulting from MiFID II, which considered the reception of fees or commissions as one of the key elements in determining whether investment advice can be considered '*independent*'²⁴⁶.

The second example, i.e. **the blurring of the lines between information, advisory and management functionalities, poses challenges for the definition of the relevant**

²⁴³ Fiedler, S., Gern, K., Kooths, S., & Stolzenburg, U. (2017).

²⁴⁴ See section 2.4.2.

²⁴⁵ See section 2.5.2.

²⁴⁶ Article 24 (7) – (9) MIFID II; articles 11 – 13 of Commission Delegated Directive 2017/593, of 7 April 2016, supplementing Directive 2014/65/EU, of the European Parliament and of the Council regarding safeguarding of financial instruments and funds belonging to clients, product governance obligations and the rules applicable to the provision or reception of fees, commissions or any monetary or non-monetary benefits.

market. More crucially, though, it poses challenges for regulatory bodies and financial supervisory authorities, which need to carefully consider the **licensing regime** to apply to each provider and the duties resulting from investor protection rules. **Monitoring the perimeter** is a priority for the EBA, which has been encouraged by respondents to its public consultation to *'analyse further whether or not variations at the national level give rise to any level playing field or consumer protection issues'*²⁴⁷. Yet this, again, is hardly a FinTech issue, or even a new issue. **'Shadow banking'**, the term often used to label issues concerning the regulatory perimeter, have been in the Commission's (regulatory) policy agenda for a long time²⁴⁸. Although the post-crisis concern was financial stability²⁴⁹, the user/investor perspective has been very present in rules, such as those for Alternative Investment Funds (AIFs²⁵⁰) and, more recently, Money Market Funds (MMFs)²⁵¹, which try to ensure that investors are aware of the type of service they are contracting and the risks involved in it.

The issue that looks more promising from a competition policy perspective is the impact of algorithms, which, from a descriptive perspective, results from the data-intensive nature of the technology and cuts across user perspectives of **perception and behaviour**, and the **operation of the technology**. The effects of the use of algorithms in the provision of FinTech wealth management services are mixed. On the one hand there are pro-competitive effects such as increased transparency on both price and quality variables as well as a more efficient development of products and services²⁵². On the other hand, there are risks that can arise, such as the potential role of algorithms to be facilitating factors for co-ordination and collusion (algorithmic collusion)²⁵³. These effects were discussed earlier²⁵⁴.

The presence and **impact of such algorithms is still uncertain and needs to be monitored closely**. Albeit algorithms raise genuine competition concerns, it is **unclear the respective roles that competition tools and regulatory tools may have in this field**. The concept of **'market manipulation'**, for example, is long established as one of the pillars of the regime on **market abuse**²⁵⁵, which includes *inter alia* situations where the entities engaged in the manipulation seek to *'secure a dominant position over the supply or demand'* or is likely to have the effect of *'fixing, directly or indirectly, purchase or sale prices'*, or create *'other unfair trading conditions'*²⁵⁶. Market abuse rules, which are mostly applicable in an *ex post* enforcement setting, however, are not the only regulatory rules involved. MiFID II introduced specific rules on algorithmic trading, which try to ensure that firms using it have proper built-in safeguards, and that there are sufficient mechanisms in place to identify orders and mitigate disruption²⁵⁷. Thus, from both *ex ante* prevention and *ex post* enforcement perspectives, it would appear that, despite the conduct's features

²⁴⁷ European Banking Authority (2018, p. 19).

²⁴⁸ See, e.g. European Commission (2012) & European Commission (2013b).

²⁴⁹ See, e.g. European Commission (2012, p. 2).

²⁵⁰ See, e.g. articles 22 et seq. of Directive 2011/61/EU, of June 2011, on Alternative Investment Fund Managers.

²⁵¹ In Regulation 2017/1131 of 14 June 2017, on money market funds, the *'core'* of the rules is the distinction between different types of funds, which present different types of risks (most notably, Constant Net Asset Value (CNAV) funds, which are prone to *'runs'* in a way similar to banks) and the imposition of restrictions on eligible assets and diversification, risk management and other procedures, on funds that wish to be marketed with a certain designation towards investors. Thus, the rules address what was arguably an issue of financial stability with investor protection measures.

²⁵² OECD (2017).

²⁵³ OECD (2017, p. 16).

²⁵⁴ See section 2.5.2.

²⁵⁵ Articles 12, 13, 15, 16 of Regulation 596/2014 of 16 April 2014 on market abuse (Market Abuse Regulation, or MAR).

²⁵⁶ Article 12 (2) (a) MAR.

²⁵⁷ Article 17 MiFID II.

placing it squarely within the field of competition policy, **financial regulation has co-opted** the field. This co-opting may be justified by reasons of the specialty of the market and the expertise of the supervisory institutions, or simply by path-dependency issues, e.g. it is more natural to add market manipulation to the set of rules that regulate insider trading.

These factors lead to conclude that, in the field of wealth and investment management, there are a number of relevant regulatory issues with an impact on competition, that the presence of algorithms raises genuine competition concerns, but that the use of competition tools may still be unwarranted for reasons of sector specificity.

