Mariana Lima de Andrade

Evolution and adoption of FinTechs in the Portuguese Banking System

Dissertation to obtain a Master's Degree in Law, in the specialty of Law and Financial Markets

Supervisor: Dr. Miguel de Azevedo Moura, Professor of the NOVA School of Law

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Lisbon, 13 of September of 2023

Mariana Lima de Andrade

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This dissertation is in accordance with American Psychological Association (APA) 7th edition, taking into consideration, that the language chosen was English and most of the literature was in the same language. In line with APA 7^{th} edition, the quotation rule for academic rules is the name of the author followed by the year. All references are fully present in the bibliography.

I hereby declare that the body of the dissertation, including the spaces and notes, occupies a total of 120.827 characters.

Acronyms and abbreviations

FinTech – Financial Technology

AMEX - American Express

ATM - Automatic Teller Machine

NASDAQ - National Association of Securities Dealers Automated Quotations

SWIFT - Society for Worldwide Interbank Financial Telecommunications

NFC – Near Field Communication

EY - Ernst & Young

FSTC - Financial Services Technology Consortium

FSB - Financial Stability Board

Crypto - Cryptocurrency

InsurTech – Insurance Technology

ESG – Environmental, Social, and Governance

RegTech – Regulatory Technology

SIBS - *Sociedade Interbancária De Serviços, SA*

GDP – Gross Domestic Product

SME - Small and Medium-sized Enterprises

BdP - Bank of Portugal

APB – Portuguese Banking Association

EU – European Union

BIS - Bank for International Settlements

IOSCO - International Organization of Securities Commissions

IASB - International Accounting Standards Board

G20 - Group of Twenty

FSF - Financial Stability Forum

BCBS - Basel Committee on Banking Supervision

RWA – Risk-Weighted Assets

CMVM - Portuguese Securities Market Commission

IASC - International Accounting Standards Committee

ESFS - European System of Financial Supervision

ESRB - European Systemic Risk Board

EBA - European Banking Authority

ESMA - European Securities and Markets Authority

EIOPA - European Insurance and Occupational Pensions Authority

ESA - European Supervisory Authorities

ECB – European Central Bank

ASF - Insurance and Pension Funds Supervisory Authority

SSM - Single Supervisory Mechanism

BES – Banco Espírito-Santo

BANIF – Banco Internacional do Funchal

BPN - Banco Português de Negócios

BPP - Banco Privado Português

AML - Anti-Money Laundering

CFT - Countering the Financing of Terrorism

MIFID - Markets in Financial Instruments Directive

MIFIR - Markets in Financial Instruments Regulation

PSD - Payment Services Directive

EC - European Commission

SEPA - Single Euro Payments Area

EUR – Euro

PGFCIFC - Portuguese General Framework for Credit Institutions and Financial Companies

GDPR - General Data Protection Regulation

INE – Instituto Nacional de Estatística

DGES – Portuguese General Directorate of Higher Education

IBM - International Business Machines Corporation

SPSS - Statistical Package for the Social Sciences

ρ - Rho

IT – Information Technology

TFZ - Technological Free Zones

EFIF - European Forum for Innovation Facilitators

PSR - Payment Services Regulation

IBAN - International Bank Account Number

E-Money - Electronic Money

PSEMLF - Payment Services and E-Money Legal Framework

CGD - Caixa Geral de Depósitos

BPI - Banco Português de Investimento

Abstract

Financial markets have changed dramatically with the emergence of new technologies, and, without exception, the banking system has also changed. Throughout this thesis, it was analyzed the relationship between several variables with the decision of an individual to become a FinTech client, as well as the regulations on the banking sector and on FinTechs which primarily engage in the payment sector. FinTechs are firms which combine finance and technology in their products and services. The objective of this thesis is to better understand the entrance and adoption of FinTechs in the Portuguese banking sector and the respective regulation (evolution, limitation, and expectations).

The Portuguese regulatory landscape concerning financial markets is multi-layered: national, European, and international layers. Following the global financial crisis of 2008, there was a shift in regulation as new and stricter regulatory frameworks emerged. However, the sector continues to be underregulated due to the difficulty of regulatory authorities to keep up the very quick pace of the evolution on the sector. This phenomenon is called regulatory disconnection. To overcome this problem, regulators are trying to have more flexibility regulations and promote innovative solutions, such as regulatory sandboxes and innovation hubs. Lastly, on the payment sector, the new EU legislation package (PSD III and PSR) are seen positively to mitigate some problems in the sector.

Based on a sample of 225 valid answers, statistical tests were conducted. A preliminary statistical test (Cronbach's Alpha) was performed to determine if all variables were internally consistent, this allowed to tune the model. With the model refined, a Pearson Coefficient of Correlation and Chi-square independency tests were performed to explore the relationships between variables, both tests supported the same findings. Age (negatively), experience in financial institutions (positively), Ease of use (positively), services offered (positively), and government support (positively) were found to be statistically significantly correlated with an individual becoming a FinTech client.

Keywords: FinTech, Banking sector, Innovation, Regulation, Payment sector, Technology, Portugal.

Resumo

Os mercados financeiros mudaram dramaticamente com o aparecimento de novas tecnologias e, sem exceção, o sistema bancário também mudou. Ao longo desta tese, foi analisada a relação entre diversas variáveis e a decisão de um indivíduo tornar-se cliente *FinTech*, bem como a regulamentação do setor bancário e das *FinTechs* que atuam principalmente no setor de pagamentos. *FinTechs* são empresas que combinam finanças e tecnologia nos seus produtos e serviços. O objetivo desta tese é compreender melhor a entrada e adoção das *FinTechs* no setor bancário português e a respetiva regulação (evolução, limitações e expectativas).

O enquadramento regulatório português relativo aos mercados financeiros é realizado a diferentes níveis: nível nacional, europeu e internacional. Após a crise financeira de 2008, houve uma mudança na regulamentação com novos e mais rigorosos quadros regulamentares. No entanto, o sector continua insuficientemente regulado devido à dificuldade das autoridades reguladoras em acompanhar o ritmo muito rápido da evolução do sector. Este fenómeno é chamado de desconexão regulatória. Para superar este problema, os reguladores estão a tentar promover regulações mais flexíveis e promover soluções inovadoras, tais como *regulatory sandboxes* e *inovation hubs*. Por último, no setor de pagamentos, o novo pacote legislativo da União Europeia (*PSD III* e *PSR*) é visto de forma positiva para mitigar alguns problemas no setor.

Com base em uma amostra de 225 respostas válidas, foram realizados testes estatísticos. Foi realizado um teste estatístico preliminar (Alfa de Cronbach) para determinar se todas as variáveis eram internamente consistentes, o que permitiu ajustar o modelo. Com o modelo refinado, foram realizados testes de correlação de Pearson e testes de independência através da Qui-quadrado para explorar as relações entre as variáveis, ambos os testes apoiaram os mesmos resultados. Idade (negativamente), experiência em instituições financeiras (positivamente), facilidade de uso (positivamente), serviços oferecidos (positivamente) e apoio governamental (positivamente) demonstraram correlações estatisticamente significativas com um indivíduo ser cliente de *FinTechs*.

Palavras-chave: *FinTech*, Sector bancário, Inovação, Regulação, Sector de pagamentos, Tecnologia, Portugal.

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1 INTRODUCTION

1.1 Context

Financial intermediaries play a key role in the economy, as they channel funds between lenders and borrowers. As financial intermediaries, historically banks had a very important role in the economy, in the sense that they were the main connector between these two parties. However, with the evolution of the financial sector, the financial sector became more specialized on the banking sector, by having several types of banks, such as investment banks, commercial banks, credit unions among others. In addition, new players (such as FinTechs) also arrived and increased the competition on this sector.

1.1.1 FinTech concept and evolution

Due to the development of new technologies, new financial intermediaries have emerged, such as the case of FinTechs. FinTechs are institutions which combine both finance and technology in their products and services. FinTechs operate in several sectors, such as, payments, digital lending, cryptocurrency and blockchain, among others. One trait of FinTechs is the utilization of new technology to promote innovative and improved financial products and services.

The FinTech ecosystem comprises five essential elements: FinTech startups, incumbent financial institutions (such as traditional banks), government bodies, technology developers, and customers of financial products and services. Each of these players represents a crucial component of the FinTech ecosystem, with FinTech startups serving as the centerpiece of this dynamic environment (Lee & Shin, 2018). This ecosystem describes the relationship between FinTech startups and the above-mentioned players. Investors may be considered as another element of the FinTech ecosystem, considering their importance in the growth and evolution of FinTech startups (Castro, 2019).

Although FinTechs are considered to be a recent trend, the concept was developed in the 19th century. Its evolution can be categorized into three eras: FinTech 1.0, FinTech 2.0, and FinTech 3.0 (Arner et al., 2015).

FinTech 1.0 was the first period of evolution of FinTech. This initial period occurred between 1866 and 1967 and marked the beginning of the globalization of finance (Giglio, 2021). During this period, there were important milestones, such as, the development of innovative technologies (e.g., Telegraph and Morse Code), the launch of the first electronic fund transfer system (e.g., Fedwire) in 1918, and the creation of credit cards in the 1950s. (e.g., Diner´s Club in 1950 and AMEX Card from American Express Company in 1958).

FinTech 2.0 is the second period of FinTech evolution. This period began in 1968 and ended in with the financial crisis of 2008. This marked the shift of traditional banks from analogue to digital. During this period, there were important milestones, including, the release of the first handheld calculator, the launch and development of the Automatic Teller Machine (ATM), the launch of the first digital stock exchange (e.g., National Association of Securities Dealers Automated Quotations, also known as NASDAQ), the implementation of the Clearing House Interbank Payments System (CHIPS), and, the launch of the Society for Worldwide Interbank Financial Telecommunications (SWIFT) as a communication tool between financial institutions.

The financial crisis can be considered a crucial element for the shift on consumer behavior towards the financial entities, especially, banks, and to the rise of FinTechs in this third era of FinTech evolution (Arner et al., 2015).

FinTech 3.0 started in 2009, following the financial crisis, and is the current stage of FinTech evolution in developed countries. Following the financial crisis, there was distrust in the financial system, specially concerning the banking system. Consequently, this diminishing trust placed in banks, led the opening to the emergence of new players in the financial markets, particularly, start-ups. During this period, bitcoin was created with the use of blockchain technology, smartphones emerged and allowed access of customers to the internet and, as consequence, direct access to financial services and products. In addition, there was also the creation of Google Wallet and Apple Pay which made possible the exchange of data between two electronic devices via Near Field Communication (NFC) technology.

While FinTech 3.5 occurred during the same period, it concerns solely start-ups in developing countries (Arner et al., 2015), particularly in Asia and Africa. For example, one of the countries which possess the highest usage of FinTech are China and India (Ernst & Young Global, 2022).

The FinTech concept has its origins in a project called the “Financial Services Technology Consortium” (FSTC) created by Citicorp in 1993 (Giglio, 2021). This project aimed to overcome resistance to the integration of technology in financial services.

FinTech is a concept that comprises two elements: Finance and Technology. FinTech, according to the Financial Stability Board (FSB) is *technologically enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services* (Financial Stability Board, 2022).

FinTech companies as we know them today emerged at the beginning of the 21st century. They have developed hand in hand with the continuous advances in technology. FinTech contributes to the integration of technology in the financial system, one of the current factors of change in financial markets.

1.1.2 FinTechs in Portugal

FinTechs in Portugal currently received more than 1 billion of Euros from investors and are currently valued at 13 billion Euros. The FinTech phenomenon is global, which is shown by the fact that, in Portugal, 48% of FinTech financing is done by foreigners, and 21% did not receive financing from Portuguese investors. According to Figure 1, the FinTechs in Portugal are present into the following sectors of activity: Lending & Credit (22%), Blockchain & Crypto (17%), Payments and money transfers (17%), InsurTech (16%), Wealth management & ESG (11%), RegTech and cybersecurity (11%), and Real Estate (5%) (Portugal FinTech, 2022). FinTechs are mainly located in the main cities of Portugal, Lisbon, and Porto (Jornal de Negócios, 2022).

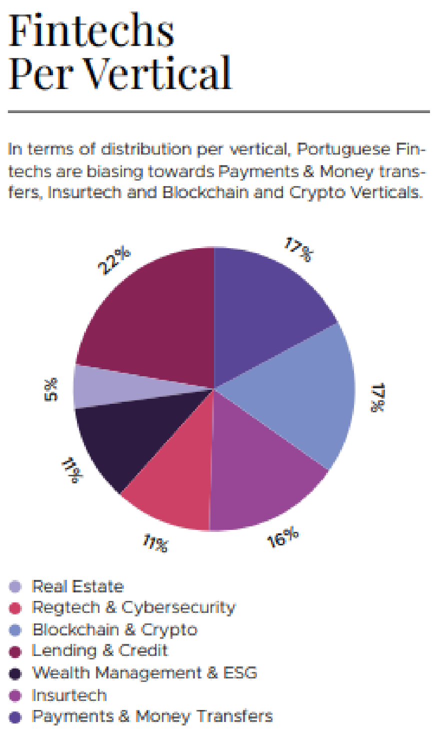

Figure 1 - Portuguese FinTechs by sector, Portugal FinTech Report 2022

In the Portuguese FinTech environment, 64% of the FinTechs primarily engage in the same activities as banks do, including, lending and credit, payments and money transfers and wealth management (Macedo Vitorino, 2023).

A startup is a company in the initial stages of development, which can also be classified as the developer of innovation via the promotion of products and services. Its main objective is to provide innovative products and services to their customers(Almeida et al. 2022). Startups growth can be divided into three stages: seed, early growth, and late growth, depending on the number of employees and level of funding (Cardoso, 2023).

