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TEYA - EUROPEAN PAYMENTS MARKET REPORT 2023

Assessing the Efficiency of the European Consumer-to-Business Payments Market: European Union Retail Payments Strategy

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Abstract

The "Teya – European Payments Market Report 2023" provides a comprehensive analysis of the European consumer-to-business payments market. Centred on the notable growth of payment cards and Alternative Payment Methods, the report assesses market dynamics, including consumers and merchants payment preferences across various EU markets. Introducing an innovative model to estimate social costs, the report emphasises existing data gaps, the lack of transparency, and the need for future research. This systematic exploration significantly advances the understanding of the complex dynamics underpinning the efficiency of the European C2B payments market.

Keywords

C2B Payments

Digital Payment Trends

Digitalisation

Social Costs

Payment Efficiency

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Chapter 1. Introduction

This thesis delves into a thorough examination of the European consumer-to-business (C2B) payments market, a specific segment within the broader payment landscape wherein transactions flow from individual consumers to businesses. This focused scope excludes other transaction types like business-to-business (B2B) or consumer-to-consumer (C2C). By narrowing our scope to the C2B relationship, this thesis seeks to address a significant gap in existing literature, aiming to analyse the specific dynamics characterising this relationship and assess its efficiency and cost-effectiveness in Europe. Moreover, the transition from traditional cash transactions to digital payment methods, particularly the dominance of payment cards and the emergence of Alternative Payment Methods (APMs), serves as the contextual backdrop for our analysis.

Following the introduction, the second chapter conducts a broad analysis of European C2B market dynamics, evaluating prevalent payment instruments, consumer and merchant preferences, and the extent of digitalisation across selected countries. Our emphasis lies in discerning disparities in operational efficiencies and cost savings linked to digital payment systems within the diverse domestic markets of the European Union (EU).

In the concluding chapter, it is present a novel model for estimating social costs, addressing severe data gaps through an index-based approach and linear interpolation. This innovative method not only offers insights into countries lacking social cost information but also highlights the need for future research improvements. Therefore, this thesis contributes to the academic discourse by providing a systematic exploration of the efficiency landscape of the European C2B payments market.

Chapter 2. Overview of EU C2B Payments Market

This chapter aims to provide a comprehensive analysis of the C2B EU payments market, exploring payment instruments, consumer preferences, and merchant preferences. Unlike recurring payments, which usually occur monthly, non-recurring payments at the point-of-sale offer distinct insights into consumer behaviour. They continuously require re-evaluation of choice in payment methods, allowing us to capture technological trends and discern real-time shifts in payment patterns. Therefore, this chapter will focus on capturing the economic effects of these transactions. Firstly, by analysing the distribution of payment instruments, the chapter illustrates which payment methods are central to facilitating the flow of transactions in the European economy. Secondly, shifting to consumer preferences and habits, the chapter delves.into the major trends transforming the choices of payment instruments. These trends manifest differently across point-of-sales (POS), impacting the degree of online and in-store payments which, in turn, influences the selection of payment instruments. Lastly, the chapter examines merchant preferences and the complexities of navigating the competitive and regulatory landscape. By analysing the interplay between different players in the market, this chapter seeks to illustrate the intricate dynamics shaping payment habits within the EU C2B payments market.

Methodology: The analysis of data in this chapter, derived from the ECB's SPACE study, recognises key methodological considerations. The SPACE (2022) survey, covering all euro area countries, employed a random sampling methodology to ensure representativeness, aligning closely with SPACE (2019) for time-series analysis. However, some variations in data collection methodologies occurred in Germany and the Netherlands, where independent studies were conducted. Furthermore, the use of one-day diaries to capture payment behaviours, while providing a comprehensive snapshot, introduces a higher degree of uncertainty compared to longer-duration methods. This uncertainty is particularly noticeable in smaller sample sizes,

cautioning the interpretation of POS and online payment values.

On a positive note, the survey's multi-round approach throughout the year captures seasonal variations in payments behaviours. This involves conducting interviews and surveys in two rounds, enabling a detailed understanding of payment trends across different periods. The emphasis on minimising bias through extensive cleaning, editing, and inflation adjustments, further contributes to the robustness of the SPACE 2022 data. While this enhances the reliability of findings, potential limitations must be considered in cross-country or subgroup comparisons.

2.1. Payment Instruments

Traditional Payment Methods: Once the overwhelmingly predominant payment method, cash transactions have experienced a substantial decline, particularly over the last decade (McKinsey 2022). Despite this downward trend, cash transactions remain significant, constituting approximately 60% of total payments at the POS in the EU, underscoring their enduring importance for European consumers (ECB 2022b). Simultaneously, debit and credit cards have emerged as dominant players in the digital transactions landscape, comprising 34% of total payments at the POS in the EU (ibid.) (Figure A 1). The speed, convenience, and security of card transactions have fuelled widespread adoption, particularly during the COVID-19 pandemic, leading to a notable increase in card payments (Statista 2021). Given this trend, companies facilitating card payments, such as Visa and Mastercard, have experienced significant profitability (ibid.).