3.2.6. Personal finance management

The field of PFM is closely linked to some of the issues already discussed in the field of payments. FinTech firms wishing to gain access to customer data often provide services of personal financial management, which is why they need access to personal data in the first place. **Denial of access by financial incumbents, such as large banks, poses a clear competition challenge, as well as the use by technology incumbents, such as large technology companies, of their position as PSPs to offer other services.** The former kind of challenge is being currently addressed by way of regulatory initiatives²⁵⁸ while the latter is still a potential, but not imminent, threat.

To the extent that the lines between PFM and wealth management begin to blur the same type of concerns, e.g. the role of algorithms may arise in this case. Furthermore, **the presence of algorithms in this field can also lead to phenomena of financial exclusion**, if data technologies are used in an unfair or discriminatory manner, e.g. by shutting off certain users from certain services, or offering them unfair conditions²⁵⁹. The relatively low penetration and intensity of use of this type of services, however, does not make the exclusion from them a pressing source of concern, although this could change if they become the norm in personal financial management. Furthermore, it is unclear how competition policy tools, rather than, for instance, consumer protection tools, may be the more appropriate instruments to deal with the issue.

3.2.7. Insurance

Even if the type of services offered are different from wealth management, the use of **data-intensive technologies** increases the supply-side similarities which also increases the likelihood that the same type of competition issues may arise. **The insurance sector, however, has been a relatively recent latecomer to the digital age²⁶⁰, which is why the effects of algorithms on collusive, or potentially collusive, strategies may come with a time lag.** Large insurance companies are still slow to adopt new technologies and large technology firms are not interested in entering the field, leaving all competitive pressure to newcomers that still need to build size and reputation.

Given that the position of incumbent insurance firms is strong, the field of InsurTech services could witness the kind of competition challenges observed in fields such as payments, which primarily concern **interoperability and standardisation**. If new, nimbler, companies may provide equivalent services at a lower cost²⁶¹, large insurance firms have a strong incentive to create **artificial barriers to entry**. Thus, **competition authorities should be particularly attentive to agreements on information**

²⁵⁸ See section 3.1.3.

²⁵⁹ Federal Trade Commission (2016a, pp. 9–12).

²⁶⁰ Willis Towers Watson (2017).

²⁶¹ Ralph, O. (2017).

exchange that are limited to established companies, or **agreements to standardise technology**, e.g. blockchain standardisation agreements²⁶². These concerns, however far away, are probable, and a closer monitoring of the sector is needed.

The fact that the impact of data-intensive technologies in the insurance sector is still in an early stage of evolution also renders speculative any exercise to allocate the response to the challenges between regulation and competition tools. It is, however, possible, to anticipate that the two would need to be consistent with each other and advance in a parallel fashion. For example, the question of what uses of blockchain technology in the design of smart insurance contracts would be considered legitimate needs an answer from the perspective of competition (to determine acceptable standardisation techniques), prudential regulation (to assess risks) and consumer protection. At the same time, competition authorities need to be vigilant about the risk that incumbent firms may use FinTech to exploit their already existing data troves and/or to engage in exclusionary conduct.

3.2.8. Enabling technologies and infrastructures

Our analysis leads to conclude that **most markets in FinTech services' enabling technologies and infrastructures**, e.g. DLTs, AI and Data Analytics, as well as cybersecurity, **pose no competition concerns**, with many providers competing in fragmented markets²⁶³.

The only cause for concern is the market of advanced cloud services, which is characterised by high entry costs, due to the need for significant investments and the dominance of a restricted number of big tech companies. Since the portfolio of services offered is quite fluid and largely commoditised, there is no present concern of anticompetitive behaviours. It is important, however, to closely monitor the services offered, to aid in the effort of defining the relevant market, which so far remains the main challenge.

²⁶² Blockchain networks can be divided into '*public blockchains*', where anybody can join the network (the main example is Bitcoin), and '*private blockchains*', with restricted access to known participants. EIOPA (2017).

²⁶³ See section 2.8.2.

4. CONCLUSIONS OF THE ASSESSMENT

KEY FINDINGS

- Technology has an important **potential to disrupt** established markets and unleash pro-competitive forces by lowering barriers of entry. Therefore, the role of anticompetitive factors needs to be weighed against the role of pro-competitive forces before making an assessment.
- Current efforts at the policy level should primarily focus on **research** and a close **monitoring** of market developments. Both descriptive and normative tools are proposed to anticipate, assess and manage competition issues as they occur.
- The response to the challenges may lie in regulatory measures, non-competition measures or follow a hybrid approach depending on several factors such as the type of service and the maturity of the existing market.
- Any financial regulatory reform should take into account competition considerations from the beginning. Both frameworks (regulatory and competition) should work in a more coordinated effort to ensure the healthy evolution of the FinTech ecosystem.

4.1. General overview and analytical tools

The word that best defines the current state of FinTech services is '**change**'. New technologies strongly affect:

- (1) the type of services that can be offered;
- (2) the type of players that can compete to offer them;
- (3) the ways in which those services can be offered.