As a result of the growth of FinTechs in the Portuguese market, several FinTech startups gained the status of unicorns (Portugal FinTech, 2022). A unicorn is a status granted for startups which value surpasses 1 billion Dollars. From 2016 to 2022, the financing on startups based in Portugal increased 30%, as a result of the emergence of the unicorns in Portugal (Peixoto et al., 2023).

In Portugal, the first FinTech was SIBS, founded in 1983, which is still in charge of the ATM network. This company was a pioneer on its sector and was responsible for the modernization of the Portuguese payments network. One of the latest developments was MBWay, a new platform that provides instant/automatic intrabank transfers, currently adopted by most of the retailers (Moreira et al., 2021).

As of 2021, there were 5 FinTech unicorns operating in Portugal. The first Portugal´s FinTech Unicorn was Feedzai in 2021 (Accenture, 2021). In 2022, it passed to seven FinTech unicorns operating in Portugal, worth over 34 billion of Euros, which represented one third of the country´s Gross Domestic Product (G. Silva, 2022). Figure 2 provides an overview of the Portuguese FinTechs, split by the sector of activity.

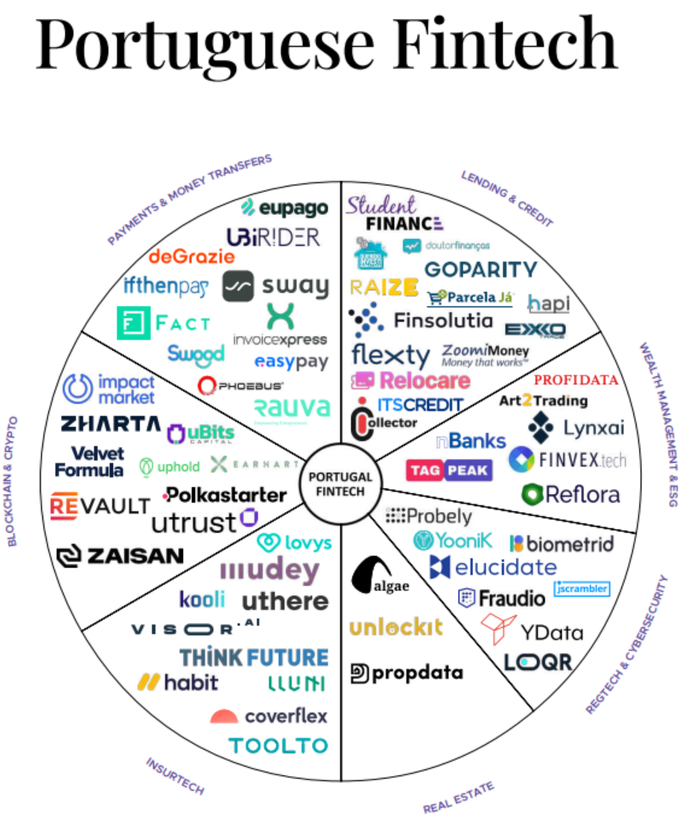

Figure 2 - Portuguese FinTechs, Portugal FinTech Report 2022

The Portuguese government has been committed to promote and understand the emergence of FinTechs, hence, promoting several initiatives, such as: (i) Startup Portugal[1], an initiative which promotes entrepreneurship and growth of Portuguese startups; (ii) Co-Investment Fund 200M,[2]

[1] Initiative promoted by the Portuguese Government, as part of the National Strategy for Entrepreneurship. Created via the Decree-Law n. º 33/2019, of 4 of March.
[2] Created via the Decree-Law nº 126-C/2017, of 6 of October.

an initiative which promotes co-investment on Small and Medium-sized Enterprises (SME), including startups and (iii) promotion of business incubators, (Peixoto et al., 2023).

In addition, there were also initiatives done by other institutions, including: (iv) FinTech 365; (v) Portugal FinLab; (vi) FinTech House; (vii) FinTech Solutions (Moreira et al., 2021). Portugal FinTech is a non-profit organization established in 2016 that engages as FinTech community in Portugal. This is an initiative from Portugal FinTech and Sitio, has the goal of fostering FinTech ecosystem and innovation. Since 2016, Portugal FinTech has provided reports on the FinTech evolution in the Portuguese financial system and has promoted several initiatives, including, Portugal FinLab, FinTech House, and FinTech Solutions (Portugal FinTech, 2022).

FinTech 365 is a program promoted by Portugal FinTech and Microsoft that fosters interaction and cooperation between FinTech and already established financial institutions. The Portugal FinLab initiative has the goal to promote a better understanding and communication between FinTechs and the Portuguese regulators (the three Portuguese regulatory authorities on the financial system) and, also, assisting with issues concerning regulatory or legal matters that may arise to FinTechs, as emerging players (Moreira et al., 2021). FinTech Solutions is an initiative from Portugal FinTech with the objective of promoting cooperation and growth of all the players in the Portuguese market (Portugal FinTech, 2022)..

Bank of Portugal (*BdP*) is one of the stakeholders of the initiative Portugal Finlab and its main goal is to have a clear understanding of these new players. Other EU regulators have also established initiatives related to FinTechs, such as a regulatory sandbox by the Bank of the Netherlands and the creation of the FinTech Forum by the Bank of France (Rosalino, 2017).

2 REGULATION

2.1 Regulation of the Portuguese banking sector

In order to have a sustainable banking sector, regulation is key. The main objective of the regulation in the financial sector is the promotion of financial stability (as per Portuguese Banking Association). The regulatory framework of the Portuguese banking system has evolved over time. One factors that has contributed to the shaping of regulatory institutions was the entrance of Portugal in the European Union (EU) in January of 1986. Since then, Portugal is fully integrated the EU. On another note, a factor that contributed to the shift of the regulatory framework was the Subprime crisis in 2008, in which the supervision model was fully reshaped, notably with the set-up of Basel framework.

Today, the Portuguese banking sector is regulated by several entities depending on the specific type of financing entity and under three layers of regulation: the international layer, the European layer, and the national layer.

2.1.1 International layer of regulation

The international layer concerns macro issues of the system and result from regulatory initiatives made by international institutions, such as the Financial Stability Board (FSB), the Bank for International Settlements (BIS), the International Organization of Securities Commissions (IOSCO), and the International Accounting Standards Board (IASB). Most of these institutions are associated with the G20, notably, the Financial Stability Board and the Bank for International Settlements. The G20, also known as The Group of Twenty, was incorporated in 1999 with the goal of promoting discussion of both financial and economic global issues between finance ministers and the governors of Central Banks. However, following the financial crisis of 2008, the G20 included Heads of State, each representing one country or nation. Currently, G20 is considered the leading forum for economic cooperation on a global level, which includes the European Union (EU) and 19 countries outside the EU.

The Financial Stability Board (FSB) was established post Subprime crisis, in April of 2009, to replace the former Financial Stability Forum (FSF). This international institution primarily engages in monitoring and providing recommendations concerning the financial sector.

The Bank for International Settlements (BIS)´s key goal is to provide assistance and promote cooperation between the central banks in matters such as monetary and financial stability. This institution is the oldest international financial institution, as it was founded in 1930. The Basel Committee on Banking Supervision (BCBS) operates within the Bank for International Settlements. The Basel Committee was constituted in 1974 and is an international organization comprising 28 countries which promotes standard regulation for banks.

It is important to mention that BASEL has a goal of minimizing the systemic risk with its three frameworks: BASEL I, BASEL II, and BASEL III. BASEL I was published in 1988 and identifies the thresholds of the minimum capital adequacy ratios. BASEL II was published in 2004 and explained the difference between the three tier capitals (Tier I, Tier II, and, Tier II, respectively) and defined the risk weighted assets (RWA) and explained the risk management process. BASEL III was published in 2010, as a response to the sub-prime crisis and its consequences. The BASEL Committee found that there was a regulation deficit, especially in the banking system (Shakdwipee & Mehta, 2017).

The International Organization of Securities Commissions (IOSCO) is an institution which incorporates several regulators of securities commissions. This organization was founded in 1983 and primarily engages in the promotion of international standards concerning the regulation of securities commissions. The Portuguese authority responsible for the regulation of securities commissions (CMVM) is a member of IOSCO since November of 2002.

The International Accounting Standards Board (IASB) is an institution which promotes and issues International Financial Reporting Standards. This entity replaced the former International Accounting Standards Committee (IASC) in 2001.

All the above institutions are only able to issue global standards and recommendations which may be further adopted or enforced by the local regulators of each jurisdiction. These institutions play a key role in providing guidelines and standards for regulations and do not have enforcement powers, thus they cannot directly sanction any local companies.

2.1.2 European layer of regulation

Portugal is part of the European Union, thus it follows the European banking policies and the respective European regulations. The current supervisory framework was implemented post subprime crisis, in 2010, with the creation of European System of Financial Supervision (ESFS)[3] and comprises both macro and micro supervision (European Central Bank, 2023).

This framework comprises the European Systemic Risk Board (ESRB), and three European supervisory authorities: (i) European Banking Authority[4]; (ii) European Securities and Markets Authority (ESMA)[5] and the European Insurance and Occupational Pensions Authority (EIOPA)[6]. For these three institutions to work effectively, the Directive 2010/78/EU (or, 'Omnibus' Directive) was published in 2010. In 2011, the Omnibus II directive was published with the purpose of creating a better understanding concerning the powers of these three new authorities (Portuguese Banking Association, 2023).

The European Systemic Risk Board (ESRB) monitors the systemic risks of the banking system and oversees the macroprudential supervision of the European financial system. On the other hand, the three European Supervisory Authorities (ESAs) are responsible for the micro prudential supervision (European Central Bank, 2023).

Focusing on the banking side, EBA sets up guidelines, which ensure the effectiveness and consistency of the banking system in Europe. To accomplish its mission, it issues guidelines for the local supervisors and financial institutions, where they must either comply or justify the reason to not comply. Once the guidelines are implemented, the European Central Bank (ECB) monitors if the rules set up by EBA are being followed.

2.1.3 National layer of regulation

At the national level, there are three authorities which compose the Portuguese financial supervision model: the Bank of Portugal (*BdP*), the Portuguese Securities Market Commission (*CMVM*), and the Insurance and Pension Funds Supervisory Authority (*ASF*).

The Bank of Portugal has the role of passing the European regulations to the local regulations and also an enforceability, with power to sanction local entities. It was founded in November of 1846 via a Royal Charter as a result of a merger between the Bank of Lisbon and an investment company named *Companhia Confiança Nacional*. The Bank of Portugal was nationalized in 1974, following the Republic Revolution, and the institution achieved the role

[3] Regulation (EU) No 1092/2010, and Regulation (EU) No 1096/2010.
[4] Regulation (EU) No 1093/2010.
[5] Regulation (EU) No 1095/2010.
[6] Regulation (EU) No 1094/2010.

as the Portuguese Central Bank, which comprised, the role of supervision of the Portuguese banking system[7].

The role and missions of the Bank of Portugal further developed due to two events: the entrance of Portugal in the European Union in 1986, and the sub-prime crisis starting in 2008. Following the sub-prime crisis, the Bank of Portugal was considered as the Portuguese institution with the macro-prudential regulatory role. As such, and since then, this institution has the role of *identifying, monitoring and assessing risks to financial stability and for adopting corresponding preventive and mitigation measures*[8]. As a result of the creation of the Single Supervisory Mechanism (SSM), the Organic Law of the Bank of Portugal was revised in 2013. After the enforcement of the Single Supervisory Mechanism in 2014, the Bank of Portugal embraced the new supervision and resolution roles. Currently, the Bank of Portugal has two main missions, focusing on the stability of both prices and the financial system. The Bank of Portugal comprises the roles of micro-prudential regulation and supervision, and, in addition, to act as macro-prudential authority. The Bank of Portugal, acting as central bank of Portugal, is part of the European System of Central Banks (ESCB), which entails the European Central Bank and the central banks of each EU countries (Aires et al., 2019).

Alike to the European framework, there is also one regulator for the market of financial instruments, *CMVM*, and another specialized regulator for the Pensions, which is *ASF*.

CMVM is the Portuguese Securities Market Commission and oversees the supervision and regulation of the market of financial instruments, including, the individuals operating in such market. This institution was created in 1991[9] by José Luís Sapateiro. *CMVM* is part of a member of ESMA, the European authority overseeing financial markets (Aires et al., 2019).

ASF is the Insurance and Pension Funds Supervisory Authority[10] and oversees the regulation of supervision of insurance, reinsurance, pension funds and the entities operating in such markets. This institution was created in 1907 with the goal of promoting the supervision of

[7] Organic Law of the Bank of Portugal, published on 15th of November of 1975
[8] Organic Law of the Bank of Portugal amended in 2013 (as per Law Decree nº 142/2013 of 18th of October of 2013)
[9] Decree-Law No. 142-A/91 of 10 April.
[10] Statuses of ASF (Decree-Law nº 1/2015, of 6th of January); Framework law on regulatory bodies (Decree Law n. º 67/2013, of 28th of August).

insurance activity[11]. ASF is a member of EIOPA, the European Authority which in charge of the insurance and occupational pensions.

2.2 Recent regulatory evolution of the Financial Markets

The sub-prime crisis and the subsequent sovereign debt crisis in the European Union (EU) highlighted the urgent need for enhanced regulation and supervision of the EU's financial system. In response to the financial crisis, the Banking Union was established in 2014 (European Council, 2023). The Banking Union entails three pillars: Single Supervisory Mechanism (SSM), Single Resolution Mechanism (SRM), and European Deposit Insurance Scheme (EDIS). However, it is important to note that this third pillar (EDIS) is not yet in place (Aires et al., 2019). SSM provides a supranational approach to the supervision of financial markets, serving as a bridge between the European Central Bank and the authorities of EU member countries. Conversely, SRM is responsible for resolving failing credit institutions, including banks (Portuguese Banking Association, 2023).

