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**An Investigation on the Impact of the Revised  
Payment Services Directive (PSD2) on Payment  
Services in Ireland**

**MSc Research Project**

**MSc. FinTech**

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# An Investigation on the Impact of the Revised Payment Services Directive (PSD2) on Payment Services in Ireland

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## **Abstract**

This study investigates the impact of the Revised Payment Services Directive (PSD2) on payment services in Ireland. Enacted in January 2018 to promote competition, innovation, and security in the payment services market, PSD2's outcomes are explored through an extensive analysis of regulatory changes, market competition, innovation, consumer protection, and financial inclusivity. The research evaluates PSD2's implementation effectiveness, its influence on market dynamics, and implications for payment service providers (PSPs) and consumers. Findings highlight the rise of new PSPs, their effects on traditional institutions, increased technological innovations, and improved consumer protection measures. The investigation underscores that statistical significance doesn't always mirror practical significance; qualitative and industry factors may contribute to unquantifiable changes. The study enriches academic discourse on payment services regulation, providing insights for policymakers, regulators, and industry stakeholders. An exhaustive comprehension of PSD2's impact necessitates a multidimensional assessment encompassing both quantitative and qualitative dimensions.

Keywords: Revised Payment Services Directive, Ireland, Payment Services

## **1 Introduction**

The financial industry has been undergoing significant transformations in recent years, driven by advancements in technology and evolving customer expectations. One notable development is the revised Payment Services Directive (PSD2), an European Union directive that aims to foster competition, innovation, and security in the payment services market. As an EU member state, Ireland has implemented the PSD2 directive, making it essential to examine the impact of these regulatory changes on payment services within the country.

## 1.1 Background of the study

The Payment Services Directive (PSD) was initially introduced in 2007 to establish a single framework for payment services across the European Union (EU). In response to the evolving landscape of financial services, the European Commission revised the directive, leading to the introduction of PSD2 in January 2018. The first Payment Service Directive was established on December 25, 2007. While this directive improved the convenience of use of digital payments across Europe, the rapid growth of digital activities and the lack of appropriate, relevant regulations to new technologies calls for an urgent need for a regulation that will eliminate the current difficulties of digital payment.

It was established by (Rupeika-Apoga and Wendt, 2021) that the current situation of financial regulations, which does not adequately cater for FinTech-specific characteristics, is a major setback to FinTech development. This was further buttressed by (Kharisma, 2020) in his study on the financial regulation in Indonesia, where he argued that the existing regulations only focus on the technical aspects of the financial system, hence the need to urgently formulate FinTech specific regulations. A few other researchers have also expressed the need for the review of the existing financial regulations to enhance FinTech growth.

Similarly, regulation plays a major role in the improvement of the security of remote payments. This in turn reduces the rate of fraud on card remote payments by 60%, and e-money payments by 80%. It has also saved customers from being defrauded to the tune of several millions of Euros (Cologgi, 2023). This is one of the reasons that the European Central Bank (ECB) reviewed the Payment Service Directive and implemented a revised regulation known as the Revised Payment Service Directive (PSD2) (Sadowski, 2021). The fact that the first Payment Service Directive could not ease cross-border payments also gave reasons for the implementation of PSD2 (Brenner, 2018). PSD2 was implemented as an amendment to the first Payment Service Directive (PSD1) to provide more advanced payment services, increase competition, and level the playing field for payment service providers. It aimed to address emerging challenges and capitalize on new opportunities in the payment services industry.

In contrast to the first Payment Service Directive, PSD2 permits third-party service providers to access the data of traditional banks' existing customers while ensuring customer protection against fraud, safer and more convenient digital payments, and encouraging innovation in the payment service industry. PSD2 is a mandatory directive for financial institutions operating in Europe, including Ireland. These institutions must provide Account Information Service (AIS), Payment Initiation Service (PIS), and Fund Availability Confirmation Service (FACS) to third-party service providers in an unbiased manner. This has helped to eliminate the data advantage held by traditional banks, as they are now required to make their data available to third parties. It has also helped to level the playing field for payment service providers (Rosati et al., 2022).

The aim of this study is to evaluate how well the Revised Payment Service Directive (PSD2) has performed in Ireland by examining its impact on major factors such as Security of payments, Innovation, Competition and Profitability, in the Republic of Ireland. The research will help to determine whether PSD2's objectives are being met and it will identify areas for improvement to inform regulatory decisions. To the best of the author's knowledge, there is no

known previous work where the performance of PSD2 was evaluated in Ireland. The author, having worked for over 10 years in the field of financial regulation across Africa is hence motivated to conduct this study, to understand how PSD2 has affected the Irish payment services industry.

## **1.2 Justification of the study**

The justification behind the investigation is to understand and evaluate the impact of PSD2 on payment services in Ireland. By examining the implementation and outcomes of the revised directive, we can gain valuable insights into the effects on various stakeholders, including payment service providers (PSPs) and consumers. This investigation will contribute to the existing body of knowledge on payment services regulation and provide relevant information to policymakers, regulators, and industry participants.

## **1.3 Research question**

The research will seek to provide answer to the question:

- “To what extent has the revised Payment Service Directive (PSD2) impacted on payment services in Ireland?”

## **1.4 Research objectives**

The research seeks to

- Evaluate the performance of PSD2 in Ireland and how it has affected payment services since its implementation.
- Identify possible gaps and regulatory challenges facing payment services and provide recommendations to inform further regulatory actions.

## **1.5 Significance of the study**

Understanding the impact of the revised Payment Services Directive (PSD2) on payment services in Ireland holds significant importance for various stakeholders. This research is expected to contribute to the following areas:

1. Academic Contribution: By conducting this investigation, we will add to the academic literature on payment services regulation, particularly within the context of PSD2. The findings will provide insights into the effectiveness of the directive's implementation and shed light on its impact on different aspects of the payment services ecosystem.
2. Industry and Policy Implications: The investigation's results will provide valuable information to policymakers, regulators, and industry participants in Ireland. Understanding the impact of PSD2 will enable them to make informed decisions, address challenges, and identify opportunities for innovation, competition, and consumer protection in the payment services market.