This makes any attempt of prognosis tentative at best and sends a message of caution to policymakers. Technology has an important potential to disrupt established markets and unleash **pro-competitive forces** by lowering barriers of entry, making it easier for new players to compete—which is, in itself, positive. Therefore, the role of anticompetitive factors needs to be weighed against the role of pro-competitive forces before making an assessment.

Current efforts at the policy level should primarily focus on **research** and a **close monitoring** of market developments. This seems to be the approach of the European Commission, or the EBA, whose FinTech action plans are characterised by efforts to understand, explore, monitor or broker private sector solutions instead of proposals to regulate or intervene.

The study uses both descriptive (explanatory matrix) and normative (competition policy decision tree) analysis to assess real or potential competition risks²⁶⁴. The current message of **caution** is not an obstacle for having **adequate tools** in place to gauge the impact of market developments in competition as they occur.

4.2. The role of regulation

If the current state of the markets for FinTech services is generally too fluid to reach firm conclusions on the existence of competition challenges, the **special role of regulation** in

²⁶⁴ See sections 3.1 and 3.2.

the field of **financial services** sends a message of caution about the appropriateness of competition policy tools as the preferred means to address those challenges.

Financial regulation is one of the primary **entry barriers** for these services, but it is also the primary source of **legal certainty**. All market operators, regardless of whether they demand more or less regulation, tend to ask for **a more stable legal framework** for FinTech services, which they see as one of the major competitive challenges. While being a competition issue, it cannot be addressed by means of competition tools.

The conclusion that the initial response to these challenges may lie in regulatory measures, rather than competition measures, is shared for a number of different services, such as banking/lending, wealth and asset management and insurance. Others, such as services related to digital currencies, or PFM, are still in an even earlier stage where the need for regulation is being assessed.

In some cases, the conclusions may be mixed. This is the case for the use of algorithms in wealth and asset management. The use of algorithms can give rise to genuine competition challenges, such as collusive behaviour (primarily) and abuse of dominant position (potentially). In cases where trading and investment is a regulated activity, as it is in financial markets, even competition concerns tend to be captured by financial regulation, through the rules on market abuse, for example.

4.3. The role of competition policy

If some services offer examples of pure regulatory problems, or problems that despite their characterisation as competition problems, can be addressed through regulatory, or non-competition measures, other cases show that the opposite may be also true, i.e. that a **regulatory problem**, addressed by regulatory provisions, **may nonetheless be aided through** the use of **competition policy tools**. This is the case of payment services, which is also the field where the actions of market incumbents are subject to more scrutiny.

The lowering of barriers of entry by facilitating access to data has been a policy decision implemented through regulation, such as **PSD2**, which is better suited than competition tools to stipulate the means by and conditions on which such access may be granted. The recent activity of competition authorities against large financial institutions for behaviours suggesting a denial of access to such data, however, suggests that competition tools may be deployed as a deterrent for firms that use customer consent, or the interoperability of technologies, to block competitors' access.

This type of **hybridity** of the tools used to address a competition problem should not be a surprise in a field like payment services. Thanks to the presence of platform dynamics, payment services offer the clearer field for the crystallisation of some of the competition concerns that have been identified by the proposed explanatory tools. Authorities need to be particularly alert to market developments, which may suggest that large technology companies or large financial companies, could be using payment services to lock-in customers and tie and bundle other services, while refusing access to other competitors.

The current level of competition in the FinTech ecosystem does not suggest the need for any urgent change regarding the competition policy tools. Yet, since FinTech competition challenges are explained by the features of the technology used to deliver them, i.e. platforms and data-intensive technologies, a broader perspective on those technologies could justify such changes on a larger scale not only focused on FinTech services. For instance, in a report on the challenges of digital markets, the German Commission on Monopolies²⁶⁵ proposed changes to competition legal tools. These proposals included a

²⁶⁵ Monopolkommission (2015, p. 131).

modification of the thresholds for notifications in merger control procedures to take into account the large purchase prices agreed by tech companies in acquisitions of competitors, which may predict future incumbency gains. The study also proposes a reform of procedural rules to avoid the use of commitment procedures, i.e. when the subjects of the investigation commit to undertake certain actions to meet the concerns of competition authorities, to give closure to cases whose assessment may vary due to changes in market circumstances. The need for such profound changes may seem more justified if the focus is placed on services such as search engines or social networks, where there is a stable market with large incumbents and less contestability, rather than on FinTech services, where the market is more fluid.

4.4. Competition considerations in regulatory policy reform

The above analysis strikes a balance between the opportunity of using existing, or modified, competition tools to address FinTech competition challenges and the need to let the industry evolve. The state of the industry does not justify, on its own, a large-scale deployment or reform of competition tools. Competition authorities should be vigilant in case the market develops some of the potential competition threats described in this study, and they should be ready to use competition tools, even in aid of goals already enshrined in regulatory rules.

The above also leads to one final conclusion: the FinTech ecosystem shows the need for a **more symbiotic relation between regulatory and competition frameworks**, which is presently insufficient. In FinTech payments, banking, wealth and asset management or financial advice goals such as financial stability and confidence, consumer protection, or data protection need to work seamlessly with the protection of competition. It is unclear how the current framework ensures the levels of coordination that would be necessary to minimise friction. The Commission's FinTech Action plan is generally vague about how competition considerations will be incorporated in the reform process, with only one explicit reference to the need to ensure that standardisation for interoperability purposes has a pro-competitive effect²⁶⁶. The EBA's FinTech Roadmap is no more explicit, and only refers to the need to promote '*equal competition*' and its relationship with technological neutrality²⁶⁷.