In response to the evolving landscape, traditional banks, which have historically been central to cash circulation, are actively partnering with such card companies. This strategic collaboration allows them to leverage established networks and offer enhanced digital payment methods. Such proactive efforts reflect the banks' commitment to staying relevant and profitable in the rapidly changing payments market.

Alternative Payment Methods (APMs): In addition to the rise in card payments, regulatory changes (discussed in Chapter 3) and technological advances have enabled FinTechs to reshape the availability of new payment options, introducing innovations that redefine how payments are conducted. While this presence is felt across all facets of payments, as discussed in other relevant sections of the thesis, the transformative influence of technology is particularly noticeable in the rise of APMs. Currently, they constitute the remaining 6% of total payments at the POS in the EU (ECB 2022b). However, despite their relatively low share, APMs are gaining traction in the EU payments market, particularly in the realm of e-commerce (Figure A 2). Although payment cards are still the preferred method within the e-commerce segment, innovative payment methods such as Account-to-Account (A2A), digital wallets, and Buy-Now-Pay-Later (BNPL) systems are experiencing notable adoption (Figure A 3). A2A instant transactions allow consumers to transfer funds directly between bank accounts without intermediaries, providing a swift and efficient electronic payment method. These transactions, often facilitated through mobile apps and QR codes, are offered by both traditional banking institutions (Swish in Sweden) and FinTech innovators like iDeal in the Netherlands (FIS 2023). The appeal lies in lower acceptance costs compared to cards (for merchants), coupled with enhanced fraud and cybersecurity measures, streamlined processes, and instant transaction settlement. Moreover, the incorporation of smartphones and QR codes enhances the ease of use and convenience for end-users, contributing to the growing popularity of this payment method. Digital wallets, facilitated by major players like Apple Pay, Google Pay, and Samsung Pay, have become the most widely used APM (ECB 2022b). These systems, which securely store payment credentials (e.g., credit card details) on a mobile device or online platform, enable convenient and swift payments without the need for physical cards or cash. The evolving payments landscape underscores the growing importance of alliances between financial institutions and tech giants. These collaborations are crucial, given the vast financial and technological resources, as well as the extensive customer bases of tech giants, positioning them as potential

competitors in the EU payments market.

BNPL transactions, offered by key players like Klarna, AfterPay, and Affirm, allow consumers to make instant purchases and postpone payments over a designated period, often with minimal or no interest (Statista 2023a). In this model, FinTechs act like facilitators, extending credit to consumers without the need for a traditional credit card (FIS 2023). This extension of credit is a distinctive feature of BNPL services, allowing users to spread the cost of their purchases over time (ibid.). The appeal of these transactions lies in their fundamental similarity to credit cards, offering comparable convenience but with more favourable terms.

Conclusion: The EU payments market displays a mix of traditional and emerging payment methods. Cash remains the most significant at 60%, while card transactions account for over 34% of total payments in the EU at the POS (ECB 2022b). Moreover, emerging APMs like A2A transactions, digital wallets, and BNPL systems are gaining popularity, especially in e-commerce. The rise of APMs reflects not only technological advancements but also the disruptive influence of FinTechs in reshaping the payments landscape, prompting traditional financial institutions to adapt and innovate. This evolving landscape reflects the shifting preferences of end-users towards innovative digital payment methods, which will be discussed further in the following section.

2.2. Consumer Preferences

Building upon the evolving landscape of payment instruments and the transformative impact of FinTech, a closer examination of the EU C2B payments market reveals trends that indicate changing consumer behaviours across POS categories, namely online and in-store.

Online payments have substantially increased their share of total EU payments volume, from 6% in 2019 to approximately 17% in 2022, reflecting the recent surge in e-commerce (ECB 2022b). This underscores the increasing preference for online transactions, fuelled by technological advancements and societal changes driven by the pandemic. In addition to

volume, online payments now constitute 28% of total EU payments value, doubling from its 2019 figure (ibid.) This remarkable growth highlights the growing significance of digital channels in facilitating economic transactions of larger amounts (**Figure A 4**).

While online payments are experiencing promising trends in term of total EU payments volume and value, there are also interesting takeaways regarding APMs. Digital wallets, in particular, emerge as the most popular APM, accounting for roughly 29% of both the total value and volume of online payments (ECB 2022b). Moreover, A2A solutions and BNPL transactions are making notable strides in the online segment, despite currently holding relatively lower shares of volume, at 18% and 10%, respectively (ibid.). In contrast, though payment cards are still the predominant payment method in online payments, accounting for roughly half of total value and volume, they have been trending downwards during the 2019-2022 period (ibid.). These trends indicate a shift among consumers towards more convenient and quick digital payment solutions in the e-commerce space (**Figure A 5**).