Following the sub-prime crisis of 2008, several European regulations were published. For instance, the Bank Recovery and Resolution Directive (BRRD)[12] was published in 2014 with the goal of promoting a framework supporting both the recovery and resolution of financial institutions, including credit institutions. This Directive was fully transposed into Portuguese law in 2015, granting resolution powers to the Bank of Portugal, as the Portuguese authority responsible for such matters (Aires et al., 2019).

A new European regulation aimed at combating financial crimes, including Anti-Money Laundering (AML) and Countering the Financing of Terrorism (CFT) [13], was published in 2015. This regulation was transposed into Portuguese law[14] in 2017. The directive's primary objectives were the prevention of financial crimes through AML and CFT measures, including the implementation of a central registry of beneficial ownership (Aires et al., 2019).

[11] Decree-Law of 21 of October of 1907.
[12] Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014.
[13] Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015.
[14] Decree-Law nº 83/2017, of 18 of August, and Decree-Law n. º 89/2017, of 21 of August

In 2014, there was the Launch of Markets in Financial Instruments Directive (MIFID) II[15] and Markets in Financial Instruments Regulation (MIFIR)[16] concerning the markets of financial instruments[17] that was enforced in Portugal[18] in 2018. MIFID and MIFIR focused on promoting both consumer and investors protection, transparency in the financial markets, and, promoting fairness among all financial players, including emerging players, such as FinTech firms (Aires et al., 2019).

In 2015, there was the publication of the revised Payments Services Directive (PSD II)[19] which was later enforced in Portugal[20] in 2018 (Aires et al., 2019). The transposition of PSD II into the Portuguese law has enabled FinTech companies to offer payment-related products and services (Moreira et al., 2021). As such, PSD II introduced new entrants, such as FinTechs, into the payment sector with the aim of fostering both competition and collaboration among the players in the financial sector. (Gomes, 2021). As a way of acknowledging the presence of FinTechs in the payment sector, PSD II created new growth opportunities for FinTech companies (Rosalino, 2017).

The emergence of two directives (the revised PSD II and SEPA[21]) allowed a diversification on the provision of payments services and promoted a healthy competition among the players in the financial markets. The Single Euro Payments Area (SEPA) promoted a harmonized framework for payments within the EU with the Euro (EUR), as the only currency (Gomes, 2021).

2.3 Regulatory disconnection and response

Currently, due to the innovation and disruption brought by FinTechs, a phenomenon known as 'regulatory disconnection' is occurring. In this scenario, regulations struggle to keep pace with the rapid rate of innovation, and regulators are faced with a dilemma regarding the appropriate scope of regulations with the goal of fostering innovation while also promoting the stability of

[15] Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014.
[16] Regulation (EU) n. º 600/2014 of the European Parliament and of the Council of 15 May 2014.
[17] EU Directive 2014/65 and EU Regulation 600/2014;
[18] Decree-Law 35/2018, of 20 July.
[19] Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015.
[20] Decree-Law n. º 91/2018, of 12 of November.
[21] Regulation (EU) No 260/2012 of the European Parliament and of the Council of 14 March 2012, and Regulation (EU) No 248/2014 of the European Parliament and of the Council of 26 February 2014.

the financial system (Waetge, 2022). One solution that has been found to mitigate the issue of regulatory disconnection is the implementation of regulatory sandboxes, also known as experimental regulation (Heinen, 2023).

As a way of expanding knowledge on FinTechs and their innovations, Regulators developed three strategies that the author classifies as: *experimentation, incorporation and accommodation of technological changes*. The first approach involves regulatory sandboxes, the second approach involves FinTech charters, and the third approach involves Regulatory Technology (RegTech). The regulatory sandboxes can be classified as programs developed by the Regulators in which FinTechs can promote their innovative products and services in a controlled space. Therefore, regulators gain more knowledge on the emerging players and their innovative products and services. FinTech charters allow FinTechs to provide products and services if obtaining the respective license. RegTech, short for regulatory technology, is a tool used by regulators to learn and adapt to these financial innovations and changes in the markets (Omarova, 2020).

The Portuguese Government has been proactive in promoting its own model of regulatory sandboxes. In 2020, it proposed the creation of regulatory sandboxes[22], and in 2021, it implemented its own model of a regulatory sandbox, named *Technological Free Zones*[23]. These Technological Free Zones (TFZ) are a way of investigating and expanding the knowledge on the new and innovative technologies emerging in the financial markets (Waetge, 2022).

One of the primary barriers to innovation in the financial system is the regulatory framework itself. To overcome this obstacle, regulations should be made more flexible and adaptable to the evolving needs of the financial sector (Bank of Portugal, 2021). As a way of fostering innovation in the financial sector, several initiatives known as 'innovation facilitators' have been introduced. These initiatives can take the form of promoting innovation hubs or establishing regulatory sandboxes (European Securities and Markets Authority et al., 2018).

The three mechanisms of regulation which promote financial innovation are regulatory sandboxes, innovation hubs and startups accelerators (Portuguese Competition Authority, 2018). There are also another means of promoting financial innovation and the FinTech ecosystem, including, creation of investment funds, implementation of incubators and

[22] Resolution of the Council of Ministers no. 29/2020.
[23] Decree-Law no. 67/2021 of 30 of July.

accelerators of FinTech startups and promotion of a revised legal and regulatory framework (Buckley et al., 2020).

Innovation hubs can be promoted by supervisory authorities, or, by partnerships between public and private institutions, such as the case of the innovation hubs of the United Kingdom[24], and Luxembourg[25] (Portuguese Competition Authority, 2018).

EU countries have been implementing regulatory sandboxes, including, the Netherlands[26], Lithuania[27], Denmark[28], Hungary[29] and Poland[30]. Regulatory sandboxes have also been implemented in jurisdictions outside of the EU, including, Switzerland[31], the United Kingdom[32], Australia[33], Canada,[34] China[35], Japan[36] and Malaysia[37] (Buckley et al., 2020).

The first regulation sandbox was promoted by United Kingdom (UK) in 2016 (Buckley et al., 2020), and the UK is considered as a forerunner on the implementation of both regulatory sandboxes and innovation hubs (Portuguese Competition Authority, 2018).

As a means of promoting innovation in the financial sector, the three European Supervisory Authorities established the European Forum for Innovation Facilitators (EFIF). This forum serves as a platform for authorities to collaborate on matters related to the regulation of innovation within the financial system. Additionally, the forum includes participation from the three regulatory bodies in Portugal: The Bank of Portugal, the Portuguese Securities Market Commission, and the Insurance and Pension Funds Supervisory Authority (Portugal Finlab, 2022).

[24] United Kingdom Innovation Hub launched by the UK Financial Conduct Authority (FCA).
[25] Luxembourg's Fintech Innovation Hub launched by a partnership between public and private institutions of Luxembourg, involving the Government of Luxembourg and private institutions, including, financial institutions and FinTech startups.
[26] Regulatory Sandbox of the Netherlands launched by the Dutch Authority for the Financial Markets (AFM) and the Dutch Central Bank.
[27] Regulatory Sandbox of Lithuania launched by the Central Bank of Lithuania.
[28] Regulatory Sandbox of Denmark launched by the Danish Financial Supervisory Authority.
[29] Regulatory Sandbox of Hungary launched by the Central Bank of Hungary.
[30] Regulatory Sandbox of Poland launched by the Polish Financial Supervision Authority.
[31] Regulatory Sandbox of Switzerland launched by the Swiss Financial Market Supervisory Authority (FINMA).
[32] Regulatory Sandbox of the United Kingdom launched by the Financial Conduct Authority (FCA).
[33] Regulatory Sandbox of launched by the Australian Securities and Investments Commission (ASIC)
[34] Regulatory Sandbox of Canada launched by the Canadian Securities Administrators (CSA).
[35] Regulatory Sandbox of Hong Kong launched by the Hong Kong Monetary Authority (HKMA)
[36] Regulatory Sandbox of Japan launched by the Government of Japan
[37] Regulatory Sandbox of Malaysia launched by the Central Bank of Malta.

To better understand the emergence of FinTechs in the financial markets, regulatory authorities such as the EBA, SSM, and the European Commission (EC) have established task forces. These initiatives aim to help regulators understand and develop new regulatory frameworks that are able to foster innovation, instead of restraining it (Rosalino, 2017).

From 2019 onwards, the authorities responsible for the supervision of the financial system of the European Union have been focused on promoting facilitators of financial innovation. By 2023, there were 36 innovation hubs and 13 regulatory sandboxes throughout the financial systems of the European Union, excluding United Kingdom and Switzerland (Portugal Finlab, 2022).

With the emergence of FinTechs as new players in the financial markets, regulators started to become alert to doubts and challenges, such, matters related to all sort of financial crimes (including money laundering) and the relation and protection to both consumer and investor. As FinTechs became more popular, and, even complex challenges started to arise, including, doubts concerning whether FinTechs could pose any systemic risk or financial instability or whether there was a shift in economy happening with these new players. Although regulators are taking action into getting answers to these questions, they are afraid of taking early action and damaging the financial innovation done by these emerging players (Omarova, 2020).

2.4 Payment Service Directives and Regulation

To face the rapid growth of the payment industry and the emergence of FinTechs as new players in the financial landscape, the regulatory framework in the EU's payments sector has experienced substantial transformation in the last decade. This framework transformation was shaped by the implementation of key regulations, such as the PSD II and the General Data Protection Regulation (GDPR), in 2015 and 2016, respectively (European Banking Authority, 2019).

PSD II was seen as a game-changer in the payments sector. One of its consequences was the promotion of competition among the players within the financial sector, the reduction of fraud cases (estimated at 60% reduction on remote payments according to Cologgi, 2023), as well as the inclusion of new players in the payment sector regulation. Regarding FinTechs, the PSD II fostered partnerships with FinTech firms and had the goal of shifting the relationship between the customers and the banking sector (Ferreira, 2019).

Nonetheless, looking from 2015 until now, it is possible to see that PSD II was not able to mitigate some problems such as: (i) the significant exposure of users to fraud, which leads to a reduced trust of the payment industry; (ii) the regulatory framework at national level of the EU members was not even, considering that PSD II is a directive and each country needs to transpose for the national legislation and (iii) non-bank payment service providers had different regulatory obligations and rights compared to bank payment service providers (Dentons, 2023).

Thus, to face these problems, the European Commission presented on the 28th of June 2023 a new legislative package with the draft of PSD III and a new Payment Services Regulation (PSR). This update has the objective to: (i) clarify specific concepts on the previous version (PSD II); (ii) balance the rules between banks and non-bank providers, while allowing non-bank providers to access directly to payment systems; (iii) enhance the confidence on the payment system by providing users with improved user rights and (iv) reorganize supervisor obligations to improve the enforcement on the members. To be noted that PSDs are EU directives, thus if they are approved it is expected that the EU members will take up to 18 months to transpose the directive to their legislation. Overall, if PSD III takes the same time between proposal and application to EU member states as PSD II, it could be expected that it will be implemented in 2026 (Sidley Austin LLP, 2023).

(i) Strength user protection and confidence in payment market

PSD III has several initiatives to improve the confidence on the payment market, via a stricter fraud framework and increase the information provided to the costumers. In terms of fraud prevention, the directive proposes to: (i) extend International Bank Account Number (IBAN) verification to all transfers of credit in Europe; (ii) make it mandatory trainings on fraud prevention for company employees and clients; (iii) improve refund rights in cases of fraud; (iv) intensify the monitoring of transactions via shared information on fraud related topics and (v) oblige a stronger customer authentication. On the other hand, in terms of information, the directive proposes to make it mandatory to inform the users about the estimated costs to convert currency and to transfer money from EU to other countries.

(ii) Balance the rules between banks and non-bank providers, while allowing non-bank providers to access directly to payment systems

One of the key points of this directive concerns the balance between banks and non-bank payment service providers. In this proposal, it is addressed three points. The first is related to the requirement for banks to provide services to non-bank payment service providers, where in case of refusal, it must be justified by a material suspicion (i.e., illegal activities). The second is to increase the safety of the user's funds by notably giving them the option to save them at the central banks. Lastly, and possibly the most important, give the non-bank payment service providers the possibility to apply for direct access to the operators of the payment system (described under the Settlement Finality Directive).

(iii) Improve competition and enhance consumer rights

In line with the current trends in the digital sectors, the treatment of personal data is one of the cornerstones of this new version. The proposed version includes: (i) the obligation for the institutions that hold user data to make it available to the data users; (ii) have a complete control about who is allowed to access their data; (iii) standardization of user data and allow them to share their data with other users and (iv) enhanced interfaces for data users (European Commission, 2023).

Overall, in the short term, these changes might lead to an increase on operational costs to implement the above measures. However, on the other hand, it can be expected that they lead to an improvement in competition, considering that users will have a cheaper and smoother transition between operators.

(iv) Reorganize supervisor obligations to improve the enforcement on the members

Currently in the EU there are several directives on the payment system depending on the specific topic. However, with the new legislative package for payment providers, some elements from PSD II will shift to a new Payment Service Regulation (PSR), and because it is a regulation rather than a directive it applies directly to all member states (no transposing). Also, Electronic Money (E-Money) Directive is proposed to be passed to PSD II and PSR, making the concept of electronic money institutions no longer exist separately. Lastly, it is proposed to enhance the rules related to breaches and sanctions.

In this chapter, it will be analyzed the regulation on FinTech which primarily engage in the payments sector, and on credit institutions, particularly banks.