3. **Consumer Awareness and Protection:** Evaluating the impact of PSD2 on consumer protection, security, and trust in payment services is crucial. The findings will contribute to raising awareness among consumers regarding their rights and the security measures implemented under PSD2, ultimately enhancing their confidence in utilizing payment services.

This research aims to assess the impact of the revised Payment Services Directive (PSD2) on payment services in Ireland. By achieving the research objectives outlined above, this study will contribute to academic knowledge, industry and policy discussions, and consumer awareness.

## **1.6 Structure of the research**

The second chapter of this report will delve into the regulatory changes, market competition, innovation, consumer protection, and financial inclusion aspects, providing a comprehensive analysis of the impact of PSD2 on payment services in Ireland.

The third chapter of this investigation will delve into specific methodologies and findings, contributing to a comprehensive understanding of the impact of PSD2 on payment services in Ireland.

## **2 Related Work**

The revised Payment Services Directive (PSD2) represents a significant regulatory development in the European Union (EU) aimed at transforming the payment services market. This literature review explores existing research and scholarly works related to the impact of PSD2 on payment services in Ireland, providing insights into the directive's implementation, market dynamics, consumer protection, and financial inclusion aspects.

The implementation of the revised Payment Service Directive (PSD2) has transformed the financial system in Europe. With the emergence of new payment service providers, traditional banks have been forced to come up with various innovations in order to remain competitive (Brener, 2018). A significant factor in this transformation is the free access to data granted by PSD2, which allows payment service providers to have access to customer data from traditional banks and use it to develop new products and services for a more convenient payment system (Ferretti, 2022). This has resulted to an increase in digital innovations in financial services while reducing the need for physical interactions between customers and financial institutions (Malinka et al., 2022). This study aims to evaluate the impact of PSD2 on payment services in the Republic of Ireland.

In a study that was conducted, (Ahuja et al., 2019) summarized the lessons learnt from the experience that Ireland had during the European Financial Crisis. The study assessed the internal response, government intervention, and steps taken to transform financial regulation in Ireland and further enhance the stability and efficiency of the system. The study provided several important recommendations to prevent a repeat of the shock that was experienced during the 2008-2012 financial crises. One major recommendation is to enhance regulatory

oversight and foster a more realistic view of the financial system, which is relevant to the implementation of PSD2.

## **2.1 Impact of PSD2 on Payment Services Regulation**

The literature highlights the regulatory changes introduced by PSD2 and their implications for payment service providers (PSPs). (Vila et al., 2013) emphasize that PSD2 mandates the implementation of strong customer authentication (SCA) to enhance transaction security and protect consumers from fraud. Moreover, (Premchand & Choudhry, 2018) explain that PSD2 encourages the adoption of Application Programming Interfaces (APIs), enabling third-party providers (TPPs) to access account information and initiate payments with customer consent. This API-driven approach promotes collaboration and innovation among financial institutions and fintech startups, fostering competition and a more open and interconnected payment services ecosystem. This section explores the key impacts of PSD2 on payment services regulation:

- **Open Banking and Third-Party Providers (TPPs):** One of the central aspects of PSD2 is the introduction of open banking, which allows third-party providers (TPPs) to access consumers' payment accounts with their explicit consent (Cocco, Pinna and Meloni, 2020). This API-driven approach encourages collaboration between traditional banks and fintech startups, leading to increased competition and the emergence of innovative payment services. Research by (Preziuso et al., 2023) highlights that open banking provisions have paved the way for new business models and the development of innovative payment solutions, benefitting consumers and promoting market dynamism.
- **Prohibition of Surcharge Fees:** PSD2 prohibits merchants from imposing surcharge fees on consumers for using specific payment instruments, such as credit or debit cards. This provision aims to promote fair and transparent pricing for payment services, safeguarding consumers from additional costs during transactions. (Pintér et al., 2021) emphasize that the prohibition of surcharge fees has led to a more fintech innovations and openness of payment network.
- **Access to Account (XS2A):** The XS2A provision under PSD2 grants consumers the right to authorize third-party providers (TPPs) to access their account information and initiate payments on their behalf. This empowerment of consumers with greater control over their financial data and transactions is seen as a pivotal aspect of PSD2. (Premchand & Choudhry, 2018) highlight that XS2A has driven innovation and the development of personalized financial services, benefiting consumers with tailored payment solutions.
- **Regulatory Technical Standards (RTS):** To ensure uniform application and compliance with PSD2 across the EU, the European Banking Authority (EBA) developed Regulatory Technical Standards (RTS). These technical guidelines provide detailed requirements for aspects such as strong customer authentication, secure communication, and access interfaces for TPPs. The RTS has played a crucial role in guiding the implementation of PSD2's provisions, ensuring consistency and adherence to regulatory standards.



The impact of PSD2 on payment services regulation has been transformative, driving changes in the industry's competitive landscape, transaction security, consumer protection, and data privacy. The introduction of open banking and access to account provisions has facilitated collaboration between traditional banks and innovative fintech startups, fostering market dynamism and encouraging the development of new payment services. Additionally, SCA and the prohibition of surcharge fees have enhanced transaction security and transparency, providing consumers with a safer and more cost-effective payment experience. Overall, PSD2's regulatory impact has contributed to a more innovative, competitive, and consumer-centric payment services market in the EU.

## **2.2 Market Competition and Innovation**

The impact of PSD2 on market competition and innovation is a prominent area of study. (Cosma et al., 2023) find that PSD2 has facilitated the entry of new players into the payment services market in Ireland, stimulating competition and leading to the development of novel payment solutions. The emergence of TPPs leveraging Open Banking APIs has challenged traditional financial institutions (TFIs) such as banks, as noted by (Pintér et al., 2021). These changes have encouraged TFIs to explore new partnerships and technological advancements to remain competitive.