Conversely, while in-store payments have experienced a downward trend over the review period, they still command a substantial 80% share of total EU payments volume (ECB 2022b). This trend is similarly reflected in cash usage at POS, as the share of cash payments in terms of total EU payments volume has declined from 79% in 2016 to 59% in 2022 (ibid.). Despite the decline, cash payments still hold the largest share of total EU payments volume. However, cash payments no longer lead in share of total EU payments value, as payment cards (46%) surpassed cash payments (42%) for the first time (ibid.). This shift indicates a significant growth in acceptance and use of digital alternatives for in-store payments among consumers and merchants, particularly regarding transactions with larger amounts (**Figure A 6**).

Conclusion: The EU payments market is undergoing a significant shift influenced by the rise of FinTech and changing consumer preferences. The surge in online payments, driven by technological advancements, indicates a shift in consumer preferences toward digital

transactions. Digital wallets lead among APMs, while traditional payment cards still dominate but show a slight decline in the online segment. While in-store payments are still substantial, they have been decreasing, as reflected in the decline of cash usage. Accordingly, the shift towards digital alternatives, especially for larger transactions, signals a significant change in the payment landscape in the EU. This dynamic environment suggests a clear movement towards digital alternatives among consumers, driven by convenience and efficiency. Consumer preferences continue to be shaped by the ongoing growth of FinTech, providing more convenient, efficient, and cost-effective payment solutions.

2.3. Merchant Preferences

The shifting EU C2B payments market is marked by the interplay of consumer preferences, technological innovations, and regulatory initiatives. As we consider the dynamics of this evolving market, it is crucial to assess the criteria guiding merchants in their evaluation of accepting payment methods. According to the ECB (2022b), key considerations include payment security, method reliability, overall acceptance costs, ease, and speed, as well as consumer preferences. These considerations are reflected in the acceptance rates of available payment methods. In 2021, cash payments were the most widely accepted, noting a 96% acceptance rate among merchants (ibid.). Following closely were credit cards at 87%, contactless cards at 82%, and debit cards at 80%, while mobile payments lagged behind with a modest 30% acceptance rate (ibid.) (**Figure A 7**).

Merchant Perception: Delving deeper into the context of these acceptance rates, 24% of merchants rank cash payments as their most preferred payment method, citing the immediacy, quickness, and reliability of these transactions (ECB 2022b, Kantar 2022) (**Figure A 8**). However, these merchants are also aware of the potential forgery risks and the inconvenience of having to deposit funds, acknowledging these shortcomings. In contrast, cards as a whole, encompassing both contactless and regular card payments, collectively account for 53% of

preferences, notably surpassing the preference for cash payments. Within this category, contactless payment cards emerge as the preferred choice for 20% of merchants, closely followed by debit PIN cards and credit PIN cards, at 17% and 16%, respectively (ibid.). Herein, a distinction is drawn between the quickness and convenience of contactless payments compared to the slightly longer processing time and manual input required for regular payment cards, given the need for a PIN code. Despite recognising that cards offer enhanced security and convenience compared to cash payments, these merchants also highlight challenges, including high acceptance costs and the lack of instant settlements. Turning to the growing online segment, merchants rank PayPal as their preferred online payment provider (Kantar 2022). This preference is attributed to the platform's ease of use, reliability, and the brand trust built-up over time.

In addition to these preferences, insights from another study shed light on merchants' aspirations for improved payment methods, particularly those targeting addressing transaction speed, lower fees, transaction tracking, and seamless integration (ECB 2022b, Kantar 2022). This is particularly reflected in the desire for reliable A2A instant payment solutions, which offer the convenience and security of card payments but at a lower cost and ensure instant settlement of cashflows (ibid.). However, despite preferences and desired improvements, merchants recognise the competitive and legal constraints limiting their choice of preferred payment methods. While the former restricts the ability of merchants to reject certain payment methods due to the risk of potentially losing customers, the latter restricts the ability to surcharge expensive payment methods or incentivise cost-effective methods (ibid.). These conditions compel merchants to align with consumer preferences irrespective of the possible shortcomings associated with their chosen payment methods.

Conclusion: Amid increased digitalisation and expanded availability of payment methods, merchants' preferences have shifted, influenced by security concerns, cost considerations, and

technological reliability. Balancing the preferences of both merchants and consumers, within the constraints imposed by the competitive landscape and regulatory framework, will be instrumental for legislative bodies in fostering efficiency and innovation in the EU payments market.