It would be desirable that the plans for future regulatory developments could provide a clearer vision of how competition considerations will be incorporated into the process, and whether the voice of competition authorities will somehow be present. If both frameworks are to work seamlessly, coordination needs to be present from their inception. Consistency should be sought in the solutions envisaged for, say, access to data, or transparency towards customers. If both regulatory and competition frameworks were reformed to reflect the need of a more flexible approach, where situations can be more quickly reassessed considering market developments, such reforms should be consistent with each other.

In this respect, FinTech could be used as an example of the greater need to incorporate a competition approach into financial regulation. This was present in a first stage of EU harmonisation, prompted by the need to achieve the single market, but, as the financial crisis hit and financial stability took centre stage, competition considerations became less present. FinTech offers a fertile ground to **re-open the dialogue between regulatory and competition goals**, principles and frameworks, which could help re-balance financial regulation policies towards a more pro-competitive stance.

²⁶⁶ European Commission (2018b, p. 7).

²⁶⁷ European Banking Authority (2018, p. 11).

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ANNEX I. DESCRIPTION OF FINTECH SERVICES

Banking

The term '*Banking*' refers to the retail activities traditionally carried out by financial firms, including saving and financing services. It can be divided into two sub-categories:

- **Deposits.** It comprises the services that allow retail customers to place their money and savings into financial institutions for safekeeping. The customer usually obtains an interest rate and can withdraw the money almost without restrictions.

Lending and equity. It includes financing services for both individuals and enterprises (mostly SMEs). The lender can be compensated via interest rates or obtaining shares from the borrower. It comprises the so-called '*Alternative Financing*' services²⁶⁸ described in Table 4.

Table 4: Alternative Finance Models (Glossary)

Service	Description
P2P Consumer Lending	Individuals or institutional funders provide a loan to a consumer borrower.
P2P Business Lending	Individuals or institutional funders provide a loan to a business borrower.
Invoice Trading	Individuals or institutional funders purchase invoices or receivable notes from a business at a discount.
Equity-based Crowdfunding	Individuals or institutional funders purchase equity issued by a company.
Reward-based Crowdfunding	Backers provide finance to individuals, projects or companies in exchange for non-monetary rewards or products.
Real Estate Crowdfunding	Individuals or institutional funders provide equity or subordinated-debt financing for real estate.
P2P Property Lending	Individuals or institutional funders provide a loan secured against a property to a consumer or business borrower.
Balance Sheet Business Lending	The platform owner provides a loan directly to a business borrower.
Donation-based Crowdfunding	Donors provide funding to individuals, projects or companies based on philanthropic or civic motivations with no expectation of monetary or material return.

²⁶⁸ Ziegler, T. et al (2018).

Service	Description
Debt-based Securities	Individuals or institutional funders purchase debt-based securities, typically a bond or debenture at a fixed interest rate.
Balance Sheet Consumer Lending	The platform entity provides a loan directly to a consumer borrower.
Mini-Bonds	Individuals or institutions purchase securities from companies in the form of unsecured retail bonds.
Profit Sharing	Individuals or institutions purchase securities from a company, such as shares or bonds, and share the profits or royalties of the business.
Balance Sheet Property Lending	The platform owner provides a loan secured against a property directly to a consumer or business borrower.

Source: Ziegler, T. et al (2018, p. 28).

Payments, Transfers and Forex

This category includes payment and money transfers solutions as well as the closely related foreign currency exchange systems.

Table 5: Payments, Transfers and Forex services (Glossary)

Service	Description
Mobile wallets	Consumers make payments via their mobile devices.
P2P mobile payments	Consumers can transfer money to other users via mobile devices.
Foreign exchange and remittances	Individuals or companies can make payments in foreign currencies and it allows real-time forex trading.
Real-time payments	It allows individuals and institutions to send and receive payments instantaneously.

Source: BNY Mellon (2015, pp. 6–7).

Digital currencies

Digital currencies, also known as 'virtual currencies' or 'cryptocurrencies' can be defined as 'a digital representation of value, not issued by a central bank, credit institution or e-money institution, which in some circumstances can be used as an alternative to money'²⁶⁹. Their value is determined by the law of supply and demand, relying on potential exchanges for other goods or sovereign currencies, and it is not backed by any monetary authority²⁷⁰ (decentralised character). The supply (creation of new units) is often managed by computer algorithms, which help to create scarcity to maintain value²⁷¹. The common feature of the various digital currencies is the use of **DLTs** to manage value exchanges²⁷². Digital currencies management encompasses services such as cryptocurrency payments, cryptocurrency wallets, exchange and trading solutions for cryptocurrencies (cryptocurrency brokerage) and mining:

Table 6: Digital currencies services (Glossary)

Service	Description
Cryptocurrency wallets	Customers can store cryptocurrency units.
Cryptocurrency payments	Customers can pay using cryptocurrency units.
Cryptocurrency exchange	Customers purchase, sale or trade cryptocurrency.
Mining	Verifying transactions and securing the public ledger (blockchain).