- **Increased Market Competition:** PSD2's provisions, such as open banking and access to account (XS2A), have opened up the payment services market to new players, leading to increased competition. Fintech startups and third-party providers (TPPs) now have the opportunity to access consumers' account information with their consent, allowing them to offer innovative payment services. This has created a more dynamic and diverse market, challenging traditional banks and established PSPs to adapt to the changing landscape. (Cosma et al., 2023) highlight that the entry of new PSPs under PSD2 has intensified competition and driven incumbents to improve their services and customer offerings to remain competitive.
- **Emergence of Innovative Payment Solutions:** PSD2's focus on open banking and data sharing has spurred innovation in the payment services sector in Ireland. With the XS2A provision, TPPs can offer personalized financial services, such as budgeting apps, account aggregation, and payment initiation services. This has led to the development of innovative payment solutions that cater to specific consumer needs. (Wolters & Jacobs, 2019) point out that non-banking entities have capitalized on the opportunities provided by PSD2 to offer creative and user-friendly payment services, transforming the way consumers manage their finances.
- **Collaboration and Partnerships:** PSD2 has encouraged collaboration between traditional banks and fintech startups to enhance their service offerings and tap into each other's strengths. Traditional banks have recognized the potential of partnering with fintech firms to leverage their agility and innovation capabilities. By collaborating, they can provide customers with a broader range of services, including seamless payment experiences and value-added financial products. This collaboration has led to the emergence of innovative payment platforms and solutions in the market.

- **Challenges for Traditional Institutions:** While PSD2 has facilitated innovation and competition, it has also posed challenges for traditional financial institutions. Traditional banks, which once held a dominant position in the payment services market, now face increased competition from agile and tech-savvy fintech startups (Pintér et al., 2021).

The revised Payment Services Directive (PSD2) has had a profound impact on market competition and innovation in payment services in Ireland. The provisions of open banking, access to account (XS2A), and collaboration between traditional institutions and fintech startups have led to increased competition, fostering a more dynamic and innovative payment services landscape. New players have entered the market, offering personalized and user-friendly payment solutions, while traditional banks have been pushed to adapt and improve their offerings to maintain their competitive edge. PSD2's focus on competition and innovation has resulted in a more diverse range of payment services, benefitting consumers and transforming the financial services industry in Ireland.

### **2.3 Consumer Protection and Security**

The literature review also addresses the impact of PSD2 on consumer protection and transaction security. Research by (Cologgi, 2023) shows that the implementation of SCA under PSD2 has significantly reduced fraudulent activities in online transactions by 60%. Moreover, (Pintér et al., 2021) highlight the importance of educating consumers about the innovation and security to enhance consumer trust and confidence in using payment services.

- **Strong Customer Authentication (SCA):** The additional layer of security SCA implements helps prevent unauthorized access to consumers' payment accounts and protects against fraudulent activities, such as unauthorized transactions and identity theft. As a result of SCA implementation, consumers in Ireland have experienced improved transaction security and increased confidence in using digital payment methods (Vila et al., 2013).
- **Data Privacy and Consent Management:** PSD2 places a strong emphasis on data privacy and consumer consent. The Access to Account (XS2A) provision allows consumers to grant third-party providers (TPPs) access to their payment account data with their explicit consent. This ensures that consumers have control over their financial data and can choose which TPPs they want to share their information with. PSD2 lacks comprehensive safeguarding for users' data, with limitations on account access and GDPR compliance. The expansive definition of "account information service" fosters innovation but also allows providers to circumvent restrictions. Additionally, PSD2 neglects to address the privacy implications of large-scale processing of account information PSD2 lacks comprehensive safeguarding for users' data, with limitations on account access and GDPR compliance. The expansive definition of "account information service" fosters innovation but also allows providers to circumvent restrictions. Additionally, PSD2 neglects to address the privacy implications of large-scale processing of account information.

- **Transparency in Payment Services:** PSD2 emphasizes transparency in payment services, requiring PSPs to provide clear and easily understandable information to consumers about transaction fees, charges, and currency conversion costs. This transparency enables consumers to make well-informed decisions about the payment services they use, contributing to fair and transparent pricing. Scholarly literature concerning financial technologies suggests that the process of digitalization plays a pivotal role in enhancing financial transparency. This is achieved through the improvement of business record-keeping practices and the reduction of transaction costs (Setor et al., 2021).

The implementation of PSD2 in Ireland has significantly enhanced consumer protection and transaction security in the payment services market. Strong Customer Authentication (SCA) has been instrumental in preventing fraud and unauthorized access to payment accounts. The emphasis on data privacy and consent management through XS2A has given consumers greater control over their financial data. Clear liability rules and dispute resolution mechanisms provide consumers with peace of mind in case of unauthorized transactions. Additionally, the transparency requirements have enabled consumers to make informed choices about payment services, contributing to a more secure and trustworthy payment ecosystem in Ireland.

#### **2.4 Financial Inclusion and Access to Payment Services**

An essential aspect of PSD2 is its potential to enhance financial inclusion by promoting access to payment services for underserved populations. However, (Wolters & Jacobs, 2019) caution that while PSD2 creates opportunities for innovative solutions tailored to specific customer needs, challenges related to data privacy and consent management may hinder the full realization of financial inclusion goals.

- **Empowering New Payment Service Providers (PSPs):** PSD2 has facilitated the entry of new payment service providers, including fintech startups and innovative third-party providers (TPPs). These new entrants have introduced user-friendly and cost-effective payment solutions that cater to specific customer needs. The presence of technology-driven PSPs has expanded the range of services available to consumers, including those previously underserved by traditional banks. As a result, consumers in Ireland now have access to a diverse set of payment options, promoting financial inclusion (Cosma et al., 2023).
- **Inclusive Payment Solutions for Underserved Populations:** The Access to Account (XS2A) provision of PSD2 has been instrumental in promoting financial inclusion by enabling consumers to authorize TPPs to access their account information. This has led to the development of inclusive payment solutions that cater to underserved populations, such as those with limited access to traditional banking services. Fintech startups have leveraged this provision to offer services like account aggregation, budgeting apps, and personalized financial advice, empowering consumers with better financial management tools (Salampasis & Mention, 2018).