2.5 Payment FinTech Regulation

The Portuguese payment institutions, including FinTechs specializing in payments and money transfer, are defined as per the Article 13 nº1 of the Payment Services and E-Money Legal Framework (PSEMLF),[38] which transposed the Payments Service Directive II into Portuguese Law. Payments institutions are considered as an entity responsible for providing payments services, according to the Article 4 of PSEMLF. Payment services encompass a range of activities, including deposits, withdrawals, transfers of fund, direct debit setups, and payment operations through payment cards, among other (Bank of Portugal, 2023b).

To commence operations, the payment institutions based in Portugal must first obtain authorization from the Bank of Portugal, as stipulated in Article 18, Paragraph 1 of the PSEMLF (Moreira et al., 2021). Furthermore, should an established payment institution seek to expand its products and services, it is also required to obtain authorization from the Bank of Portugal, in accordance with Article 18, Paragraph 2 of the PSEMLF (Bank of Portugal, 2023b).

However, an exemption regime exists for the mandatory authorization requirements, as outlined in Article 37 of the PSEMLF[39]. This regime applies to entities wishing to provide payment services as identified in Article 4 (from paragraph A to paragraph E) of the PSEMLF. The Bank of Portugal has the authority to determine whether the exemption applies fully or partially based on the required criteria. According to Paragraph 3 of Article 37 of PSEMLF , this exemption can be granted when two requirements are met: (i) the monthly average of the total value of payment operations conducted by the entity over the past 12 months does not exceed three million Euros; and (ii) none of the individuals in charge of the entity's management have been convicted of crimes such as money laundering and terrorist financing (Bank of Portugal, 2023b).

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[38] Decree-Law n. º 91/2018, of 12 of November.

[39] In line with the Executive Order No 239/2019 of 30 July of 2019 regarding the terms and conditions of the exemption regime.

The regulations governing payment institutions are not dependent on the type of entity but rather on the nature of the products and services offered to customers. Therefore, it does not impact whether the entity in question is a FinTech or not; what matters are the products and services they provide (Moreira et al., 2021).. This aligns with the principle of proportionality in regulation, where the focus is on the activities undertaken by these entities (Bank of Portugal, 2023).

On a national level, regulations pertaining to payment institutions encompass the Payment Services and E-Money Legal Framework (PSEMLF) [40], the Portuguese General Framework for Credit Institutions and Financial Companies (commonly known as the Banking Law) [41], and the Portuguese Regulation on Measures to Combat Money Laundering and Terrorist Financing[42]. Furthermore, the Bank of Portugal issues notices and instructions on a range of topics, including the reporting of information concerning payment systems[43], and obligations related to reporting of operational or security incidents associated with the provision of payment services[44] (Bank of Portugal, 2023).

At the European level, the regulatory landscape for payment institutions includes the Payments Services Directive II[45] and the Regulation on Prudential Requirements for Credit Institutions[46]. Additionally, it incorporates guidelines issued by the European Banking Authority[47], covering various topics. These topics encompass information to be submitted to competent authorities, setting the minimum monetary amount of professional indemnity insurance, and procedures for managing complaints from payment service users, among others (Bank of Portugal, 2023).

[40] Decree-Law n. º 91/2018, of 12 of November.
[41] Decree-Law nº 298/92, of 31 of December.
[42] Decree-Law nº 83/2017, of 18 of August.
[43] Instruction of the Bank of Portugal nº 5/2020 of 17 of February of 2020.
[44] Instruction of the Bank of Portugal nº 1/2019 of 15 of January of 2019.
[45] Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, and Commission Delegated Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication.
[46] Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions.
[47] EBA/GL/2017/09, EBA/GL/2017/08, EBA/GL/2018/07, EBA/GL/2017/10, EBA/GL/2017/13, EBA/GL/2019/04), EBA/GL/2018/05, and EBA/GL/2019/02.

2.6 Credit institutions regulation

A credit institution is defined under Article 1ºA, Paragraph 1 of the Portuguese General Framework for Credit Institutions and Financial Companies, commonly known as the Banking Law (Bank of Portugal, 2023).[48] According to this article, a credit institution is an entity that receives deposits or other reimbursable funds and provides credit on its own (Aires et al., 2019).

Portuguese traditional banks, such as *Caixa Geral de Depósitos* (CGD) and *Banco Português de Investimento* (BPI), are indeed considered credit institutions in accordance with Article 3 of the Portuguese General Framework for Credit Institutions and Financial Companies. The activities carried out by banks are defined under Article 4, Paragraph 1, of the same framework. Meanwhile, other credit institutions (excluding banks) are permitted to engage only in activities as specified by the laws and regulations governing their respective sectors of operation (Bank of Portugal, 2023).

Similar to payment institutions, credit institutions based in Portugal are required to obtain authorization before commencing operations, in accordance with Article 14 of the Portuguese General Framework for Credit Institutions and Financial Companies. As such, the credit institutions need to fulfill the specified criteria as outlined in Article 14, Paragraph 1 of the same legal framework. One notable distinction between the authorization processes for payment institutions and credit institutions lies in the fact that credit institutions must seek authorization not only from the Bank of Portugal but also from the European Central Bank. This requirement applies if the credit institutions intend to be established in Portugal or any other member state of the European Union that is part of the Single Supervisory Mechanism (Bank of Portugal, 2023).

On a national level, regulations governing credit institutions encompass the Portuguese General Framework for Credit Institutions and Financial Companies[49], commonly referred to as the 'Banking Law,' as well as the Portuguese Regulation on Measures to Combat Money Laundering and Terrorist Financing[50]. Additionally, the Bank of Portugal issues notices and instructions pertinent to credit institutions. Moreover, there is an Executive Order detailing the minimum share capital requirement for credit institutions (Bank of Portugal, 2023).[51]

[48] Decree-Law nº 298/92, of 31 of December.
[49] Decree-Law nº 298/92, of 31 of December.
[50] Decree-Law n. º 83/2017, of 18 of August
[51] Executive Order n. º 95/94, of 9 of February

At the European level, the regulations governing credit institutions included a legal framework pertaining to the supervision of the European Central Bank on the credit institutions, [52] the Single Supervisory Mechanism (SSM) Framework Regulation[53], and a legal framework concerning the prudential requirements concerning credit institutions and investment firms[54]. These regulations are complemented by guidelines issued by the European Banking Authority (EBA) and the European Securities and Markets Authority (ESMA). The Single Supervisory Mechanism involves a cooperative approach between the European Central Bank and national authorities within each jurisdiction (Bank of Portugal, 2023).

The FinTech firms which engage in crowdfunding activities are not considered as credit institutions and have their own legal framework[55] and are overseen by CMVM (Moreira et al., 2021).

2.7 Regulation of other countries in Europe

The regulatory framework of the payment systems and Banks in Europe is very similar between the countries that are part of the European Union, considering that most of the legislation is performed at European level. Depending on the type of legislation, if it is a regulation or directive, it will apply directly to the countries, or it will need to be transposed to the country's legislation.

One special case in Europe is the United Kingdom, which was aligned with the remaining EU members until January 2020 (Brexit). By exiting the European Union, the country became independent on this topic, and it won't continue to pursue the EU legislation. Currently, the regulation is still broadly similar to the EU rules, since the last material update on the payment regulation was the PSD II (January 2018), when the UK was still part of the EU (Bird & Bird, 2023).

However, in the beginning of 2023, the HM Treasury (the UK's government's economic and financing minister), issued both a review on the regulation of the payment services and a call for evidence to reflect with the market players about how the regulation should evolve on the

[52] Council Regulation (EC) Nº 1024/2013, of 15 of October of 2013
[53] Regulation (EU) Nº 468/2014 of the European Central Bank, of 16 of April of 2014
[54] Regulation (EU) 575/2013 of the European Parliament and of the Council, of 26 of June of 2013
[55] Law n. º 102/2015 of 24 August 2015, complemented by Law No. 3/2018 of 9 February 2018, and CMVM Regulation No. 1/2016.

sector. The review of the regulation, mostly coming from 2017 (originally from PSD II, EU directive), concluded that the UK payment sector regulation is robust, however it was not enough to promote the open banking environment, notably a fair competition between the different types of PSP and also acknowledged that the pace of change in the sector was very quick and that regulations are struggling to keep this pace. The call for evidence was open between the 13 of January 2023 and the 7 of April 2023 and concerned four topics: (i) how to keep an agile regulation to promote the UK's growth an innovation on the payment sector; (ii) guaranteeing the proper trust and safeguarding of consumers; (iii) securing the resilience and integrity of the sector and (iv) promotion of competition for the benefit of consumers (DLA Piper, 2023).

Until the summer of 2023, there were no updates on specific regulatory updates, taking into account that this type of regulatory update is very time consuming. Nonetheless, the UK is going to pursue an independent framework and most probably shifting from EU regulation. This will be especially effective with the update of the European legislation in the sector (PSD III). However, UK's government mentioned that the new updates on the legislation will balance between the participation in Single Euro Payments Area (SEPA, currently very aligned between the UK and EU regulation) with the country specific needs (SIDLEY, 2023).

3 LITERATURE REVIEW

3.1 Chronology

FinTech is considered a link between two concepts: innovation and disruption (Katori, 2017). FinTech is also linked with financial innovations as there is a promotion of innovative products and services via the use of advanced technology (Zavolokina et al., 2016). Disruption can be described as the emergence of new players which poses a challenge to already established players in a specific market, such as, traditional banks. These new players usually have a similar trait as they don't have the same resources as the established players in the markets. (Zalan & Toufaily, 2017).

The Subprime crisis (2007/2008) was a cornerstone for the introduction of new players into the financial markets (Worthington & Welch, 2011). Their investigation pointed that the disruption caused by the crisis led new players to emerge and to not be part of the traditional financial system. As a consequence of the sub-prime crisis, consumer´s perception on banks and on the overall banking system deteriorated. In addition to this distrust on the banking sector, employees specialized in the financial sector who had lost their jobs, turned to FinTechs (Giglio, 2021). These individuals applied their financial expertise and found a new sector in the FinTech 3.0 era (Arner et al., 2015).

The impacts of the Subprime crisis can be analyzed through the development of technology and the rise of new regulations. Regarding updated regulatory framework, Ly Hõbe in 2015, found evidence that it got stricter, especially in the banking sector (e.g., the update of BASEL III in 2010). The ultimate goal of regulation in the banking sector is to deliver a solid banking system, protecting the depositors and reducing the probability of defaults, which are very costly both socially and economically. Concerning the technology development, the author stated that there were two consequences related to the technology revolution: revolutionary changes in traditional banking with new products and services to the customers, and emergence of new players in the financial markets that were eager and to better adjust the needs and preferences of its customers and provide innovative ideas and products (Hõbe, 2015).

As the financial sector is always changing and evolving, considering, the developments of new technologies and new regulations, it is also important to note that customers' expectations are getting higher and the demand for products and services is directed for the individual needs for each consumer (Hõbe, 2015).

This crisis led the confidence of the consumers on the traditional financial institutions to sharply deteriorate and this phenomenon led to an opportunity the other players enter in the market (Passos, 2017). However, the entrance of FinTechs in the financial market was also possible due to advances in technology (Arner et al., 2016), considering that the main competitive advantage of the FinTech is their technology. Example of the advances in technology is the rapid pace of growth on smartphones, which allowed a better interaction/relationship between the clients and service providers/companies (Dietz et al., 2016).

As a result of the emergence of FinTechs in the financial markets, the banks had the necessity to improve their products and services to a closer level of quality as FinTechs. This was also supported by the change on customer behavior and respective demands. Consumer behavior is always evolving, as customers are always eager for better products that are able to attend their personal needs (Henriques dos Santos, 2017).

Broom, in 2015, analyzed the integration of FinTech in the financial markets post subprime-crisis and found evidence that banks have been implementing measures to create synergies with the FinTechs by promoting venture capital investments and accelerator/incubator programs for startup companies. This approach had the objective for banks to improve their digital portfolio and be on top of the new technologies that are arising. Threatened by the arising of the FinTechs, the author stated that banks had no alternative rather than to adapt and to benefit from these alliances (Broom, 2015).

Innovation in the financial sector is key to promote stability and better quality of financial services. There has been a material growth of players in the financial markets that provide traditional banking typical services, which were usually only provided by established players in the financial system, such as, banks (Das et al., 2018).

Historically, the banking sector was not proactive to integrate FinTechs, which created a challenge to the cooperation (Truong, 2016), however for the traditional banking players to survive they must adapt to this new reality (Campanella et al., 2017).

Evidence was found that financial innovations are linked to three events: shift on customer behavior, change in regulatory framework, or development of new technologies (Varma et al., 2022). It is considered that the evolution and development of the products and services of FinTech are dependent on the emergence of new technologies and on the response from the regulators on the emergence of FinTechs (Gomber et al., 2017).

Currently, it is considered to still be in FinTech 3.0, an era marked by the emergence of start-ups. This creates a challenge for regulators and other players in the financial markets, as the benefits and risks of innovation must be taken into account (Arner et al., 2015).

In the aftermath of the sub-prime crisis, the incumbent financial institutions, including traditional banks, have become subject to more rigorous regulations. On the other hand, FinTech startups enjoy a more favorable regulatory environment, as governments actively engage in promoting these startups, as way of encouraging innovation and fostering healthy competition within the financial markets. Due to this regulatory environment, FinTech startups hold an advantage over traditional financial institutions, as they are able to offer better products and services tailored to their customer needs and easier to be accessed by the consumers (Lee & Shin, 2018).