2.4. Overview of Domestic C2B Payments Markets

The preceding section delved into the multifaceted landscape of C2B payments across the EU, exploring payment instruments, consumer, and merchant preferences on a European level. In this chapter, our focus narrows to examine how these overarching trends manifest at the national level within select EU countries. We aim to categorise these nations along a spectrum, ranging from highly digitalised payment markets to those with a pronounced reliance on cash, aiming to form a representative 'sample'. Recognising the significant variations among Member states, this analysis seeks to shed light on how cultural preferences, economic conditions, and regulatory environments influence the adoption of payment instruments (**Table A 1**). This exploration will serve as a crucial supplement to our earlier examination, offering insights into the intricacies that define payment behaviours in specific national contexts.

Methodology: Relying extensively on GlobalData's country reports, it is essential to consider potential limitations in the employed methodology throughout this chapter. While the underlying approach is comprehensive, relying on secondary sources like central bank statistics could introduce incomplete or outdated data. Moreover, its forecasting methodologies, which combine in-house models with insights from primary research, face inherent challenges in predicting dynamic market changes. However, despite these limitations, the transparency of GlobalData's methodology and adherence to industry standards enhance report credibility.

2.4.1. Highly Digitalised Payments Infrastructures

Table 1: Share of Traditional and Alternative payment

Country	Payment Instrumnets (2022)				
	Cards [1]	**Cash** [1]	**Digital Wallet** [2]	**BNPL** [2]	**A2A** [2]
Highly Digitalised Payment Countries					
Denmark (DK)	49.10%	12.90%	29%	12%	7%
Sweden (SE)	44.80%	8.50%	21%	24%	20%
Moderately Digitalised Payment Countries					
Germany (DE)	21.20%	32.30%	29%	23%	27%
Poland (PL)	38.90%	37.70%	15%	2%	67%
Highly Cash-Based Payment Countries					
Portugal (PT)	32.10%	58.30%	-	-	-
Italy (IT)	20%	67.70%	35%	6%	13%

(1) Total Market Transaction Volume (In-Store and E-commerce) **Source:** GlobalData 2023
(2) E-commerce transaction value **Source:** FIS Report 2023

Sweden has witnessed a significant shift in its payment landscape, with the share of total payments attributed to cash transactions dropping from 18.5% in 2021 to approximately 8.5% in 2022 (GlobalData 2023a). In contrast, payment cards now constitute around 45% of total payments volume, reflecting a 6% increase from the 2021 figure (ibid.) (**Figure A 9**). This notable transformation underscores the increasing preference for digital payment methods, driven by regulatory support, technological advancements, and evolving consumer choices. Estimates suggest that this trend will persist, fuelled by the emergence of APMs and the expanding e-commerce segment (ibid.).

The primary driver behind Sweden's digitalisation of the payment market is the growing use of payments cards, especially contactless ones. This surge is fuelled by consumer preferences, a well-developed payment infrastructure, and a wide acceptance network among merchants (GlobalData 2023). Mastercard and Visa dominate both debit and credit card segments, accounting for nearly all card-based transactions in Sweden due to the absence of a domestic card scheme (Statista 2023c).

In addition to the preference for cards, the central bank's promotion of the Swedish A2A payment system, Swish, has significantly contributed to the adoption of APMs. Supported by RIX-INST, a 24/7 real-time gross settlement system, Swish enables instant payments for both

consumers and businesses (Swish 2023). With 8.5mn users, exceeding 80% of the total Swedish population, Swish has seamlessly integrated into the domestic payment market, particularly through interoperability between partner banks (ibid.).

The emergence of the Swedish BNPL system, Klarna, in the growing e-commerce segment further propels the rise of APMs. Klarna's advantages, i.e., the ability to defer payments at minimal interest rates, have resonated positively with consumers, resulting in a 75% penetration rate among Swedish web-shops (GlobalData 2023a). Its success extends beyond domestic markets, making Klarna one of the preferred BNPL providers in the EU (ibid.).

While the increased adoption of card payments and APMs has undoubtedly led to a decline in cash usage (**Figure A 10**), this trend is further amplified by the central bank's regulatory approach. Specifically targeting tax evasion and undergoing a systematic overhaul of banknotes and coins, these initiatives aim to curtail illicit financial activity and redesign the physical currency infrastructure, collectively playing a significant role in steering the nation away from cash transactions (RinksBank 2022) (**Table 1**).

Denmark has also made significant strides towards a cashless payment market, with card payments holding the largest share of total payment volume, at 49.1% (GlobalData 2023b). Conversely, cash transactions only constitute 12.9% of total payments, signalling a pronounced shift in consumer preferences towards digital payment methods (ibid.). This trend is notably influenced by Denmark's 84% banked population, indicating widespread consumer penetration in banking services and fostering an environment conducive to increased adoption of new and innovative payment methods (GlobalData 2023b) (**Figure A 11**).