- **Reduction of Barriers to Entry:** By standardizing regulations and opening up the payment services market, PSD2 has reduced barriers to entry for new players. The reduced cost and complexity of entering the market have encouraged more entities to offer payment services. This has led to greater competition, better service offerings, and lower transaction costs, benefiting all consumers (Cosma et al., 2023).
- **Digital Payments for Financial Inclusion:** PSD2's focus on digital payments has made it easier for consumers in Ireland, including those in rural or remote areas, to access financial services. The widespread adoption of mobile devices and digital platforms has made it convenient for consumers to conduct transactions and access financial products without the need for physical bank branches. This shift to digital payments has also enabled the provision of financial services to previously unbanked or under banked individuals, contributing to financial inclusion (Frączek & Urbanek, 2021).
- **Enhanced Payment Services for Vulnerable Groups:** PSD2 has encouraged PSPs to develop solutions that cater to the needs of vulnerable groups, such as the elderly and people with disabilities. These solutions prioritize accessibility and usability, ensuring that all individuals can easily access and use payment services. For instance, innovative payment methods that support voice recognition or biometric authentication have improved the accessibility of payment services for those with physical impairments (Lee et al., 2023).
- **Increased profitability:** PSD2 increases profitability by enabling payment service companies to provide more convenient and tailored financial products through the open banking platforms. The Open Banking platforms will improve the financial wellbeing of the increasing number of the underserved population in the EU, which is currently around 25% of its population. When financial inclusion is improved, profitability will also be increased (Preziuso et al, 2023). Similarly, in a study that assesses the opportunities and threats that banks may face when they adopt Open Banking, Guibaud (2016) argues that despite the risk that PSD2 has brought with third parties having access to bank accounts, a more proactive approach on how banks work with third parties and other banks could create services that will make them attract more customers, thereby increasing their revenue.

The implementation of PSD2 in Ireland has had a positive impact on financial inclusion and access to payment services. The entry of new payment service providers, along with the inclusive and innovative payment solutions they offer, has expanded the range of services available to consumers. The Access to Account (XS2A) provision has empowered consumers with greater control over their financial data, enabling personalized financial services. Moreover, the reduction of barriers to entry and the focus on digital payments have made financial services more accessible, particularly for underserved and vulnerable populations. Overall, PSD2 has contributed to fostering financial inclusion and improving access to payment services in Ireland.

The literature review showcases the significant impact of the revised Payment Services Directive (PSD2) on payment services in Ireland. Scholars have extensively researched the

regulatory changes, market competition, innovation, consumer protection, and financial inclusion aspects related to PSD2. The directive's implementation of SCA and the adoption of APIs have paved the way for a more competitive and innovative payment services landscape, driven by the entry of new players and partnerships between traditional financial institutions and fintech startups. Furthermore, PSD2's emphasis on consumer protection and transaction security has improved consumer trust and confidence in payment services. While PSD2 has potential implications for financial inclusion, it also presents challenges in data privacy and consent management.

### **3 Research Methodology**

This study will adopt a mixed-method research design, combining both qualitative and quantitative approaches. The qualitative component will involve conducting semi-structured interviews with key stakeholders, while the quantitative aspect will consist of distributing online surveys to a diverse sample of payment service providers (PSPs) and consumers in Ireland. This comprehensive approach will enable a thorough exploration of the impact of PSD2 on payment services, providing both in-depth insights and statistical data.

This study investigates the impact of PSD2 on payment services in Ireland. It was conducted by issuing questionnaires to customers and stakeholders in the payment service industry in Ireland. The questionnaire was constructed to ask questions that will address the research question. It covers the growth of payment service businesses, the security of customers and data protection, Innovation, profitability, and competitiveness amongst the payment service providers.

#### **3.1 Target Population**

The target population for the questionnaire consists of individuals and stakeholders aged 18 to 60 who reside in Ireland and adopted the PSD2 or have been influenced by its adoption. This group was selected to investigate their opinions regarding the impact the adoption of the PSD2 has had.

#### **3.2 Scale and Measurement**

The survey employed a five-point Likert scale, ranging from "Strongly Agree" to "Strongly Disagree," to elicit precise input from participants. It was organized into sections that sought participants' perspectives on numerous factors of impact of PSD2 on payment service providers and customers. To ensure data accuracy, the survey included several slightly varied questions to confirm the completeness and consistency of participants' responses. This approach was employed to verify that all survey questions were addressed by the participants.

### **3.3 Data Collection**

There were two sets of questionnaires issued to two different groups. The first questionnaires were distributed to payment services providers, compliance officers in financial institutions and businesses. The other set of questionnaires were distributed to customers who use PSD2 to facilitate transaction for goods and services. There were 117 responses gathered from customers and 53 stakeholders gave their feedback.

### **3.4 Hypothesis**

H1: PSD2 has improved the security for customers in relation to payment services in Ireland.

H2: PSD2 has improved the competitiveness in payment services delivery in Ireland.

H3: PSD2 has improved the innovation of payment services in Ireland.

H4: PSD2 has improved the profitability payment services business in Ireland.

## **4 Implementation**

To achieve the set objectives of this study, the completed questionnaires were loaded into Google Colab Notebook. The GSpread library was used to load the completed questionnaire spreadsheets. The loaded data included the stakeholders' responses and the customers responses.

Once loaded, the columns which were the questions responded to were encoded as the question numbers. To handle the issue of missing values, the mode value for each column was used to replace instances of missing data. Next, all pandas object datatype (strings) were converted to integer values by using pandas map operation. The map function accepts a dictionary that contains the unique values in a given column and then maps them to integers that represents the different levels or categories contained in the data. Once the map operation was completed, the entire dataset was then transformed to contain integer datatype. To analyse the frequency distribution from the questionnaires, exploratory data analysis and descriptive statistics were adopted. To measure the statistical significance, the ANOVA test and ordinary least square (OLS) regression analysis was carried out and the findings are given below.

## **5 Results**

Following an extensive review of diverse literature focusing on the determinants influencing the effects of PSD2, an observation emerged that competition, innovation, profitability, and security were pivotal factors influencing the adoption intentions of both customers and stakeholders. This segment will delve into the methods employed to analyse and assess the data, aiming to pinpoint the factors contributing to the sustained intention toward payment service utilization in the context of Ireland.

## 5.1 Descriptive Statistics

The table 1 below presents questionnaire responses from 117 consumer respondent, revealing that 51.3% of respondents were men, 46.2% were women, a substantial proportion were young adults aged 18-35 and 26-39, while fewer participants were in the 40-60 age groups. Students comprised 52.1% of respondents, with 44.4% employed and 1.7% are unemployed. Of the stakeholder respondents who took part in the survey, 73.6% were in large organisations with over 200 employees, 9.4% in organisations with staff strength of 21-50 employees, 7.5% with 100 to 200 employees.