3.2 Technology and sector transformation

Historically, the banking system has been one of the less disrupted sectors (Dietz et al., 2016), which is currently on a mature stage with increasingly saturation (Deloitte Global, 2018)**.** However, technological advances, notably electronic technologies, have begun a physical technological disruption in the financial system. FinTechs usually have higher levels of technology, which might be disruptive in the market. Innovation can be considered as a critical factor of the success and has a material impact on the growth of both economic and social environment, innovative products, services, or business models (Nejad, 2016).

CITI bank in 2016, published a report that pointed out that the developments in technology created an impact on the relationship between banks and customers, considering that the consumers have more diverse digital options to choose. Consumers are also more likely to shift for digital solutions with more personalized services, higher security, and higher convenience (D. Lee et al., 2015). Hence, it suggests that traditional banks should target an omni-channel strategy.

Consumer habits have also changed in the last decade, with the wide spread of internet and smart phones social media become a part of daily life of everyone. This, combined with the development in technology, made the conditions for new and innovative financial products to appear. The boom of technological advances in this field might go back to 2010, but the technology growth is expected to continue and to further impact banking operations (Iwata, 2017).

Younger individuals who reside in urban areas, possess proficiency in the use of new technologies, and have higher income levels are more inclined to become FinTech clients. Notably, the generation of the *Millennials* constitutes a significant portion of the FinTech client population. Consequently, the younger generations, in particular the *Millennials,* are considered to be a key element on the expansion of FinTechs products and services in the future (Lee & Shin, 2018).

3.3 Benefits of FinTech to the financial system

The three main benefits from the appearance of FinTechs are the following: i) the promotion of products and services in a more efficient way than banks do and even promoting new products that banks don't have in their portfolio; ii) improved competition in the financial markets by emerging as new players with innovative products and services and iii) emergence of new users of these products and services, that did not had access before (Navaretti et al., 2018).

With technology developments client have higher expectations for more personalized or tailor-made products and services and FinTechs are generally closer to clients thus are better positioned to fulfill the more recent needs of the clients (Eickhoff et al., 2017)

Currently, the role of the financial market is becoming broader, to not only connect the lenders to borrowers but promoting financial inclusion and connectivity inclusion (D. Lee et al., 2015).

Connectivity inclusion refers to the ability to be connected via the whole ecosystem (phone, tablets, computers etc.). To achieve this goal, the FinTechs have a pivotal role, which is bringing a more sustainable and inclusive product to the customers or to bring the technology via alliances.

3.4 Relationship between FinTech and Banks

Traditional banking institutions, faced with the new competition, can either promote their own initiatives or promote collaboration/partnership with FinTechs (Bean, 2018).

On the other hand, FinTechs usually promote their products and services directly to the consumers. The author defends that these institutions are currently taking a “hybrid approach.”

Most academic research point for the risk of the new competition, however, some authors[56] see the collaboration between banks and FinTechs and the new reality as an opportunity to foster innovation in general, considering that generally banks have higher resources the regulatory knowledge, while FinTechs have more advanced technology and have a more agile structure. Banks may promote cooperation with FinTech as a way of diminishing the disruption caused by FinTechs (Varma et al., 2022).

The risk of the above-mentioned disruption is real to the traditional financial entities and, as such, it is crucial to promote cooperation with FinTechs. In fact, the incumbent financial entities may transform this challenge into an opportunity by collaborating with FinTechs. Cooperation with FinTechs may take several forms, from incubation programs and venture capital, to establishing partnerships with FinTechs, acquisitions of FinTechs, or even establishing FinTechs subsidiaries (Romanova & Kudinska, 2016). This risk of disruption includes the business models of the traditional financial institutions, as there are younger generations with better technology knowledge, continuous developments in technology and, therefore, the constant digitalization of the financial sector, as a whole (Gomber et al., 2017).

Some authors, such as (Navaretti et al., 2018), expect FinTech in the future to not replace the banking institutions concerning their core businesses. Nonetheless, it is expected that FinTechs continue to promote a new and innovative way that financial services are normally provided by banking institutions, cannibalizing some of traditional banking services, which will oblige the banks that are able to promote new ways of the same products and services.

However, some authors point out a high probability of FinTechs taking over and, eventually, replacing the traditional banking institutions. On a Portuguese banking side view, the author pointed out that the Portuguese banking sector believes that FinTechs are not going to replace banks as there is space for both players (Silva, 2022).

On another note, there is an expectation of a situation called *in-depth symbiosis* (creation of venture capital or an accelerator) between banks and FinTechs and that this cooperation between the financial institutions most likely will change the banking system, as it is known.

[56] (Romanova & Kudinska, 2016), (Ricou & Ferreira, 2017), (Deloitte Global, 2018).

While there is cooperation, there is also competition between these financial institutions as it is expected for the banking industry to decline as new players emerge with better products and services to the customers (Melnyk et al., 2022).

Even though competition exists between FinTechs and banks, it is not expected for one player to eliminate the other, in the sense that, FinTechs are not expected to replace banks. Nevertheless, as FinTechs continue to emerge as new players with innovative products and services, banks should promote and develop innovative solutions to keep up with the competition (Elsaid, 2021).

3.5 FinTech in Portugal

The Portuguese banking system is considered to have low credibility by some authors, not only, due to the sub-prime crisis and the European sovereign debt crisis, but also due to the impacts of the intervention of the Portuguese government on the banking sector (Carvalho, 2016).

The sub-prime crisis affected several economies, including the Portuguese economy, which also led to the increasing of public debt (Pinto, 2021). In this understanding, following the global financial crisis, the European sovereign debt crisis emerged, and Portugal was one of the countries affected, as it needed to receive bail-out assistance in 2011, and several Portuguese banks collapsed (Pereira & Filipe, 2016). In particular, the collapsed Portuguese banks were *Banco Espírito-Santo* (formerly known as BES), in 2014 (Guliyev, 2019), *Banco Internacional do Funchal* (formerly known as BANIF) in 2015 (Ricou & Ferreira, 2017), *Banco Português de Negócios* (formerly known as BPN) and *Banco Privado Português* (formerly known as *BPP*), in 2008 (Macedo Vitorino, 2023).

As banking institutions heavily rely on the trust of their consumers, if there is a collapse of the institution, several consequences may arise, including, shift of trust from customers and fear arising. As fear continues to emerge, panic may be established and may result in the collapse of another banking institutions (Pinto, 2021).

As a result of the failure of several banking institutions in Portugal, the Portuguese Government intervened and assisted the banking system. Evidence was found that, from 2009 to 2022, the Portuguese Government spent over 13 billion of Euros, with the purpose of assisting the Portuguese banking institutions. The collapse of these established banking institutions in

Portugal can be considered as a factor that contributed to the distrust on the Portuguese banking system (Macedo Vitorino, 2023).

The Portuguese banking system has been historically in a fragile situation due to: (i) the declining of profitability of Portuguese banks; (ii) low interest rate policies; (iii) rise of digital markets; (iv) increasing operational costs and (v) stricter regulation, notably higher capital, and liquidity requirements (Ricou & Ferreira, 2017).

Despite the generalized growth of the FinTechs, including Portugal, challenges still lie ahead, mostly concerning the generalized inflationary process, lack of regulation, data protection and ensuring that they are following all relevant legal framework (Portugal FinTech, 2022). This is specifically challenging considering that they usually have small structures.

The Portuguese traditional banks are currently digitalizing their products and services as a reaction from the arrival of FinTechs along with the development of technology, and the change in customer behavior, in particular concerning the younger generation, *Millennials* (Bank of Portugal, 2016).

Currently, there is a cooperation trend in Portugal, noting that Portuguese banks and FinTechs are actively forming partnerships as a means of fostering growth within this rapidly evolving ecosystem (Ferreira, 2019).

4 METHODOLOGY

4.1 Data collection

The questionnaires were created in Google Forms and shared via social media during one week, from the 29 of June 2023 to the 6 of July 2023 both in Portuguese and in English. The participation was voluntary, and the data collected was intended solely for academic purposes. In line with the General Data Protection Regulation (GDPR), the replies were anonymous and confidential, where it is not possible to identify the person replying (email, name, phone, and other identification data was not requested). In addition, if any field had less than 5 replies, it was not analyzed to ensure confidentiality. Please refer to appendix 1 for the overview of the questionnaire. Overall, there were 227 submitted answers, of which 225 were considered valid.

The sample is classified as a convenience sample, considering that the data was not collected via any statistical software. There was no specific population target for this questionnaire, however the answers were screened in the chapter part of the questionnaire. In this section each answer was characterized by the following variables: gender, age, level of education, occupation, professional field, working experience in financial institutions, working experience in legal field, frequency of travelling to banks, frequency of social media usage, mastery of new technologies, and classification of FinTech companies.

4.2 Data transformation

The Portuguese and English questionnaires were merged into one data base. Afterwards, the non-valid answers (e.g., non-applicable answers) were removed. Out of the 227 responses, two were removed due to having non-valid answers, notably on the open field of the questionnaire (age). Lastly, to ensure the consistency of the data and enable the statistical software to process the data, dots, non-requested words, and other special characters were removed.

For the purpose of statistically analyzing the data provided in the questionnaires, all string variables (“Yes” and “No”) were coded as “1” and “0”, transforming them into numerical variables.

For the question concerning how often the participants go to the bank´s branches, the answers were coded as per the following: never (0) annually (1), semi-annually (2), monthly (3), weekly

(4). For the question concerning the usage of social media, the answers were coded as per the following: never (0), sporadically (1), weekly (2), daily (3), also transforming the variable from string to numerical.

The 5-point Likert scale was used for the questions that had scales with five options of answers (e.g., from "totally disagree" to "totally agree"). The Likert Scale is a method used for assessing the attitude of the population of a questionnaire (Taherdoost, 2019).

On the question to identify FinTech companies, there were four correct answers and four wrong answers. The correct answers were: Revolut, Go Parity, *Doutor Finanças*, and Coverflex. The data was measured via the methodology from Metropolitan & Bacon, n.d.. In this method, each correct answer scored one point, and, each wrong answer deducts one point, this way, penalizing the wrong answers. Lastly, the coefficient is the absolute net amount of not correct answers divided by the total number of answers, leading to a score between 0 and 1:

Coefficient = (1-|net amount of not correct answers|/total number of answers)

4.3 Questionnaire structure

The questionnaire was divided into six chapters: i) sample characterization; ii) knowledge, means and motives for the utilization of FinTech services; iii) Comparison between FinTech and traditional banking services; iv) Trust and Perceived Risk; v) Government Support; and (vi) Relationship between FinTechs and Banks.

The first chapter of the questionnaire contained ten questions and had the objective of characterizing the sample, in order to understand the basis characteristic of the same. These variables were classified as independent variables in the statistical analysis explained "results" section of this thesis. The sources for this chapter were Basdekis et al., 2022, Hu et al., 2019, Fernandes, 2019, (F. Pinto, 2020).

The professional field question was based on the categories based on the Portuguese Labor Law (Instituto Nacional de Estatística, 2010). The level of education question was based on a classification of each level of education by Portuguese General Directorate of Higher Education (DGES)[57].

[57]National Qualifications Framework in line with the European Qualifications Framework (applied in Portugal as per Law n. º 782/2009, of 23 of July).

The second chapter “knowledge, means and motives for the utilization of FinTech services” included nine questions/variables concerning the knowledge on new technologies and FinTechs, how the people handle their banking transactions and the motives to use or not use FinTech services. For the participant to accurately answer the questions on these sections and acknowledging that the participants might not be aware of what a FinTech is, it was added an initial statement with the concept (“knowledge, means and motives for the utilization of FinTech services”). The sources for this chapter were Basdekis et al., 2022, and Fernandes, 2019.

The third chapter included seven questions/variables about the services that FinTechs provide to its consumers. It included a comparison with traditional banking, the easiness of its usage and the suitability compared to the consumer needs. The sources for this chapter were Basdekis et al., 2022, and Hu et al., 2019.

The fourth chapter included three questions in which the participants answered concerning trust and perceived risk on FinTechs. The source for this chapter was Basdekis et al., 2022.

The fifth chapter included three questions concerning the government support on the FinTechs. The source for these questions was Hu et al., 2019.

And the sixth chapter included one question concerning the perceived relationship between traditional banks and FinTechs. The source for this question was Fernandes, 2019.

4.4 Investigating model and objectives

Based on the literature review and the research objective, the questionnaire in Appendix 1 was created, to analyze the relationship of seven variables with the predictive variable (being a FinTech client). With this objective in mind, it was built an initial model (figure 2). However, in order to make sure that all variables were internally consistent, they were screened via the Cronbach Alfa test.

The Cronbach Alfa was used to measure the level of internal consistency of the variables on the questionnaires. The consistency of each variable, except for the sample characteristics, was determined. The Cronbach Alfa usually ranges from 0 to 1, however, it may take negative values when there are structural problems with the data. For a value to be considered good, the minimum threshold is 0,7. The Alpha values may range until 1, however, there is scientific evidence that the maximum value should be close to 0,9 (Tavakol & Dennick, 2011).

Out of the six variables in study, three variables ranged between 0,7 and 0,9, which means that those three were all statistically consistent, and, not redundant. The first variable, Easiness of Use, had an Alpha value of 0,877. The second variable, Services, had an Alpha value of 0,862. The third variable, Government Support, had an Alpha value of 0,704. These three values identified high consistency among the answers of these three variables.

On the other hand, the remaining three variables had lower values than 0,7, hence, did not show a good level of internal consistency on the answers. The first variable in case, “Knowledge”, the second variable, “New Technologies” and the third variable “Perceived Trust and Risk”. These three values showed an internal level of consistency below the benchmark (0.7), thus they were not further analyzed. Overall, the first model was transformed into the final model (Figure 3).