Similar to Sweden, the primary driver behind Denmark's increased digitalisation is the growing use of payment cards. Dankort, the domestic debit card, dominates with a 93% share of total card payment value in 2022, but is expected to face challenges from international debit card players, namely Mastercard and Visa (ibid.). Credit card usage is growing, especially for high-value transactions, further reflecting the diverse transaction types made with payment cards,

and forecasts suggest a continued preference for these trends (ibid).

Beyond in-store payments, the e-commerce segment is witnessing growing preferences for APMs, despite debit and credit cards collectively accounting for 49% of total payment value in this segment (FIS 2023). Of these APMs, digital wallets emerge as the preferred payment method, constituting 29% of e-commerce transaction value (FIS 2023). Notably, MobilePay, launched by the Danish central bank in 2013, dominates the digital wallet landscape despite international presence of players like PayPal and Apple Pay (ibid.). Factors such as wider merchant acceptance, convenience, and a preference against carrying cards or cash contribute to the popularity of mobile wallets (GlobalData 2023b). The prevalence of mobile wallets is expected to persist, with payment service providers and banks actively promoting such payment methods in Denmark (ibid.). Overall, the country's highly digitalised status, reflected in a 98.1% internet penetration rate, creates a favourable environment for the adoption of cashless payments (ibid.). In addition, Denmark's relative share of card payments and mobile payment transactions are the highest in the EU, cementing its position as one of the most digitally advanced payment systems (ibid.) (**Table 1**).

Conclusion: Both Sweden and Denmark exemplify the profound shift towards highly digitalised payment markets, driven by robust infrastructures and changing consumer preferences. In Sweden, the surge in card payments and APMs, propelled by Swish and Klarna, reflects a deliberate regulatory and technological push. In Denmark, the dominance of card transactions, especially through Dankort, and the growing influence of digital wallets like MobilePay underscore a similar trajectory. The notable digitalisation in both nations, reflected in high card payment shares and innovative payment methods, positions them at the forefront of Europe's digital payment evolution.

2.4.2. Moderately Digitalised Payments Infrastructures

Germany maintains a persisting preference for cash transactions, with shares of digital payment methods being distinctly lower compared to the Nordic countries. Cash remains predominant, comprising 32.3% of total transaction volume (GlobalData 2023c). In contrast, payment cards constitute 21.2%, while digital wallets make up a minimal 0.3% (ibid.). This inclination reflects a strong cultural desire for payment privacy and security, contributing to a relatively slower adoption of cashless payment methods.

Nonetheless, a growing trend in card usage emerges, fuelled by the expanding e-commerce sector, improved payment infrastructure, and greater financial inclusion (GlobalData 2023c). Notably, debit cards, especially the domestic Girocard, drive this surge, constituting 73.2% of total card payment value in 2022 (ibid.). The anticipated increased adoption of Girocard is facilitated by reduced processing costs under the IFR (discussed in chapter 4) and a broader acceptance network for contactless payments (ibid.).

Conversely, credit cards, historically less favoured due to cultural aversions to debt, are gaining traction through incentivisation by card companies offering enhanced value-added features, such as cashbacks, discounts, and reward systems (ibid). For instance, strategic partnerships, such as Visa's collaboration with the FinTech company Pliant, aim to boost credit card usage with improved digital card management tools and attractive benefits (ibid.). The growing e-commerce industry is expected to further contribute to this uptake in credit card usage (ibid.).

In addition to card payments, Germans display a favourable attitude towards BNPL services in the e-commerce segment, constituting around 23% of transaction value in 2022 (FIS 2023). This trend is driven by factors such as rising internet and smartphone penetration, increased confidence in online transactions, and a growing awareness of flexible payment (ibid.). Leading providers like PayPal and Klarna are at the forefront of BNPL offerings in Germany (ECDB 2023) (**Table 1**).

Poland's payment landscape presents a mix of traditional and digital preferences. Notably, the use of cash remains significant, accounting for 37.7% of all transactions (GlobalData 2022d) (**Table 1**). This persistent reliance for cash is rooted in various factors, including the comfort and familiarity associated with physical currency, and a perceived sense of security against digital fraud (ibid.). On the other hand, card usage, representing 38.9% of all transactions, signals a gradual shift towards digital payment methods, highlighting Poland's transitional phase where traditional practices coexist with emerging technologies (ibid.). Notably, as is the case in Sweden, both debit and credit card segments are dominated by Mastercard and Visa, accounting for nearly all card-based transactions in Poland due to the absence of a domestic card scheme (Statista 2023c).