Source: Hileman, G. & Rauchs, M. (2017, p. 21).

²⁶⁹ European Central Bank (2015, p. 4).

²⁷⁰ Bank for International Settlements (2015).

²⁷¹ Bank for International Settlements (2015, p. 5).

²⁷² Hileman, G. & Rauchs, M. (2017).

Wealth and Asset management

Wealth and asset management involves those services aimed at helping customers to **optimise** the return on their assets. They usually combine financial and investment **advice**, as well as other services such as tax advice or retirement planning. FinTech services on this field are focused on providing automated advisory (robo-advisors) and automated trading.

Table 7: Wealth and Asset management (Glossary)

Service	Description
Comparison websites	Comparison websites of prices and features of investment products before investing.
Financial aggregator platforms	Provide an overview and, therefore, better control over their overall investments by consolidating different investing accounts across multiple financial institutions. They can mine data and provide investment advice.
Robo-advisors and Quant-advisors	Robo-advisors provide access to modern portfolio theory-based investing at lower costs and in smaller sizes than traditional banks. Robo-advisors are mainly based on passive investing in ETF (Exchange-traded fund) indexed funds, and increasingly in goals-based investing. Quant-advisor relies on more active investment strategies in discrete assets to get an absolute return disregarding market fluctuation.
Social trading and investing platforms and other innovative business models	These business models typically place some reliance on the theory of the ' <i>wisdom of the crowds</i> ', a social approach to investing where followers follow a leader of their choice. The term ' <i>social, mirror, and copy trading and investing</i> ' describes this type of services. Other innovative services are related to social media sentiment, crowdsourced research and social networking platforms, or rounding-up credit card purchases to be applied to a robo-advisors.
Algorithmic trading	Trading in financial instruments where a computer algorithm automatically determines individual parameters of orders, with limited or no human intervention.

Source: IOSCO except algorithmic trading (MiFID II).

Personal finance

This category encompasses advisory services and products for self-managing or better understanding individuals or small companies' own finances. They do not usually entail fund management.

Table 8: Personal finance services (Glossary)

Service	Description
Budgeting	Users can control their financial standing by consolidating information from their different financial products (bank accounts, credit cards, loans, mortgages, etc.).
Financial services comparison platforms	Users can compare the conditions of diverse financial services provided by different firms.

Source: IOSCO (2017).

InsurTech

InsurTech is the term used to refer to the application of technological innovations to the provision of insurance services. The following table summarises the most common InsurTech services.

Table 9: InsurTech services (Glossary)

Service	Description
Insurance products comparison platforms	Users can compare the conditions of diverse financial products provided by different firms.
P2P insurance	<i>'Risk-sharing network where a group of associated or like-minded individuals pool their premiums together to insure against a risk'</i> ²⁷³ . It allows pool members to obtain more adjusted premiums. If unused premium funds exist after the end of the coverage period, those are reimbursed to the members by the P2P insurer. If claim pay-outs exceed the premium funds during a coverage period, a reinsurer usually covers the difference.
Usage-based insurance	Type of vehicle insurance where the premium depends on the distance and the driving style of the policyholder.
On-demand insurance	Customers can easily take out insurance for individual items through mobile applications or digital platforms. Currently this service is focused on insuring electronic devices.

²⁷³ Investopedia (2016).

Service	Description
Robo-advisors	Customers can receive personalised offers for insurance services from automated advisors based on algorithms and the customer’s own data.

Source: McKinsey & Company (2017).

Enabling technologies and infrastructures

This category includes the technologies and infrastructures that enable the provision of FinTech and InsurTech services.

Table 10: Enabling technologies and infrastructures (Glossary)

Service	Description
Distributed Ledger Technologies (DLTs)	<p>A distributed ledger is essentially a database that keeps the accounting of a specific asset²⁷⁴ and incorporates the mechanisms that allow:</p> <ul style="list-style-type: none"> • Sharing among multiple sites, being updated almost in real-time (seconds or, in worst case, a few minutes) so all tenants keep identical copies. • Cryptographic support to enforce security of the information. • Updates of specific management rules as agreed by network owners or participants. <p>Some DLs implement a specific data structure called <i>'blockchain'</i> to record and synchronise data across the distributed system: each modification is validated by the network, registered in an information block and then linked to the history of the asset as a <i>'string of records'</i> or <i>'chain of blocks'</i>.</p> <p>DLT and blockchain allow for the implementation of accounting systems for transactions without the need for a trusted authority.</p>
Artificial Intelligence (AI) & Data Analytics	<p>AI and Data Analytics provide FinTech companies with advanced processing capabilities and smart assistants that mimic the activity of the human operator.</p> <p>From previous paradigms, normally based on rules that tried to capture human knowledge, modern AI is based on the analysis of large amounts of data. This analysis can find trends, correlations, clustering and other forms of classification. These are the bases for performing smart</p>

²⁷⁴ European Central Bank (2016); UK Government Office for Science (2016); World Bank (2017).