Initial Model:

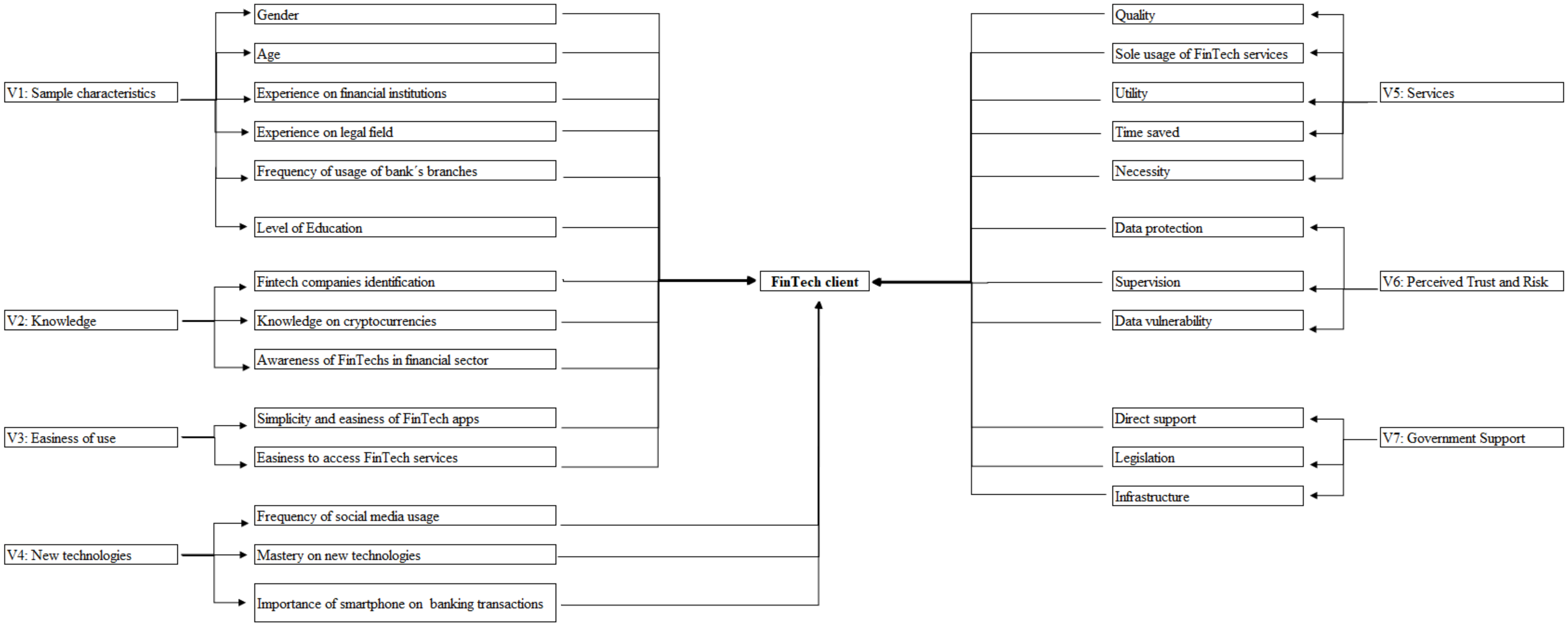

Figure 3 – Initial Conceptual Framework

Final Model:

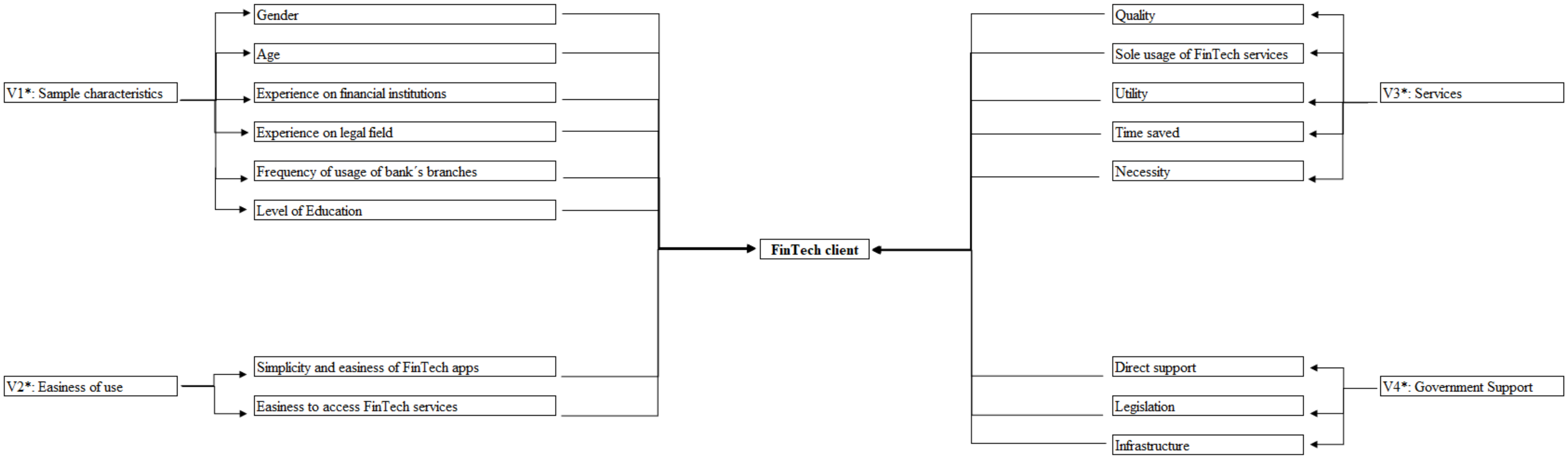

Figure 4 - Final Conceptual Framework

4.5 Hypothesis Testing

Having into account the objective to better understand adoption and perceived risks of bank clients and FinTech clients in the Portuguese banking system, four hypothesis tests will be analyzed to better understand how they are related. Please refer to the below variables and the respective hypothesis testing:

1. **H1: Specific Sample characteristics are positively correlated with a person becoming a FinTech client:**
   1.1. Gender
   1.2. Age
   1.3. Experience on financial institutions
   1.4. Experience on legal field
   1.5. Frequency of usage of bank´s branches
   1.6. Level of Education

2. **H2: The easiness of use is positively correlated with a person becoming a FinTech client.**
   2.1. Simplicity and easiness of FinTech apps
   2.2. Easiness to access FinTech services

3. **H3: A person becoming a FinTech client is positively correlated with the quality of FinTech services.**
   3.1. Quality
   3.2. Sole usage of FinTech services
   3.3. Utility
   3.4. Time saved
   3.5. Necessity

4. **H4: The perceived support from the Government on FinTech is positively associated with a person becoming a FinTech client**.
   4.1. Direct support
   4.2. Legislation

4.3. Infrastructure

5 RESULTS

To analyze the results, the data was exported from Microsoft Excel and imported to the IBM SPSS Statistics 29, with the objective to perform statistical analysis of the data set. As explained, prior to the analysis of the results, the questionnaire was screened concerning the internal consistency of the variables, via the Cronbach Alpha test. Once, this pre-requirement was completed, the following analysis were performed: (i) a descriptive analysis, where the data set was characterized; (ii) the correlations between the variables, with resource to the Pearson correlation coefficient and (iii) an independence test, via the Chi-Square statistic.

5.1 Descriptive Statistics

Out of the 225 valid responses, the participants have ages between 22 and 78 years ($\mu = 50{,}86$, $\sigma = 15{,}18$). The average age of the participants of the sample is 4 years older than the average age of the Portuguese population.[58]

Concerning the gender, 39,1% of the participants were female and 60,9% of the participants were male. In comparison with the Portuguese population, the sample is biased towards male participants (13,8% above the Portuguese average male population). [59]

Out of the total responses, 52% of the participants hold a bachelor's degree, 22,7% hold a master's degree, 20% have high school level or below, and 5,3% hold a doctorate degree. Once again, in comparison with the Portuguese population, the sample is biased towards the level of education, considering that the only 20% of the sample has high school level or below, while 73,2% of the Portuguese population has this level of education. On the other hand, 80% of the participants hold a university degree (such as, bachelor, master, and doctorate degrees), while only 19,8% of the Portuguese population has this level of education. [60]

Regarding the occupation, 55,1% of the participants are workers, 37,8% are retired/pensioner, while the remaining 7,1% are students, unemployed or domestic/inactive. Overall, the sample presents a slightly higher number of workers and retired/pensioners (considering that 46,99%

[58] Data referent to 2022 and source: Eurostat.
[59] Data referent to 2022 and source: INE/PORDATA.
[60] Data referent to 2021 and source: INE.

of the Portuguese population are workers, and 34,83% of the same population are retired/pensioners).[61]

Regarding the professional fields, 40% of the participants are part of the category of Professions linked to Armed Forces or personal, protection and security services, while only 18,2% of the Portuguese population is active in this professional field. Additionally, there is a slightly higher number of Technicians and professions of intermediate level (comparing this to the Portuguese population, which is 11,8% of the total population). On the other hand, the sample presents a slightly lower number of Specialists in intellectual and scientific activities (taking into account that 23,9% of the Portuguese population has this professional field), and, on the administrative staff (as this category is present in 9.9% of the Portuguese population). The remaining thresholds similar with the percentages of each professional field as per the Portuguese population. For example, 5,3% of the sample is part of the category of Representatives of the legislative and executive bodies, directors, and executive managers, while 6,8% of the Portuguese population has this professional field.[62]

Concerning the working experience, 84% of the participants confirmed no professional experience on financial institutions, while the remaining 16% have professional experience working on financial institutions in the present or past. In addition, 63,1% of the sample confirmed having no professional working experience on legal field, while the remaining 36,9% have professional experience working on legal fields in the present or past.

Out of the total sample population, 37,8% of the sample only go on an annual basis to the bank, while 29,8% go semi-annually. It is also important to note that 12,9% of the sample never goes to the bank, while 15,1% goes monthly to the bank.

Regarding the usage of social media, 90,7% of the participants confirmed that they use social media on a daily basis, while only, 4,4% of the sample confirmed that they use it on a sporadic basis. When comparing with the Portuguese average utilization on the daily basis (82%[63]), one can observe that the sample had a significant bias in this field (8,7% above country average). A possible explanation might be the fact that the questionary was shared via social media, thus, it

[61] Data referent to 2022 and source: CGA/MTSSS-MF, PORDATA.
[62] Data referent to 2022 and source: INE/PORDATA.
[63] Data referent to 2022 and source: Statista.

is likely that the people that replied might have higher utilization of social media. Additionally, 46,2% of the participants self-assed as proficient in the mastery of new technologies.

Concerning the FinTech companies' identification: 36,9% of the participants had a coefficient of "o", thus not being able to identify any FinTechs after deducting the wrong replies; 55,1% were able to identify some FinTech, after deducting the wrong replies; and solely 8% of the participants had a score of "1", meaning that they identified all correct answers and did not get any wrong answers. As a reminder, the following formula was used to calculate the coefficients:

Coefficient = (1-|net amount of not correct answers|/total number of answers)

FinTech identification

Coefficient	Frequency	Percentage	Percentage acc.
,00	83	36,9	36,9
,25	40	17,8	54,7
,50	37	16,4	71,1
,75	47	20,9	92,0
1,00	18	8,0	100,0
Total	225	100,0	

Figure 5 - FinTech identification

In the sample collected, 45,3% (102 individuals) were FinTech clients, while the remaining 58,6% (123 individuals) were not FinTech clients. Out of the 102 individuals, 36% were female and 64% were male. In addition, the sample shows a behavior biased towards male participants becoming FinTech clients (47,4% of the male participants, 2,1% above the sample average).

5.2 Correlations between variables

For this analysis, it will be used the Pearson Coefficient of Correlation and the respective significance level (alfa = 5%, two-sided). The Pearson coefficient was chosen to test the correlation between the variables. In this way, Pearson tests linear correlations between variables, they can be positive or negatively correlated (from -1 to 1) and the correlation can be statistically significant or not. Under the Pearson test, the null hypothesis is that ρ is 0, which means that one variable does not covary with the remaining variables (Schober et al., 2018). To be noted that this test does not analyze any causality effects.

V1: Sample characteristics

Sample characteristics

		FinTech client	Gender	Age	Level of Education	Experience on financial institutions	Experience on legal field	Freq. of usage of bank's branches
FinTech client	Correlation coefficient	1	,053	-,240**	,106	,138*	,025	,038
	Sig. (2 Tails)		,429	,000	,111	,038	,705	,575
	N	225	225	225	225	225	225	225
Gender	Correlation coefficient	,053	1	,402**	-,199**	,027	,292**	,055
	Sig. (2 Tails)	,429		,000	,003	,689	,000	,415
	N	225	225	225	225	225	225	225
Age	Correlation coefficient	-,240**	,402**	1	-,189**	-,270**	,222**	,051
	Sig. (2 Tails)	,000	,000		,005	,000	,001	,443
	N	225	225	225	225	225	225	225
Level of Education	Correlation coefficient	,106	-,199**	-,189**	1	,111	-,199**	-,077
	Sig. (2 Tails)	,111	,003	,005		,098	,003	,249
	N	225	225	225	225	225	225	225
Experience on financial institutions	Correlation coefficient	,138*	,027	-,270**	,111	1	-,108	,073
	Sig. (2 Tails)	,038	,689	,000	,098		,108	,274
	N	225	225	225	225	225	225	225
Experience on legal field	Correlation coefficient	,025	,292**	,222**	-,199**	-,108	1	,159*
	Sig. (2 Tails)	,705	,000	,001	,003	,108		,017
	N	225	225	225	225	225	225	225
Freq. of usage of bank's branches	Correlation coefficient	,038	,055	,051	-,077	,073	,159*	1
	Sig. (2 Tails)	,575	,415	,443	,249	,274	,017	
	N	225	225	225	225	225	225	225

Figure 6 – Correlation results (Sample characteristics)

Two variables were statistically significant correlated with the fact of being a FinTech client: (i) Age with a negative correlation (ρ: -0.24 / P-value < 0.001), which means that the younger the person the more likely it is a FinTech client; and; (ii) Experience on financial institutions with a positive correlation (ρ: 0.138 / P-value = 0.038), meaning that a person with working experience in financial institutions is more likely to be a FinTech client. The correlation between age and the FinTech clients was in line with previous analysis in other geographies (Hu et al., 2019), and (Nguyen, 2022).