The e-commerce sector in Poland, however, is showing a stronger trend towards APMs. In particular, A2A payments, commanding a 67% share of transaction value, have experienced a remarkable 58% increase from the previous year, underscoring a transformative shift (FIS 2023). Consumer insights indicate a growing preference for A2A payments due to perceived higher security, ease of use, faster transaction speeds (ibid.). At the heart of this digital transformation is the BLIK app, a versatile payment method, allowing for easy and instant payments 24/7. Notably, it boasts widespread adoption, with 12mn active users and 3.5mn daily transactions (FIS 2023). Developed through collaboration with major Polish banks and global payment providers, strategic partnerships have played a pivotal role in enhancing customer experience and fostering trust in this innovative payment method (GlobalData 2022d).

Conclusion: Overall, both countries show a mix of traditional and modern payment preferences, indicating a transitional phase in the payment landscape. Especially, Germany's payment landscape shows a shift away from strong biased preference for cash towards digital payments. However, while digitalisation is evident, access to cash remains crucial, requiring a balanced approach. The impact of these trends emphasises the importance of strategically adapting digital

payments as an additional payment option to enable a sustainable transition towards a more digitalised payment landscape. In addition, the adoption of digital payments in these countries is mainly driven by increasing familiarity with digitalisation and the rise of e- commerce sector, reflecting a gradual but significant move towards more diversified and digital payment options. Furthermore, the increasing importance of e-commerce and the central role of domestic applications in shaping payments trends is shown by the rapid growth of A2A payments in Poland. Generally showing an inclusive approach that acknowledges the diversity of consumer needs and ensures that advancements in digital payments do not compromise accessibility to traditional payment methods.

2.4.3. Highly Cash-based Payments Infrastructures

Italy, historically characterised as a slow adopter of digital payments, heavily relies on cash, constituting 67.7% of total transactions (GlobalData 2023e). Despite this, recent regulatory initiatives aimed at curbing cash usage in favour of digital payments have contributed to a gradual decline in the cash share (ibid.). Payment cards, now accounting for 20% of total transactions, have gained traction with regulatory support to enhance card acceptance networks and promote of digital payments (ibid.). Nonetheless, lingering structural and cultural barriers, especially concerning tax evasion, continue to impede a more significant shift from cash usage in Italy.

Italy stands out in the digital payments landscape, emerging as one of the most developed contactless card markets globally, with nearly 8 in 10 consumers possessing contactless cards (GlobalData 2022e). The perceived convenience of digital payments, coupled with a robust payment infrastructure and a growing e-commerce segment, has fuelled market growth, evidenced by a 16.9% Compound Annual Growth Rate (CAGR) in card payment volume from 2018-2022 (ibid). Government-led initiatives to expand acceptance networks among merchants have further supported this trend, reflected in a 9.7% CAGR in number of POS terminals during

the same period (ibid.).

However, despite promising developments in the digital payment market, Italy grapples with a persistent reliance on cash payments (ibid) (**Table 1**). Challenges related to tax evasion, merchant reluctance to accept cards payments, and a limited response to government incentives hinder the widespread adoption of digital payment methods (ibid.). Additionally, Italy faces obstacles in digital familiarity, with only 46% of the population possessing basic digital skills, coupled with an 86.1% internet penetration rate, falling below the North-European countries' average of 97.3% (European Analysis Report 2022). Nonetheless, a decreasing trend in cash usage suggests a gradual shift towards more digitalised payments (**Table 1**).

Portugal's payment landscape also displays a significant reliance on cash, constituting 58.3% of transactions by volume in 2022, reflecting a traditional preference for cash (GlobalData 2023f). Nevertheless, this trend is gradually evolving as improvements in banking infrastructure, the adoption of contactless payments, and the growth of e-commerce prompt shifts in consumer and merchant behaviour (ibid.). Payment cards emerged as the second most used payment method, capturing a 32.1% share in transaction volume (ibid.) (**Table 1**). Central bank measures, such as the National Strategy for Retail Payments, have played a pivotal role in encouraging the transition to cashless payments by mandating merchants to offer at least one cashless payment method (ibid.).

Within the payment card landscape, the debit card market in Portugal is expanding, driven by a near 45% increase in the number of bank accounts from 2020-2022 (Banco de Portugal n.d). This trend is expected to continue, with banks adopting digital onboarding and offering a growing number of debit cards (ibid.). In contrast, credit cards constituted only 4.7% of the total number of card payments in 2022, primarily used for high-value purchases (ibid.). Similar to Germany, credit cards are growing in popularity due to value-added benefits and the introduction of new cards targeting a broader consumer base (ibid.) (**Table 1**).

MB WAY, a domestic digital wallet launched by Multibanco, stands out as a notable player in

Portugal's APMs, facilitating convenient and timesaving in-store and online payments through a mobile app (ibid.). The popularity of MB WAY is evident, with over 4.28mn users in 2022, and more than 33% of consumers designating it as their preferred online payment method (Statista 2023b). However, similar to Italy, Portugal faces challenges in digital familiarity, with only 55% of the population possessing basic digital skills, well below the average in North-European countries, limiting the extent of digital adoption (European Analysis Report 2022).