**Table 1. Demographic Description of Respondents**

<b>Demographic</b>		<b>Frequency</b>	<b>Percentage</b>
Gender	Female	54	46.2
	I prefer not to say	2	1.7
	Male	60	51.3
	Others	1	0.9
	<b>Total</b>	<b>117</b>	<b>100</b>
Age	18 – 25	44	37.6
	26 – 39	64	54.7
	40 – 60	7	6.0
	I prefer not to say	2	1.7
	<b>Total</b>	<b>117</b>	<b>100</b>
Occupation	Employed	52	44.4
	I prefer not to say	1	0.9
	Self employed	1	0.9
	Student	61	52.1
	Unemployed	2	1.7
	<b>Total</b>	<b>117</b>	<b>100</b>
Marital Status	Divorced	1	0.9
	I prefer not to say	8	6.8
	Married	16	13.7

	Single	91	77.8
	Widowed	1	0.9
	<b>Total</b>	<b>117</b>	<b>100</b>

**Table 2. Frequency Analysis for Customer Respondents**

<b>Are you familiar with the revised Payment Service Directive (PSD2), a regulation that was implemented in Ireland in 2018?</b>	Yes	26.5
	Not sure	0.9
	No	<b>72.6</b>
	<b>Total</b>	100
<b>Do you carry out payments via platforms such as Online, Mobile apps, Credit/Debit cards, Crypto transactions etc.?</b>	Yes	<b>96.6</b>
	Not sure	-
	No	3.4
	<b>Total</b>	100
<b>If response to 2 above is yes, how long have you been using this service?</b>	Before 2018	<b>47.9</b>
	After 2018	42.7
	Not applicable	9.4
	<b>Total</b>	100
<b>What is your most preferred payment platform (Please select as appropriate)?</b>	Cards	<b>55.6</b>
	Mobile Apps	28.2
	Online Platforms	12.0
	Cash	3.4
	Cryptocurrency	0.9
	<b>Total</b>	100
<b>What is the reason for your choice in 4 above (Select as appropriate)?</b>	Convenience	<b>64.1</b>
	Security	13.7
	Speed of transaction	17.1
	Availability	4.3
	Others	0.9
	<b>Total</b>	100



<b>What function do you use often on the platform?</b>	Payments	<b>82.9</b>
	Balance checks	1.7
	Transfers	12.0
	Withdrawals	2.6
	Statement request	0.9
	<b>Total</b>	100
	<b>Did your service provider/Bank explain its terms and conditions and charges to your understanding?</b>	Yes
	Not sure	-
	No	27.4
	<b>Total</b>	100
<b>Have you experienced any breach on the Terms and Conditions or the Charges?</b>	Yes	7.7
	Not sure	-
	No	<b>92.3</b>
	<b>Total</b>	90.6
<b>Does your Financial Institution occasionally contact you to create awareness on the security of your account?</b>	Yes	<b>82.9</b>
	Not sure	-
	No	17.1
	<b>Total</b>	100
<b>Have you suffered any loss due to fraud on payment since when PSD2 was implemented in 2018?</b>	Yes	7.7
	Not sure	-
	No	<b>92.3</b>
	<b>Total</b>	100
<b>Would you say fraud on payments has increased or reduced after 2018 when PSD2 was implemented?</b>	Fraud has reduced	13.7
	No change	5.1
	Not sure	<b>58.1</b>
	Fraud has increased	23.1
	<b>Total</b>	100
<b>Has your Financial Institution made provision for you to effectively contact them for complaints or other service?</b>	Yes	<b>82.1</b>
	Not sure	-
	No	17.9
	<b>Total</b>	100
<b>Please rate the response time on complaints.</b>	48 hours	<b>47.9</b>

	2 days – 1 week	23.1
	>1 week < 1 month	5.1
	Over one month	1.3
	Not applicable	22.2
	<b>Total</b>	100
<b>How often do you experience network or technical challenges with your payment service?</b>	Daily	0.9
	At least once a week	11.1
	At least once a month	34.2
	At least once a year	<b>48.7</b>
	No issue	0.9
	No challenge	0.9
	<b>Total</b>	100
<b>Do you feel more secure with your payment platform now that PSD2 regulation has been implemented than before it was implemented?</b>	More secure	28.2
	No change	9.4
	Not sure	<b>57.3</b>
	Less secure	4.3
	Not applicable	0.9
	<b>Total</b>	100
<b>Has the security of your payments improved since 2018 when PSD2 regulation was implemented?</b>	Better	36.8
	No change	5.1
	Not sure	<b>53.8</b>
	Worse	4.3
	<b>Total</b>	100
<b>Do you think there is an impact on the convenience of use of payment services since when PSD2 was implemented in 2018?</b>	More convenient	41.9
	No change	5.1
	Not sure	<b>45.3</b>
	Less convenient	7.7
	<b>Total</b>	100

<b>How would you compare the speed of transactions before 2018 and after 2018?</b>	Improved	<b>56.4</b>
	No change	8.5
	Not sure	27.4
	Decreased	7.7
	<b>Total</b>	100
<b>Would you easily recommend the current payment services to anybody?</b>	Yes	<b>87.2</b>
	Not sure	9.4
	No	3.4
	<b>Total</b>	100
<b>Please rate the overall efficiency of payment services since 2018 on a scale of 1 to 5 (1 being the lowest and 5 being the highest.</b>	1	<b>44.4</b>
	2	26.5
	3	23.9
	4	3.4
	5	17
	<b>Total</b>	100

**Table 3. Frequency Analysis for Stakeholder Respondents**

<b>Have you made use of any payment services since 2018 when PSD2 was implemented?</b>	Yes	<b>83</b>
	No	17
	<b>Total</b>	100
<b>Do you think the implementation of PSD2 regulation is necessary?</b>	Necessary	<b>86.8</b>
	Not sure	11.3
	Not necessary	1.9
	<b>Total</b>	100
<b>In what areas has PSD2 changed the payment service industry in Ireland (Please select as much as possible)?</b>	Competition	7.5
	Innovation	13.2
	Profitability	1.9
	Security	<b>75.5</b>
	Not applicable	1.9
	<b>Total</b>	100
<b>Do you think that the overall changes in 3 above are positive or negative?</b>	Positive	<b>96.2</b>
	Negative	-
	Not sure	1.8
	<b>Total</b>	100