The correlation between the people that worked in financial institutions and the fact that they are FinTech clients might be explained by their higher exposure to the newer trends in the financial sector, but also due to the higher perceived knowledge on the financial markets. A study found (in their sample) that real knowledge was not correlated with being a client but rather the perceived knowledge of the people (Nguyen, 2022).

On the other hand, and in line with the findings of previous analysis by other authors in other regions, gender had no statistically significant correlation with the decision of being a FinTech client (Singh et al., 2020).

One last point regarding Figure 7, is the fact that the level of education was not statistically correlated with an individual becoming a FinTech client (ρ: -0.106 / P-value = 0.111). Previous analysis under the Portuguese market found contrary evidence (Said, 2020), however, in that study, the sample only targeted younger generations. A possible explanation for the difference on the outcome is the significant difference on the samples (age and occupation of the samples in question) and the used methodology.

- **V2: Easiness of use**

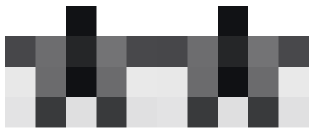

Figure 7 - Correlation results (Easiness of use)

All variables were statistically significantly correlated with the fact of being a FinTech client: (i) Simplicity and easiness of FinTech apps (ρ: 0.404 / P-value < 0.01) and (ii) easiness to access FinTech services (ρ: 0.434 / P-value < 0.01). Thus, based on this sample, the simplicity and facility to access and use the FinTech services is strongly positively associated with a client being a FinTech client.

The simplicity of the technology is seen as a key factor of success, thus, the positive association between the variables was in line with this rationale and the findings of Singh et al., 2020. As of today, transferring an account from a bank to a FinTech is not simple considering that the user data is not standardized between institutions. However, if PSD III is approved and the user data becomes standardized, it will significantly facilitate the transfer of accounts and probably change the elasticity characteristics of the sector.

- **V3: Services**

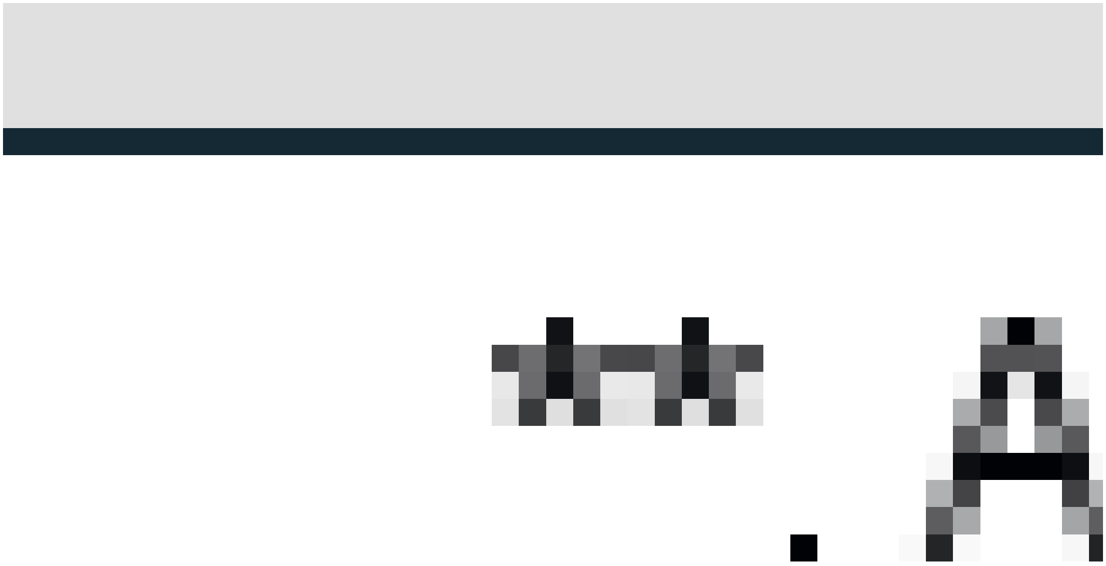

Figure 8 - Correlation results (Services)

All independent variables were statistically significantly correlated with the fact of being a FinTech client: (i) Quality (ρ: 0.390 / P-value < 0.01), (ii) Sole usage of FinTech services (ρ: 0.353 / P-value < 0.01); (iii) Utility (ρ: 0.488 / P-value < 0.01), (iv) Time saved (ρ: 0.402 / P-value < 0.01) and; (v) Necessity (ρ: 0.523 / P-value < 0.01). Overall, all independent variables were strongly positively correlated with the predictive variable (being a FinTech client), thus one can notice that the specific services of the FinTech clients are positively associated with someone being a client. The perceived utility, quality, and speed of the FinTech services is based on more advanced technology (versus traditional banking). And, in line with history, it is expected that technology will continue to grow, notably in the Information Technology (IT) field, unlocking further potential of future possible products and/or improving the current products. To exemplify, a person can open a Revolut account without leaving his home, without minimum money and within minutes until it is fully operational[64], while on Millenium BCP (the comparable version, online opening), you must have a minimum of €250, show proofs of your profession and be available for a video call on business days before opening, which overall translates in more than a day[65]. These results were also in line with Singh et al., 2020.

In addition, if PSD III is approved, FinTechs are also going to be able to access directly to payment systems (i.e., Target 2) and bank PSP cannot refuse transactions from non-bank PSP, such as FinTech. As such, the potential of FinTech services should be broader in the future.

- **V4: Government Support**

Figure 9 - Correlation results (Government Support)

In this section, solely one variable was statistically significant correlated with the fact of being a FinTech client: Direct support with a positive correlation (ρ: 0.148 / P-value < 0.05), which means that the people that believe that the state supports the services of FinTech were more

[64] Source: https://www.revolut.com/a-radically-better-account
[65] Source: https://ind.millenniumbcp.pt/pt/Documents/abertura-conta/abertura-conta-online-millennium.html

likely to be FinTech client. The remaining two variables were not significantly correlated to the decision of being a FinTech client.

Taking into account the Portuguese FinTech ecosystem, indeed there is a support from Government via the creation of Technology Free Zones, and, via Portuguese Authorities, such as the Bank of Portugal ("FinTech +"), Portugal FinLab and several other public institutions to FinTech providers. This support is done through clarification of the applicable legislation, communication channels between FinTechs and the regulators and funding in specific cases.

5.3 Independence test (Chi-square)

To test the association between independent variables and with the predictor variable, based on grouping, it was performed an independence test via the chi-square statistic. This is a non-parametric test used for non-ratio variables (i.e., ordinal, or nominal), (McHugh, 2013). The significance level (alfa) chosen for this test was 5%, where: (i) Ho: the variables are independent and (ii) Ha: the variables are not independent.

V1: Being a FinTech client and sample characteristics.

Figure 10 - Chi-Square test of independence (FinTech client and sample characteristics)

The Chi-Square statistic supports the results in the Pearson correlation analysis, with two independent variables statistically significant associated with the fact of being a FinTech client: (i) Age with a Chi-Square of 17.639 (P-value = 0.001), and (ii) Experience on financial institutions with a Chi-Square of 4.305 (P-value = 0.038).

- **V2: Easiness of use**

Figure 11 - Chi-Square test of independence (Easiness of use)

The Chi-Square statistic supports the results in the Pearson correlation analysis, with all independent variables being statistically significantly associated with the fact of being a FinTech client: (i) Simplicity and easiness of FinTech apps with a Chi-Square of 39.834 (P-value < 0.001) and (ii) easiness to access FinTech services with a Chi-Square of 45.062 (P-value < 0.001).

- **V3: Services**

Figure 12 - Chi-Square test of independence (Services)

Once again, The Chi-Square statistic supports the results in the Pearson correlation analysis, with all independent variables being statistically significantly associated with the fact of being a FinTech client: (i) Quality with a Chi-Square of 35.423 (P-value < 0.01), (ii) Sole usage of FinTech services with a Chi-Square of 31.628 (P-value < 0.01); (iii) Utility with a Chi-Square of 55.955 (P-value < 0.01), (iv) Time saved with a Chi-Square of 44.860 (P-value < 0.01) and (v) Necessity with a Chi-Square of 61.528 (P-value < 0.01).

- **V4: Government Support**

Figure 13 - Chi-Square test of independence (Government Support)

The Chi-Square statistic supports the results in the Pearson correlation analysis. Solely one independent variable was statistically significant associated with the fact of being a FinTech client: Direct support with a with a Chi-Square of 4.934 (P-value = 0.26).

5.3.1 Independence test (Chi-Square), special cases

In addition to the analysis performed between the predictor variable (being a FinTech client) and independent variables, it was also studied the relationship between specific variables. In total three tests were made based on the Chi-Square independence tests.

On the first test, the objective was to analyze if the people with experience in the legal fields had a statistically significant different view on the legislation of FinTechs in comparison with the remaining sample.

Figure 14 - Chi-Square test of independence (Experience on legal field)

The results (Figure 13) show that there is a significant association between the legal experience of a person and their view on the legislation that covers FinTechs (Chi-Square of 10,232, P-value = 0.001). In this sample people with legal experience were more favorable in their view of the governmental regulation and legislation of FinTechs. Only 6 % of the people without experience on a legal field replied that governments implemented favorable legislation for

FinTechs, while 24% of the people with legal experience had the same reply (4x more than the other group). In addition, based on the analysis of the current legislation concerning FinTechs, one can note that is not even between bank and non-bank PSPs. There are indeed some areas which have less heavy legislation (i.e., for non-bank PSP, there are several exceptions that allows them to not have a payment institution license), but on the hand they are penalized into the direct access of some payment systems.

On the second test, the objective was to analyze if the people with experience in financial institutions had a statistically significant different view on the quality, utility, and efficiency of FinTechs in comparison with the remaining sample.

Figure 15 - Chi-Square test of independence (Experience on financial institutions)

The results (Figure 14) show that there is a statistically significant association between the experience in financial institutions and their view on the time saved and necessity of FinTech services (Chi-Square of 10,309, P-value = 0.036 and Chi-Square of 4,063, P-value = 0.044 respectively). About the time saved, only 1 out of the 36 people (2.7%) with experience in financial institutions disagreed with the statement “FinTech services allow the customer to save time”. On the other hand, 30 out of the 189 people (16%) without experience in financial institutions disagreed with the statement “FinTech services allow the customer to save time”. A possible justification for this result would be that the people with experience in financial institutions have a deeper understanding of the potential and usage of the FinTech services, thus it allows them to use those services in a more efficient way.

On the last test, the objective was to analyze if specific sociodemographic characteristics (Gender, Age and Education) were associated with the perceived easiness and simplicity to use FinTech services and the respective applications.

Figure 16 - Chi-Square test of independence (Personal characteristics and Easiness of use)

The results (Figure 15) show that there is solely one statistically significant association between age and perceived easiness and simplicity to use FinTech services (Chi-Square of 43,952, P-value = 0.04 and Chi-Square of 50,950, P-value <0.01 respectively). The rationale of these results is in line with the literature review (Henriques dos Santos, 2017), where newer generations tent to adapt quicker to new technologies, especially the ones focused on simplicity and sustainability.

Moreover, neither Gender nor the level of education shown any statistically significant association with the perceived easiness and simplicity to use FinTech services. This result was in line with similar analysis on other geographies (Sakhare et al., 2023).

6 STUDY LIMITATIONS AND CONCLUSION

6.1 Study limitations

This thesis presents some limitations related to the methodology, sample, bibliography, and regulation. It is worth having these limitations when one is analyzing the results and conclusions of this study.

The first limitation is related to the sampling method used. As mentioned before, it was used a convenience sample, thus it was not random, which might lead to some bias. This was confirmed during the descriptive statistics analysis, where it was shown that the sample had a slight age bias (4 years older than average population), a gender bias (towards male participants), education bias (more educated on average than the Portuguese population) and a professional biased (Professions linked to Armed Forces or personal, protection and security services had twice the weight in total professions compared with the country average).

The second limitation relates to the anonymity of the survey. The survey was completely anonymous; thus, it was not possible to confirm any reply. This anonymity makes it impossible to correct any misleading or non-accurate replies. Moreover, it is possible to speculate that in questions related to self-evaluate the participant skills or achievements, that there might be the presence of a self-enhancement bias (Krueger, 1998). Under this behavior bias, the participant exaggerates their skills in order to appear closer to the perception of social norms.

The third limitation concerns the methods used during the statistical analysis. The Pearson correlation test is robust statistical test and supported by literature. However, it has some limitations: (i) it only analyses the correlation and not causality, meaning that it is only possible to observe if variables are correlated, while it is not possible if there is any cause effect relationship; (ii) it only analyses linear relationships, thus all non-linear relationships are not considered under this test.

The fourth limitation concerns the available information on the Portuguese FinTech ecosystem, notably related to the bibliography. In addition, most of the information available related to reports from public institutions and consulting companies. This might be explained by the limited size of the Portuguese market in comparison with the main FinTech hubs (i.e., United States of America and United Kingdom).