Service	Description
	<p>inferences on situations that, up to this moment, could only be handled by humans.</p> <p>The reliability and availability of AI has boosted several applications as personal assistants, recommenders' systems, smart digesting of information and smart trading among many others.</p>
Cybersecurity	<p>Cybersecurity encompasses all technologies that help to protect computer systems, telecommunications and applications on them. It must support:</p> <ul style="list-style-type: none"> • Confidentiality of data and operations. This includes data privacy. • Integrity: all operations are carried out as designed from beginning to end. • Authentication: ensuring that all parties in a transaction are who they claim to be. • Non-repudiation: each actor in any performed act cannot deny their authorship. For instance, the signatory of a document cannot claim that she/he has not done the signature. • Availability: systems and communications are available as expected or agreed. <p>Public authorities endorse the legal validity of digital operations carried out under specific technical conditions. Both, the availability of reliable IT security measures and the legal validity of digital acts, are key enablers for FinTech.</p>
Advanced Services from Cloud Infrastructures	<p>Cloud computing relies on the availability of a quality network connection to provide computing and storage services. Over time the value proposition of cloud providers has evolved from a '<i>bare metal</i>' provision to the availability of complex services. This includes access to advanced algorithms for AI and huge data processing capabilities.</p> <p>The availability of these services under a '<i>pay per use</i>' model is a key enabler for FinTech companies as it allows a start-up to access computing resources that a few years ago were only available to large corporations.</p>

Source: Iclaves (2018).

ANNEX II. METHODOLOGY

The analysis was performed using the open source statistic program *R* and the *R-studio environment*²⁷⁵. We have used several R packages to perform the analysis²⁷⁶.

Analysis of the size and characteristics of the FinTech market

From the demand and market size point of view, data regarding the European market is quite limited. This report gathers the most updated data available at the moment of elaboration (May 2018). Data came from secondary sources, mainly from consultancy and industry reports, such as *Capgemini*, *EY*, *PwC* or *Deloitte* or international organizations such as the World Bank. Consultancy reports tended to focus on specific aspects of the FinTech market, such as the characterisation of the user (age, level of digital skills, etc.) or its preferences for usage of services and disposition to shift to new service providers, and did not have a recurrent character. The last available report on each topic has been used. Data from the World Bank was extracted on May 2018.

Analysis of the structure of FinTech service providers

The quantitative analysis is based on the *Crunchbase* data base²⁷⁷, considered one of the most valuable startup information platforms, which provides information to help others discover industry trends, acquisitions, investments and news about global companies in all sectors²⁷⁸ by using a '*unique and scalable approach to data collection leveraging a strong community of contributors, the largest venture partner network, and in-house data teams armed with powerful machine learning*'²⁷⁹. This information not only allows for the collection of data regarding European FinTech industry, but also allows for comparison with other selected countries.

The data was downloaded on **11th of January 2018**. On that date, the *Crunchbase* database, whose information can be analysed by categories, provided a total of 4 359 companies worldwide that are labelled as FinTech companies. For the study, the FinTech category is the only one selected. Companies whose operating status is indicated as closed are not included. Since companies are usually classified in more than one category, all firms were reclassified by hand to improve the accuracy of the analysis by assigning one single precise category according to the services described in section 1.2. After a careful assessment of these companies²⁸⁰, up to 507 companies, although defined as FinTech, did not clearly engage in activities that were related to the use (or development) of innovative technologies that provided financial services. As a result, these companies that were not considered to be FinTech were excluded. Therefore, the total number of FinTech companies included in the dataset was 3 852 from 93 countries.

²⁷⁵ R is a free software environment for statistical computing and graphics. R Core Team (2016); Studio (2012). The software can be download at <https://www.rstudio.com/>.

²⁷⁶ C. Butts (2008); C. T. Butts (2016); Csardi & Nepusz (2006); Dormann, Fründ, Blüthgen, & Gruber (2009); Lahti, Huovari, Kainu, & Biecek (2017); Pedersen (2017); Slowikowski (2017); Urbanek (2014); Wickham (2009, 2011, 2016, 2017a, 2017b); Wickham & Hadley (2007); Winston Chang (2014). We want to thank all the authors for providing this amazing code to make quantitative analysis feasible.

²⁷⁷ Crunchbase (2018b).

²⁷⁸ Ingham (2014).

²⁷⁹ Crunchbase (2018a).

²⁸⁰ The assessment has been based on the description of the companies in the *Crunchbase* database, where the companies explain their activity. If, despite this analysis, there were still doubts about the different services provided by a concrete company, its website was also revised. If its activities do not match any of the FinTech categories defined, the company was discarded.