Conclusion: Italy and Portugal, both characterised by historically high cash reliance, are undergoing gradual shifts towards digital payments. Regulatory initiatives in Italy have curbed cash usage, with payment cards gaining traction, notably in the contactless segment. Despite digital advancements, Italy faces hurdles like cultural barriers and limited digital familiarity. In Portugal, improvements in banking infrastructure and central bank measures propel the transition to cashless transactions, with debit cards expanding. However, challenges in digital skills persist, reflecting a slow but evolving digital landscape in both nations. Their unique challenges, stemming from cultural, regulatory, and digital literacy factors, contribute valuable insights to the broader category of highly cash-dependent economies seeking a balance between tradition and digital transformation.

Chapter 3. Social Cost Model

In the rapidly evolving landscape of European C2B payment markets, understanding the economic implications and potential for optimisation is crucial. This chapter is centred around the construction of a model designed for estimating social cost figures in EU countries. Recognising the persistent challenge posed by severely limited high-quality data, our aim is to methodically develop an assessment of payment market efficiency across the EU.

The foundation of our model is based on the creation of an index devised to evaluate a country's digital payment affinity. This index integrates three distinct factors, namely infrastructure, consumer knowledge, and payment habits, all of which reflect the degree of digitalisation in payment systems. Given the inherent relationship between digitalised payment systems and cost-effectiveness, as discussed throughout our report, the index emerges as an appropriate metric for gauging social costs generated by a country's underlying payment market. Subsequently, leveraging linear interpolation based on known social cost figures and the derived index, we extrapolate estimates for countries lacking such data.

Expanding on our foundational model, we conduct two scenario analyses to explore economic implications by manipulating input variables. One scenario mirrors Denmark's social cost growth rates across EU countries until 2030, providing insights into broader economic impacts. The second scenario considers EU-wide cost-effectiveness through a predominant reliance on A2A systems in 2022, known for their efficiency in social costs (Junius et al. 2022). This approach allows us to assess the robustness of our findings and broaden our scope to include potential cost savings through the widespread adoption of streamlined payment systems across the EU.

Throughout the construction of our model, we outline our methodologies, assumptions, and the inherent limitations in our analyses. However, the central challenge persists, i.e., the lack of high-quality data. This chapter inherently serves as a call for more comprehensive and robust data within this domain, as our ability to draw conclusive findings is impeded by the difficulty of building a statistically sound model. Therefore, aside from shedding light on potential cost savings, this chapter primarily aims to encourage further research, recognising that informed decision-making in the context of European C2B payments is contingent upon the availability of high-quality and extensive datasets.

6.1. Index

As discussed in Chapter 5, the metric of social costs relative to GDP is an important indicator for assessing the efficiency of payment markets in the EU. Unfortunately, only a handful of countries (Denmark, Portugal, Poland, Italy, and Hungary) have this data readily available in national studies. In addition, methodological disparities in the few studies that do compute social costs hinder direct comparisons, contributing to the persistent challenge of limited quality data.

Accordingly, our model emerges to address this issue by estimating social cost figures for countries lacking such information, thereby facilitating a meaningful assessment of payment market efficiency across the EU. Drawing inspiration from Mastercard's Digital Payment Index (DPI), the foundation of our model lies in the construction of an index comprising three principal categories, namely Infrastructure, Consumer Knowledge, and Payment Habits. These categories each include specific sub-elements, collectively reflecting the extent of digitalisation in payment systems. As discussed throughout our report, the underlying relationship between digitalised payment systems and cost-effectiveness positions the index as an appropriate metric for gauging the social costs generated by a payment market.

Notably, in navigating the challenges of limited data availability and methodological disparities, we opted for a concise approach within our index construction. By limiting the sub-elements per category to three, we aim to mitigate the margin of error while maximising representativeness, striking a necessary balance given the need to make numerous assumptions. While this implicitly carries limitations, the index is built as robust as possible within the constraints of data availability. In addition, transparent discussions regarding the limitations of assumptions are made when relevant.

1) The Infrastructure category is designed to assess the capacity of existing payment infrastructures to support digital payments, contributing to overall efficiency and cost-

effectiveness in the payment market.

- **Cards per Inhabitant** measures the number of consumer cards in circulation per capita within a country. Sourced from individual country reports by GlobalData, this metric measures card uptake among consumers, offering valuable insights into prevalent payment instruments and the degree of digitalisation within the payment system.
- **POS Terminals per 1,000 Inhabitants**: Derived from ECB Data Portal and World Bank, this indicator illustrates the extent of available infrastructure to support digital payments within a payments market at the merchant level.
- **Normalised GDP per Capita** evaluates the overall prosperity of countries based on their economic growth. Sourced from Eurostat, with the utilisation of purchasing power parities (PPSs) for cross-country comparability, it underscores the financial foundation required to support a digital payment infrastructure. While each payment-efficient EU country concurrently ranks high on the GDP per capita list, it is important to note that this metric alone may not accurately reflect the efficiency of payment infrastructures. For instance, Brazil holds a very efficient and cost-effective payment market despite having a relatively low GDP per capita. This underscores the importance of considering numerous factors, such as different sub-elements in each of our categories, when assessing the efficiency of payment systems within dynamic and diverse economic environments. However, due to data constraints, this model opts for this metric.