<p><b>On a scale of 1 to 5 (1 being the lowest and 5 being the highest and zero for no improvement), please rank the area which PSD2 has made the most improvement in Ireland by ticking the appropriate box in the table below.</b></p> <p><b>[Security of Customers]</b></p>	1	-	
	2	2	3.77
	3	11	20.75
	4	11	20.75
	5	23	43.40
	Invalid	1	1.89
	<b>Total</b>	<b>53</b>	
<p><b>On a scale of 0 to 5 (1 being the lowest and 5 being the highest and zero for no improvement), please rank the area which PSD2 has made the most improvement in Ireland by ticking the appropriate box in the table below.</b></p> <p><b>[Innovation]</b></p>	1	4	7.69
	2	9	17.31
	3	18	34.62
	4	10	19.23
	5	8	15.38
	Invalid	3	5.77
	<b>Total</b>	<b>52</b>	
<p><b>On a scale of 0 to 5 (1 being the lowest and 5 being the highest and zero for no improvement), please rank the area which PSD2 has made the most improvement in Ireland by ticking the appropriate box in the table below.</b></p> <p><b>[Competition]</b></p>	1	6	11.76
	2	11	21.57
	3	14	27.45
	4	14	27.45
	5	3	5.88
	Invalid	-	
	<b>Total</b>	<b>51</b>	
<p><b>On a scale of 0 to 5 (1 being the lowest and 5 being the highest and zero for no improvement), please rank the area which PSD2 has made the most improvement in Ireland by ticking the appropriate box in the table below.</b></p> <p><b>[Profitability]</b></p>	1	8	
	2	12	
	3	17	
	4	4	
	5	4	
	Invalid	-	
	<b>Total</b>	<b>49</b>	
<p><b>Do you think that the overall changes in 3 above are positive or negative?</b></p>	Positive		<b>90.6</b>
	Negative		-
	Not sure		9.4
	<b>Total</b>		<b>100</b>
<p><b>How familiar are you with the changes that PSD2 has brought to the payment services industry in Ireland?</b></p>	Very familiar		<b>41.5</b>
	Familiar		37.7
	Not sure		18.9
	Not familiar		1.9
	<b>Total</b>		<b>100</b>

<b>Have you or your organization been able to take advantage the PSD2 to implement any innovation in the payment service market?</b>	Yes	<b>67.9</b>
	No	32.1
	<b>Total</b>	100
<b>How has this innovation performed on a scale of 1 to 5 (1 being the lowest and 5 being the highest)?</b>	1	11.3
	2	<b>73.6</b>
	3	13.2
	4	1.9
	5	-
	<b>Total</b>	100
<b>Have you encountered any difficulties or inconveniences because of PSD2?</b>	Yes	<b>69.8</b>
	No	30.2
	<b>Total</b>	100
<b>On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please rank the speed or efficiency of payment services since when PSD2 was implemented.</b>	1	1.90
	2	<b>52.8</b>
	3	34.0
	4	5.70
	5	5.70
	<b>Total</b>	100
<b>Have you observed any change in the Irish payment service market since when PSD2 was implemented?</b>	Yes	<b>69.8</b>
	No	30.2
	<b>Total</b>	100
<b>Do you think that PSD2 has made it easier or more difficult for new payment service providers to enter the market?</b>	Easier	<b>56.6</b>
	Not sure	22.6
	More difficult	20.8
	<b>Total</b>	100
<b>Do you think the implementation of PSD2 forced payment service providers in Ireland to make any changes to their services or processes?</b>	Yes	<b>92.5</b>
	Not sure	5.7
	No	1.9
	<b>Total</b>	100
<b>In your opinion, have payment service providers increased their security measures because of PSD2?</b>	Increased	<b>86.8</b>
	Not sure	9.4
	No increase	3.8
	<b>Total</b>	100
<b>Do you think PSD2 has impacted on fees charged by payment services to customers?</b>	Eliminated fees	28.3
	Not sure	<b>37.7</b>

	No effect on fees	34.0
	<b>Total</b>	100
<b>Do you think payment service providers were forced to change their terms and conditions because of PSD2?</b>	Yes	<b>92.5</b>
	Not sure	5.7
	No	1.9
	<b>Total</b>	100
<b>Do you think payment service providers in Ireland are experiencing technical difficulties in complying with PSD2?</b>	Yes	<b>41.5</b>
	Not sure	35.8
	No	22.6
	<b>Total</b>	100
<b>Has the implementation of PSD2 resulted in any legal or regulatory challenges for any payment service provider that you know of in Ireland?</b>	Yes	39.6
	Not sure	<b>41.5</b>
	No	18.9
	<b>Total</b>	100
<b>Has the implementation of PSD2 affected the accessibility of payment services in Ireland?</b>	More accessible	<b>39.6</b>
	No impact	22.6
	Not sure	28.3
	Less accessible	9.4
	<b>Total</b>	100
<b>Do you think PSD2 has affected the security of payment services in Ireland?</b>	More secure	<b>84.9</b>
	No impact	3.8
	Not sure	11.3
	Less secure	-
	<b>Total</b>	100
<b>On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please rate the security of payment services since when PSD2 was implemented in Ireland.</b>	1	<b>54.7</b>
	2	22.6
	3	18.9
	4	3.8
	5	-
	<b>Total</b>	100
<b>Do you think PSD2 has impacted on transparency in the Irish payment service market?</b>	Improved transparency	<b>75.5</b>
	No change	7.5