The fifth limitation concerns with the regulation considering that we are currently on a turning point on the payment sector regulatory landscape. By having only, the proposal on the new EU legislation package related to the payment sector, there is no guarantee that there won´t to be an amendment to the current legislation framework.

6.2 Conclusion

FinTech can be characterized as a company that focus and promotes financial services and products with the use of new and advanced technology. In this understanding, FinTech connects both Finance and Technology. Although FinTech is a recent topic, its evolution traces back to the 19th century when financial globalization was first developed.

Following the global financial crisis of 2008, the perception of customers on the financial system deteriorated, especially on the banking system with the collapse of several banks, which led to a shift on the behavior of the customers. As a consequence of the financial crisis, regulation on the financial system, in particular, on the banking sector, got stricter. This has allowed an opportunity for new players to emerge, such as, FinTechs.

The Portuguese FinTech ecosystem has experienced substantial growth in the recent years, notably concerning the significant investments and valuations regarding FinTech companies. The majority of the Portuguese FinTechs primarily engage in sectors of activity similar to the ones from traditional banks, including, lending and credit, and payments.

Currently FinTechs can be seen as a thread to the existing players in the financial markets, however, they can also be understood as an opportunity. Research points out that there is a FinTech Revolution happening and banks are approaching FinTechs in several forms, including, partnerships, venture capital investment and acquisition of FinTech firms.

6.2.1 Legislation

As FinTechs continue emerging all over the world, regulators are assessing how to update the current legislation while also promoting the development and growth of FinTechs. As a way of understanding FinTechs, regulators have been promoting several initiatives, such as, regulatory sandboxes and innovation hubs. Portugal is no exception to this reality, and, in fact, regulators have been promoting collaboration and fostering the growth of FinTechs.

The Portuguese Government and the three supervisory authorities have been promoting initiatives, fostering financial innovation and cooperation in the financial markets. Currently, Portugal is considered as an emerging FinTech hub within the European Union.

The regulatory framework of the Portuguese financial sector is multi-layered as it involves a national, an European and an international layer. The national layer comprises the three supervisory authorities overseeing the financial markets in Portugal, including (i) the Bank of Portugal, acting as the Portuguese Central Bank, (ii) the Portuguese Securities Market Commission (CMVM), acting as authority in charge of securities markets, and (iii) the Insurance and Pension Funds Supervisory Authority (ASF), acting as authority in charge of insurance and pension funds.

The regulatory landscape on the EU payment sector went through significant changes following the emergence of FinTechs as new players in the financial markets. In particular, PSD II was key on the payment sector, as a way of fostering competition and cooperation between the financial players, including FinTechs. However, PSD II unveiled issues concerning the exposure of users to fraud, the issue concerning the regulations on a national layer, and the difference between bank payment providers and non-bank institutions. As such, the European Commission proposed a new EU legal framework on the payment sector with the implementation of PSD III, and PSR.

As per the principle of proportionality in regulation, the focus is not on the type of entity, rather on the activities undertaken by these entities. It is not concerned if the entity is FinTech or not, but rather its products and services. Payment institutions, including Payment FinTechs, are subject to the Payment Services and E-Money Legal Framework (PSEMLF), while, credit institutions, such as banks, are subject to the Portuguese General Framework for Credit Institutions and Financial Companies, also known as Banking Law. Both payment and credit institutions must obtain authorization before starting operations: for payment institutions, the authorization must come from the Bank of Portugal, and, for credit institutions, the authorization must be from both the Bank of Portugal and the European Central Bank.

The regulatory landscape concerning payment institutions have a high degree of harmonization among the EU countries. European regulations and directives play a key role in each EU member state legal framework. Depending on the type of legislation, if it is a regulation or directive, it will apply directly to the countries, or it will need to be transposed to the country's legislation.

An event known as regulatory disconnection is occurring, meaning that regulators are not able to move as fast as financial innovation does. As a way of mitigating this disconnection and fostering financial innovations, the implementation of regulatory sandboxes was considered as a solution, allowing an understanding from a regulatory point of view on the innovative products and services promoted by FinTechs.

Overall, the Portuguese regulatory landscape for FinTechs is considered to be underregulated, as the supervisory authority struggle to keep up with the pace of the evolution of financial innovation. Nonetheless, the Portuguese authorities are invested to promote initiatives to mitigate the regulatory disconnection. In addition, on a European level, it is seen as very positive the proposal of the new legislation package for the payment sector (PSD III and PSR).

6.2.2 Statistical results

In terms of statistical tests, a Pearson correlation coefficient was performed to explore the relationships between variables. Age (negatively) and experience in financial institutions (positively) were found to be correlated with an individual becoming a FinTech client, whereas Gender did not display a significant correlation. Additionally, variables related to the Ease of use, Services offered, and Government support showed significant positive correlations with an individual becoming a FinTech client.

The Chi-Square independence test was performed to test the independence between the variables. These tests supported the findings from the Pearson correlation analysis. Notably, Age and Experience in financial institutions were identified as factors associated with an individual becoming a FinTech client.

Further Chi-Square tests were conducted to investigate specific relationships. People with professional experience in legal fields was found to be associated with a more favorable view of governmental regulation for FinTechs. Participants with professional experience in financial institutions shown stronger a more optimistic view on the timesaving and necessity of FinTech services.

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8 APENDIX

8.1 Questionnaire

The below questionnaire was a survey shared in this thesis. There were two languages available (Portuguese and English), however, the English version was a translation from the Portuguese questionnaire.

Evolução e adoção das *FinTechs* no sistema bancário português

Caro/a participante,

No contexto do meu Mestrado em Direito e Mercados Financeiros na Universidade Nova de Lisboa (NOVA LAW), gostaria de pedir a sua colaboração no seguinte questionário.
O objetivo do questionário é estudar a evolução e adoção das *FinTechs* no sistema bancário português.

A sua participação é voluntária,
anónima e confidencial, na qual não existem respostas certas ou erradas às questões colocadas. Os dados recolhidos destinam-se a tratamento
estatístico e nenhuma resposta será analisada ou reportada individualmente.

Muito obrigado pela sua participação,

Mariana Andrade

* Indica uma pergunta obrigatória

1. Qual é o seu género? *

Marcar apenas uma oval.

- Feminino
- Masculino
- Outro
- Não respondo

2. Qual é a sua idade? *

____

3. Qual é o seu nível de escolaridade? *

Marcar apenas uma oval.

- Nível de escolaridade obrigatória (12º ano) ou menor
- Licenciatura
- Mestrado
- Doutoramento

4. Qual é a sua ocupação? *

Marcar apenas uma oval.

- Trabalhador
- Estudante
- Doméstico / Inativo
- Desempregado
- Reformado / Pensionista

5. Qual é o seu ramo profissional? *

Marcar apenas uma oval.

- Profissões das Forças Armadas ou de serviços pessoais, de protecção e segurança
- Representantes do poder legislativo e de órgãos executivos, dirigentes, directores e gestores executivos
- Especialistas das atividades intelectuais e científicas
- Técnicos e profissões de nível intermédio
- Pessoal administrativo
- Trabalhadores qualificados da agricultura, da pesca, da floresta, indústria, construção e artífices
- Operadores de instalações e máquinas e trabalhadores da montagem
- Trabalhadores não qualificados
- Outro

6. Trabalha ou já trabalhou numa instituição financeira? *

Marcar apenas uma oval.

- Sim
- Não

7. Trabalha ou já trabalhou numa área legal? *

Marcar apenas uma oval.

- Sim
- Não

8. Com que frequência se dirige a um banco? *

Marcar apenas uma oval.

- Semanalmente
- Mensalmente
- Semestralmente
- Anualmente
- Nunca

9. Com que frequência usa as redes sociais? *

Marcar apenas uma oval.

- Diariamente
- Semanalmente
- Esporadicamente
- Nunca

10. Como classificaria o seu domínio das novas tecnologias? *

Marcar apenas uma oval.

Pouco proficiente

- 1
- 2
- 3
- 4
- 5

Muito proficiente

11. Das seguintes empresas, quais são *FinTechs*: *

Marcar tudo o que for aplicável.

- Caixa Geral de Depósitos
- Millennium BCP
- Revolut
- Go Parity
- Novo Banco
- Doutor Finanças
- Banco BPI
- Coverflex

Finalidade do uso dos serviços providenciados por *FinTechs*

Caso o participante desconheça o conceito de *Fintechs*, refira-se ao seguinte conceito: empresas que combinam finanças e tecnologias nos seus produtos e serviços.

12. Através de que meios realiza a suas transações bancárias? *

Marcar tudo o que for aplicável.

- [ ] Balcão
- [ ] Canais digitais (excepto smartphones)
- [ ] Multibanco / ATM
- [ ] Smartphone
- [ ] E-mail
- [ ] Outros

13. Que importância atribui à utilização do telemóvel nas suas transações bancárias (Smartphone ou aplicação móvel de online banking)? *

Marcar apenas uma oval.

Nada importante

1 ◯
2 ◯
3 ◯
4 ◯
5 ◯

Bastante importante

14. Está ciente da presença de *FinTechs* no setor financeiro? *

Marcar apenas uma oval.

◯ Sim
◯ Não
◯ Não sei

15. Já realizou alguma transação bancária através de *FinTechs*? *

Marcar apenas uma oval.

◯ Sim
◯ Não
◯ Não sei

16. Sabe como funcionam as moedas digitais (criptomoedas), como *Bitcoin* e *Litecoin*? *

Marcar apenas uma oval.

◯ Sim
◯ Não

17. Caso já utilize os serviços das *FinTechs*, quão provável é continuar a utilizar esses serviços? *

Marcar apenas uma oval.

Muito improvável

1 ◯
2 ◯
3 ◯
4 ◯
5 ◯

Muito provável

18. Quão provável seria recomendar os serviços das *FinTechs* aos seus amigos e família? *

Marcar apenas uma oval.

Muito improvável

1 ⬭

2 ⬭

3 ⬭

4 ⬭

5 ⬭

Muito provável

19. Caso seja cliente de *FinTechs*, indique os motivos mais relevantes que o levaram à sua escolha? *

Marcar tudo o que for aplicável.

- [ ] Comodidade
- [ ] Facilidade na abertura de conta
- [ ] Produtos mais inovadores
- [ ] Menos custos
- [ ] Melhor qualidade serviço
- [ ] Melhor experiência online face aos bancos
- [ ] Mais segurança na experiência online
- [ ] Não aplicável - Não sou cliente de nenhuma FinTech

20. Se não é cliente de *FinTechs*, mas utiliza serviços do seu banco online, indique os motivos mais relevantes: *

Marcar tudo o que for aplicável.

- [ ] Estou contente com o meu banco
- [ ] Desconhecia esta oferta para serviços financeiros
- [ ] É difícil mudar de prestadores de serviços
- [ ] Os serviços prestados pelas Fintechs são limitados
- [ ] Não aplicável - Sou cliente FinTech

Serviços das *FinTechs* e serviços dos bancos tradicionais

21. As *FinTechs* são capazes de providenciar melhores produtos e serviços do que os bancos tradicionais. *

Marcar apenas uma oval.

Discordo totalmente

1 ⬭

2 ⬭

3 ⬭

4 ⬭

5 ⬭

Concordo totalmente

22. No caso das *FinTechs* providenciarem melhores serviços do que os bancos tradicionais, quão disposto está para fazer todas as transações através das *FinTechs*? *

Marcar apenas uma oval.

Muito improvável

1 ⬭

2 ⬭

3 ⬭

4 ⬭

5 ⬭

Bastante provável

23. No geral, os serviços das *FinTechs* são úteis para o cliente. *

Marcar apenas uma oval.

Discordo totalmente

1 ⬭

2 ⬭

3 ⬭

4 ⬭

5 ⬭

Concordo totalmente

24. Os serviços das *FinTechs* permitem poupar tempo ao cliente. *

Marcar apenas uma oval.

Discordo totalmente

1 ⬭

2 ⬭

3 ⬭

4 ⬭

5 ⬭

Concordo totalmente

25. Acredita que os serviços providenciados pelas *FinTechs* são adequados para atender às suas necessidades? *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

26. As aplicações das *FinTechs* são simples e intuitivas. *

Marcar apenas uma oval.

Discordo totalmente

1
2
3
4
5

Concordo totalmente

27. É fácil aceder aos serviços das *FinTechs* (telemóvel, aplicações, internet, etc.). *

Marcar apenas uma oval.

Discordo totalmente

1
2
3
4
5

Concordo totalmente

Confiança e risco

28. Confia mais nos bancos tradicionais do que nas *FinTechs* para as suas transações e tratamento dos seus dados pessoais? *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

29. A sua confiança nas *FinTechs* melhorará caso começem a ser supervisionadas ao mesmo nível que os bancos tradicionais? *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

30. Qual a probabilidade de existir violação de dados pessoas por invasores externos, através das plataformas das *FinTechs*? *

Marcar apenas uma oval.

Muito improvável

1
2
3
4
5

Muito provável

Apoio do Governo

31. O Governo apoia e suporta o uso dos serviços providenciados por *FinTechs*. *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

32. O Governo introduziu legislações e regulações favoráveis ao uso de serviços providenciados por *FinTechs*. *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

33. O Governo é ativo no desenvolvimento de infraestruturas, tais como, telecomunicações, o qual tem um impacto positivo na promoção de serviços de *FinTechs*. *

Marcar apenas uma oval.

- Sim
- Não
- Não sei

Relação entre FinTechs e Bancos

34. Como vê a relação entre os bancos tradicionais e as *FinTechs*: parceiros e/ou concorrentes: *

Marcar apenas uma oval.

- Parceiros
- Concorrentes
- Parceiros e concorrentes
- Não sei