Table 11: Number of FinTech companies by country

Country	Number	Country	Number
United States	1 491	Portugal	7
United Kingdom	454	Egypt	6
India	158	Kenya	6
Canada	129	Romania	6
Spain	100	Cayman Islands	5
Australia	95	Norway	5
Germany	90	Uruguay	5
Singapore	81	Malta	4
China	74	Uganda	4
France	64	Bangladesh	3
Israel	57	Hungary	3
Switzerland	55	Mauritius	3
Ireland	52	Morocco	3
The Netherlands	51	Tunisia	3
Hong Kong	45	Bermuda	2
South Africa	41	Bulgaria	2
Brazil	37	Europe	2
Sweden	33	Greece	2
Russia	28	Kuwait	2
Turkey	23	Pakistan	2
Mexico	22	Senegal	2

Country	Number
Denmark	20
Japan	18
Belgium	17
Poland	17
Finland	16
Indonesia	15
Italy	14
Ukraine	14
Nigeria	13
South Korea	13
Malaysia	12
Philippines	12
Argentina	11
Czech Republic	11
Luxembourg	11
New Zealand	11
Cyprus	10
Chile	10
United Arab Emirates	10
Estonia	9
Latvia	9
Thailand	9

Country	Number
Slovenia	2
Taiwan	2
Albania	1
Armenia	1
Bahrain	1
Barbados	1
Belarus	1
Botswana	1
Cambodia	1
Cameroon	1
Costa Rica	1
Ecuador	1
Georgia	1
Ghana	1
Isle of Man	1
Jordan	1
Kyrgyzstan	1
Lebanon	1
Panama	1
Peru	1
Qatar	1
Rwanda	1

Country	Number
Austria	8
Colombia	8
Vietnam	8
Lithuania	7
TOTAL	

Country	Number
Seychelles	1
Slovakia	1
Zambia	1
Unknown	255
	3 852

Source: Compiled by the authors based on *Crunchbase* (2018b).

The following different analyses have been made:

- Numbers of companies by country/region

The analysis was based on the countries where the headquarters are located. Data of 3 852 FinTech companies were collected from the query in *Crunchbase*.

To provide a detailed overview of the FinTech industry in the EU compared to other countries, the study focused on those countries which have the largest number of FinTech companies in the world. The number of companies in the regions or countries included in the benchmarking (Australia, Canada, EU28, China, India, Singapore and the US) was 3 048 out of a total of 3 852 FinTech organisations. These companies should be considered a significant sample of the total number of FinTech related companies, and not the actual number of companies.

- Size of the companies by number of employees by country/region

The analysis was made for the **EU** and 6 other countries with a high number of FinTech companies, namely the **US, India, Canada, Australia, Singapore** and **China**. To know the size of the companies, the variable used was the **number of employees**, whose information was classified in 6 categories ranging from '1-10' to 'more than 500'.

- Years of companies

The analysis was made for the same six countries and the EU. In this case, it was focused on the years since the constitution of the company. The **company's founding date** is the original variable which refers to the date the organisation was founded.

- Type of services

The services provided by the companies were classified into: **Banking, Payments, Transfers & Forex, Digital Currencies, Wealth & Asset Management, Personal Financial Management, Insurance** and **Enabling technologies and infrastructures**. Category '**Other**' includes those FinTech companies from *Crunchbase* database that do not fit well into the remaining categories.

The companies were manually classified based on the description of the companies and the default *Crunchbase* dataset categories. This task lead, as indicated above, to the exclusion of more than 500 companies from the dataset that should not be considered as FinTech.

- Funding mechanism of FinTech companies

The analysis was made for the same six countries and the EU. *Crunchbase* makes available **information of funding rounds** of companies, including data about the company, the funding stage and the money raised since 1998. For this study, information on the funding rounds of about 4 090 of FinTech companies in the selected countries and regions were found in the database.

This dataset was used to analyse the number and type of funding rounds, the money raised per company and its yearly evolution and the level of investments in the sector by type of service and region/country.

We focused on the proportion of funding rounds out of the total funding rounds in countries and regions and by the type of funding (related to the stage of the funding round). *Crunchbase* provided a detailed description of the different types of funding²⁸¹. For the analysis, the types of funding provided by *Crunchbase* were aggregated into eight categories, as shown in Table 12.

Table 12: Types of funding used in the analysis and relation to the types of funding provided by *Crunchbase*

Funding Type used in the analysis	<i>Crunchbase</i> Funding Type
Seed	Angel
	Seed
Crowdfunding	Equity Crowdfunding
	Product Crowdfunding
Early Stage Venture	Convertible Note
	Series A-B
Late Stage Venture	Series C-G
Private Equity	Private Equity
Post-IPO	Post-IPO Debt
	Post-IPO Equity
Series unknown	Funding Round
	Venture - Series Unknown
Other	Corporate Round

²⁸¹ Crunchbase (2018c)

Funding Type used in the analysis	<i>Crunchbase</i> Funding Type
	Debt Financing
	Grant
	Initial Coin Offering
	Non-equity Assistance
	Secondary Market

Regarding the figures, it should be noted that some of the amounts are provided in other currencies. Those figures have been converted to USD. To minimise conversion rate errors, we have selected USD because most of the figures are provided in that currency. The conversion to USD was done using the conversion rate of January 2018 regardless of the year of the operation.