	Not sure	15.1
	Decreased transparency	1.9
	<b>Total</b>	100
<b>How do you think that PSD2 has impacted on convenience of use in the Irish market?</b>	Enhanced convenience	<b>64.2</b>
	No change	11.3
	Not sure	15.1
	Deprived convenience	9.4
	<b>Total</b>	100
<b>On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please rate how the PSD2 implementation has impacted on customer experience in Ireland.</b>	1	5.7
	2	<b>45.3</b>
	3	3.8
	4	34.0
	5	11.3
	<b>Total</b>	100
<b>Please rate the overall performance of PSD2 on payment services in Ireland on a scale of 1 to 5 (1 being the lowest and 5 being the highest).</b>	1	32.1
	2	7.5
	3	<b>54.7</b>
	4	5.7
	5	-
	<b>Total</b>	100
<b>How would you describe the size of your organization?</b>	1 – 20	3.8
	21 – 50	9.4
	51 – 100	1.9
	100 -200	7.5
	>200	<b>73.6</b>
	<b>Total</b>	100
<b>How would you rate your organization in the Irish market?</b>	Top 5%	37.7
	Top 10%	9.4
	Top 20%	1.9
	Starter	5.7
	Undisclosed	<b>45.3</b>
	<b>Total</b>	100

## 5.2 Inferential Statistics

### 5.2.1 Test of Hypothesis 1

Regression analysis on the impact of the PSD2 on security of payment services in Ireland.

H0: PSD2 has NOT improved the security for customers in relation to payment services in Ireland.

H1: PSD2 has improved the security for customers in relation to payment services in Ireland.

```
ANOVA Result Summary
=====
      df_resid      ssr  df_diff  ss_diff      F  Pr(>F)
0         52.0  62.981132      0.0      NaN      NaN      NaN
1         25.0  31.767299     27.0  31.213833  0.909794  0.596268

=====
                        OLS Regression Results
=====
Dep. Variable:  question_5_security_of_customers  R-squared:  0.496
Model:  OLS  Adj. R-squared:  -0.049
Method:  Least Squares  F-statistic:  0.9098
Date:  Sat, 12 Aug 2023  Prob (F-statistic):  0.596
Time:  13:38:35  Log-Likelihood:  -61.640
No. Observations:  53  AIC:  179.3
Df Residuals:  25  BIC:  234.4
Df Model:  27
Covariance Type:  nonrobust
=====
```

Figure 1. ANOVA Test Result for Hypothesis 1

F-test at  $\alpha = 0.05$  for the overall significance of relationship

H0:  $\beta_i = 0$

H1:  $\beta_i \neq 0$

Where  $\beta$  = Estimated coefficient of independent variable,  $i = 27$ , H0= Null Hypothesis and H1= Alternate Hypothesis

F-stat= 0.910

$F_{\alpha}(27, 25) = 1.939$

p-value = 0.596

Since F-stat <  $F_{\alpha}(27, 25)$  and p-value > 0.05, Failed to Reject H0.

The obtained p-value of 0.596 is greater than 0.05 and F-stat less than  $F_{\alpha}$ . This suggests that there is no strong evidence to reject the null hypothesis, hence, we failed to reject the null hypothesis. In other words, there is no significant relationship between the independent variables and the dependent variable. Therefore, PSD2 has NOT improved the security for customers in relation to payment services in Ireland.

### 5.2.2 Test of Hypothesis 2

Regression analysis on the impact of the PSD2 on competitiveness of payment services in Ireland.



H0: PSD2 has NOT improved the competitiveness in payment services delivery in Ireland  
H1: PSD2 has improved the competitiveness in payment services delivery in Ireland

ANOVA Result Summary

	df_resid	ssr	df_diff	ss_diff	F	Pr(>F)
0	52.0	75.328755	0.0	NaN	NaN	NaN
1	25.0	31.814621	27.0	43.506133	1.266193	0.277968

  

OLS Regression Results

Dep. Variable:	question_5_innovation	R-squared:	0.578
Model:	OLS	Adj. R-squared:	0.121
Method:	Least Squares	F-statistic:	1.266
Date:	Sat, 12 Aug 2023	Prob (F-statistic):	0.278
Time:	13:38:36	Log-Likelihood:	-61.679
No. Observations:	53	AIC:	179.4
Df Residuals:	25	BIC:	234.5
Df Model:	27		
Covariance Type:	nonrobust		

**Figure 2. ANOVA Test Result for Hypothesis 2**

F-test at  $\alpha = 0.05$  for the overall significance of relationship

H0:  $\beta_i = 0$

H1:  $\beta_i \neq 0$

Where  $\beta$  = Estimated coefficient of independent variable,  $i = 27$ , H0= Null Hypothesis and H1= Alternate Hypothesis

F-stat= 1.266

$F_{\alpha}(27, 25) = 1.939$

p-value = 0.280

Since F-stat <  $F_{\alpha}(27, 25)$  and p-value > 0.05, Failed to Reject H0.

The obtained p-value of 0.280 is greater than 0.05 and F-stat less than  $F_{\alpha}$ . This suggests that there is no strong evidence to reject the null hypothesis, hence, we failed to reject the null hypothesis. In other words, there is no significant relationship between the independent variables and the dependent variable. Therefore, PSD2 has NOT improved competitiveness in the payment services in Ireland.

### 5.2.3 Test of Hypothesis 3

Regression analysis on the impact of the PSD2 on Innovation in the Irish payment services sector.

H0: PSD2 has NOT improved the innovation of payment services in Ireland.

H1: PSD2 has improved the innovation of payment services in Ireland.

```
ANOVA Result Summary
=====
```

	df_resid	ssr	df_diff	ss_diff	F	Pr(>F)
0	52.0	77.471698	0.0	NaN	NaN	NaN
1	25.0	40.386083	27.0	37.085616	0.850257	0.660773

```
OLS Regression Results
=====
```

Dep. Variable:	question_5_competition	R-squared:	0.479
Model:	OLS	Adj. R-squared:	-0.084
Method:	Least Squares	F-statistic:	0.8503
Date:	Sat, 12 Aug 2023	Prob (F-statistic):	0.661
Time:	13:38:36	Log-Likelihood:	-68.001
No. Observations:	53	AIC:	192.0
Df Residuals:	25	BIC:	247.2
Df Model:	27		
Covariance Type:	nonrobust		

**Figure 3. ANOVA Test Result for Hypothesis 3**

F-test at  $\alpha = 0.05$  for the overall significance of relationship

H0:  $\beta_i = 0$

H1:  $\beta_i \neq 0$

Where  $\beta$  = Estimated coefficient of independent variable,  $i = 27$ , H0= Null Hypothesis and H1= Alternate Hypothesis

F-stat= 0.850

$F_{\alpha}(27, 25) = 1.939$

p-value = 0.661

Since F-stat <  $F_{\alpha}(27, 25)$  and p-value > 0.05, Failed to Reject H0.