Table 13: Number of funding rounds by year and country/region

	Australia	Canada	China	EU	India	Singapore	US
1998	0	0	0	0	0	0	2
1999	0	0	0	0	0	0	6
2000	1	0	1	0	1	0	15
2001	0	0	1	2	0	1	10
2002	0	0	0	0	0	1	5
2003	2	0	2	1	0	0	5
2004	2	0	1	2	1	0	11
2005	3	0	2	4	1	0	14
2006	3	1	3	8	3	0	22
2007	4	2	2	13	3	0	38
2008	4	2	3	15	2	0	37

	Australia	Canada	China	EU	India	Singapore	US
2009	1	1	2	18	2	1	52
2010	0	3	1	18	3	0	76
2011	2	6	6	32	6	1	120
2012	2	9	6	73	5	5	161
2013	9	5	12	93	7	7	243
2014	17	19	31	175	15	13	373
2015	18	23	33	226	36	20	380
2016	21	23	28	234	43	28	398
2017	21	23	22	245	41	20	298
2018	0	1	0	3	4	0	8
TOTAL	110	118	156	1162	173	97	2274

Source: Compiled by the authors based on *Crunchbase* (2018b).

- Acquisitions of FinTech companies

The analysis was made for the same six countries and the EU. *Crunchbase* provided detailed information on acquisitions, including data about the acquired and the acquiring company (category, country, etc.) and the date of acquisition since 1997. The total number of acquisitions of FinTech companies among the selected countries in the dataset was 214 from 18 countries after all the filters were applied. An additional analysis was made depending on the sector of the acquiring company. Three sectors were selected: Financial sector, Technology sector and FinTech sector (companies that are in both sectors).

Different analyses were made. The first analysis was to compare the percentage of acquiring companies and the percentage of companies that had an initial public offering (IPO) between the different countries and the EU. Second was to check whether there was geographical endogamy in the acquisitions. Third was the assessment of the relationship between the sector of the acquiring company (financial, FinTech and technology) and the type of service provided by the FinTech acquired company. The results are presented in network graphs to facilitate the interpretation of the findings.

Table 14: Acquisitions by country/region of the acquired company and the acquiring company

Country/region of Acquiring Company	Country/region of Acquired Company	n
Asia	China	1
Asia	EU28	3
Asia	India	1
Asia	US	2
Australia	Australia	2
Australia	Singapore	1
Australia	US	1
Canada	Canada	2
Canada	US	2
Europe	Canada	1
Europe	EU28	37
Europe	US	10
Other	EU28	3
Other	US	2
US	Canada	2
US	China	1
US	EU28	19
US	India	2
US	US	122
TOTAL		214

Source: Compiled by the authors based on *Crunchbase* (2018b).

Analysis of the global financial inclusion

The quantitative analysis also focuses on the **access of individuals and businesses to financial products and services**. In this case, information from the World Bank, one of the most relevant and largest data sources in the world, were used. In particular, the *Global Financial Inclusion Database*²⁸², available both in microdata and in the *DataBank* online tool, which provides over 800-country level indicators of financial inclusion for people over 15 years old by demographic characteristics such as age, gender, income, education and rural residence. These variables refer to how people save, borrow and make payments, as well as how many people have an account or use financial services such as credit and debit cards.

Downloaded data only included aggregated information from two waves -2014 and 2017-. To compare European financial inclusion to other markets, our dataset includes data from both European Union (EU28) countries and the same countries selected for the previous *Crunchbase* analysis, i.e. Australia, Canada, China, India, Singapore and the US. *DataBank* provided global averages of variables. In that way, we were also able to elaborate EU averages of all indicators for worldwide comparison. Time series were not always available in the data set; as a result, some indicators are only available for one wave of the survey, while others are available for both years.

Among all financial inclusion indicators, the analysis focused on the percentage of individuals who have an account at a bank or financial institution and the percentage of those who have a credit or debit card. We also selected variables that measured habits such as borrowing money in the last year, borrowing money from a financial institution or a private informal lender and using a credit card in the past year. We analysed how many people make transactions using a mobile phone and the penetration of ATMs and Commercial bank branches per 100 000 adults in each region or country.

ANNEX III. LIST OF EXPERTS INTERVIEWED

The following experts were interviewed during the defining process of the study's content. We want to thank them for their valuable ideas and contributions:

- Ge Drossaert and Nadia Benaissa, Chief Commercial Officer and Chief Marketing Officer, respectively, at Fidor Bank, Dubai, United Arab Emirates
- Philippe Gellis, CEO at Kantox, London, UK
- Álvaro Martín, Head of Digital Regulation at BBVA Research, Madrid, Spain
- Francisco Uría, Partner at KPMG, Responsible of Financial Sector for EMEA, Madrid, Spain
- Pascal Ouvrard, International Development Director at Lendix, Paris, France
- Noemie Papp, Head of Digital & Retail at the European Banking Federation, Brussels, Belgium
- Jesús Pérez, President of the Spanish Fintech and Insurtech Association, Madrid, Spain

²⁸² World Bank (2018).

The increasing number of FinTech services provided by newcomer start-ups, traditional financial institutions and big tech companies can bring new competition challenges to the playing field. Some factors can result in anticompetitive behaviours, namely the network effects derived from the use of online platforms, the access to customer data, standardisation, interoperability and the use of algorithms. Combined with a service-by-service analysis, the study provides both, descriptive analysis and normative tools to anticipate and manage anticompetitive behaviours as they occur. This document was provided by Policy Department A at the request of the ECON Committee.

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