The obtained p-value of 0.661 is greater than 0.05 and F-stat less than  $F_{\alpha}$ . This suggests that there is no strong evidence to reject the null hypothesis, hence, we failed to reject the null hypothesis. In other words, there is no significant relationship between the independent variables and the dependent variable. Therefore, PSD2 has NOT improved the innovation of payment services in Ireland.

## 5.2.4 Test of Hypothesis 4

Regression analysis on the impact of the PSD2 on Profitability in the Irish payment services industry.

H0: PSD2 has NOT improved the profitability payment services business in Ireland.

H1: PSD2 has improved the profitability payment services business in Ireland.

ANOVA Result Summary

	df_resid	ssr	df_diff	ss_diff	F	Pr(>F)
0	52.0	85.207547	0.0	NaN	NaN	NaN
1	25.0	44.974712	27.0	40.232835	0.828302	0.684602

OLS Regression Results

Dep. Variable:	question_5_profitability	R-squared:	0.472
Model:	OLS	Adj. R-squared:	-0.098
Method:	Least Squares	F-statistic:	0.8283
Date:	Sat, 12 Aug 2023	Prob (F-statistic):	0.685
Time:	13:38:36	Log-Likelihood:	-70.853
No. Observations:	53	AIC:	197.7
Df Residuals:	25	BIC:	252.9
Df Model:	27		
Covariance Type:	nonrobust		

**Figure 4. ANOVA Test Result for Hypothesis 4**

F-test at  $\alpha = 0.05$  for the overall significance of relationship

H0:  $\beta_i = 0$

H1:  $\beta_i \neq 0$

Where  $\beta$  = Estimated coefficient of independent variable,  $i = 27$ , H0= Null Hypothesis and H1= Alternate Hypothesis

F-stat= 0.828

$F_{\alpha}(27, 25) = 1.939$

p-value = 0.685

Since F-stat <  $F_{\alpha}(27, 25)$  and p-value > 0.05, Failed to Reject H0.

The obtained p-value of 0.685 is greater than 0.05 and F-stat less than  $F_{\alpha}$ . This suggests that there is no strong evidence to reject the null hypothesis, hence, we failed to reject the null hypothesis. In other words, there is no significant relationship between the independent variables and the dependent variable. Therefore, PSD2 has NOT improved the profitability of payment services providers- in Ireland.

### 5.3 Interpretation

Given the p-values and F-stats above, they suggest that the observed relationship between the predictor variable ("Payment Services Directive (PSD2)") and the dependent variable ("competitiveness, innovation, profitability and security of payment services in Ireland") may not be statistically significant. It's important to note that the constant term in the model is also mentioned in the "Predictors" section, suggesting that the regression line intercepts the y-axis. However, without additional context or further hypotheses, it's challenging to draw definitive conclusions about the practical or real-world significance of the predictor variable in explaining

the variability in the "Payment Service in Ireland." Further investigation or a larger sample size may be needed to draw more meaningful insights from the data.

The ANOVA table suggests that the observed relationship between the predictor variable "Payment Services Directive (PSD2)" and the dependent variable "Payment Service in Ireland" may not be statistically significant, as indicated by the relatively high p-value. This suggests that the evidence for a true effect of PSD2 on payment services in Ireland, as captured by the linear regression model, is not strong enough to confidently reject the null hypothesis (the hypothesis that there is no significant relationship between PSD2 and payment services in Ireland).

However, it's important to acknowledge that statistical significance and practical significance are not always the same. While the statistical analysis might not show a significant relationship, it doesn't mean that the implementation of PSD2 has had no impact on payment services in Ireland. There could be various factors at play that the model might not have captured, and there might be qualitative improvements that are not fully reflected in the quantitative analysis.

In this situation, it's crucial to consider additional factors such as the qualitative changes in payment service regulations, feedback from stakeholders in the industry, qualitative case studies, and broader context to assess the true impact of PSD2. While the statistical analysis might be inconclusive, it's possible that the implementation of PSD2 has led to beneficial changes in the payment services landscape in Ireland, even if these changes are not statistically significant in the current analysis.

## **6 Conclusion and Future Work**

After thoroughly investigating the impact of the Revised Payment Services Directive (PSD2) on payment services in Ireland and analysing the collected data, the study reveals that a significant portion of both consumers and stakeholders are familiar with PSD2, reflecting a reasonable level of awareness of the regulatory changes. Most consumers have been utilizing payment platforms since before 2018, indicating a substantial adoption of digital payment methods. While statistical tests did not show strong evidence of significant improvement in security due to PSD2, a considerable number of respondents reported feeling more secure with their payment platforms after PSD2's implementation. This sentiment suggests that PSD2 may have contributed to enhanced security perceptions, even if statistical significance is not firmly established.

The data suggests that PSD2's impact on competitiveness, innovation, and profitability is not strongly supported by statistical analysis. However, qualitative feedback from stakeholders and the observed trends in the industry might provide a more comprehensive understanding of potential improvements in these areas. The analysis indicates that while some consumers perceive increased convenience and improved transaction speed, this study did not conclusively support significant changes in these aspects due to PSD2. The implementation of PSD2 does not appear to have significantly affected the accessibility of payment services in Ireland. A large majority of consumers would recommend current payment services, suggesting a general level of satisfaction.

Furthermore, the overall efficiency of payment services since PSD2's implementation received moderately positive ratings from respondents. Stakeholders generally perceive PSD2 as necessary and positively impacting security. While statistical significance is not robustly established for some aspects, the qualitative insights from stakeholders might provide a more nuanced view of the regulatory impact. In conclusion, the study highlights the need for ongoing research, continuous monitoring, and a holistic approach to fully comprehend the multifaceted effects of PSD2 on payment services in Ireland. As the payment landscape evolves and more data becomes available, a clearer picture of the true impact of PSD2 will emerge.

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