By considering these three sub-elements, we ensure a well-rounded assessment of the payment infrastructure, considering accessibility, acceptance, and the economic foundation of digital payments. This allows us to capture the interplay of factors shaping the efficiency and cost-effectiveness of payment infrastructures.

2) The Consumer Knowledge category aims to gauge consumers' understanding of digital payments and their overall proficiency in engaging with such payment methods. These elements

are crucial in influencing the likelihood of adopting cost-efficient digital payment instruments.

- **Digital Skills** is a metric designed to measure how adeptly consumers handle digital payment methods. Sourced from Eurostat, it provides insights into the design requirements of innovative payment methods influencing uptake, shedding light on the ease with which consumers can adopt to digital payment solutions.
- **Consumers in E-commerce** quantifies the number of consumers actively making online purchases in the e-commerce segment. Derived from Eurostat, this indicator reflects the evolving sentiment regarding consumers' desire and ability to adapt to online payments and, consequently, digital payment instruments.
- **Percentage of Banked People** measures the share of total population with access to traditional banking services. Sourced from Eurostat, this indicator serves as a prerequisite for obtaining various digital payment instruments, laying the foundation for consumers to develop an understanding of digital transactions.

By examining these three sub-elements, we ensure a comprehensive evaluation of consumer knowledge in digital payments, covering the ease of handling digital methods, consumer behaviour in e-commerce, and the foundational role of traditional banking services. This approach captures the proficiency and adaptability of consumers, providing an indicator of their readiness to engage with and adopt cost-efficient digital payment instruments.

3) The Payment Habits category sheds light on different behavioural patterns associated with the usage of digital payments, considering the persistent prominence of cash payments and the gradual emergence of innovative digital payment methods.

- **Share of Card Payments** measures the percentage of the total payment volume associated with consumer cards. Due to limited data availability, this metric was collected from two sources, i.e., GlobalData and the ECB. Accordingly, we acknowledge the potential negative impact of discrepancies in underlying methodologies. This indicator aims to offer insight

into prevailing card usage and identifies opportunities for further growth in cashless payments within the broader context of increased efficiencies.

- **Share of Mobile Wallets** captures the percentage of the total payment volume associated with mobile-based payments. Similar to the first point, the data was sourced from both GlobalData and the ECB due to limited availability, potentially introducing negative impacts stemming from differences in underlying methodologies. This indicator aims to capture the growing emergence of mobile-based payment solutions, providing insights into shifting consumer preferences towards instruments with efficiencies surpassing even those of consumer cards (as described in Chapter 6).
- **Ratio of Card Payments to Cash Withdrawals** shows the primary purpose of cards by including the ratio of card payments to cash withdrawals, particularly indicating the volume and value of cash being withdrawn. Sourced from the ECB Data Portal, this metric is crucial in assessing the degree of digitalisation in current payment markets.

Through these metrics, we capture a nuanced picture of evolving payment habits, ranging from card usage to the rise of mobile wallets and the shift away from cash transactions. These insights offer a concise yet comprehensive overview of digitalisation trends and changing consumer preferences, thereby impacting the degree of efficiency and cost-effectiveness in the payment landscape.

Normalisation: In constructing our index, we face challenges of integrating diverse indicators with varying metrics and units, such as the number of cards per inhabitant and GDP per capita. To ensure a fair and standardised comparison, we employ min/max normalisation, allowing for proportional contribution and equal weighting across all sub-elements. This process involves transforming indicators to a common scale, between 0 and 1, making them comparable despite different measurement units. Further details on the specific formula used can be found in **Equation D 1**.

Equal-Weighting Approach: Following the normalisation process, the sub-elements are averaged to derive the overall figure for each principal category. Subsequently, in line with Mastercard's DPI, we opt for an equal weighting approach for each principal category. This decision stems from the absence of strong empirical basis for assigning different weights to specific components based on current published data and research. Furthermore, after a thorough evaluation of different weighting methods, it became clear that an equal weighting approach consistently provided the most accurate and realistic results.

It is important to recognise that equal weighting assumes equal importance and impact of each sub-element and category, which might not align with the real-world significance of these factors. Certain sub-elements may have a more substantial influence on the overall objective or may require more consideration due to their relevance or sensitivity. Recognising this, future research could benefit from incorporating empirical findings to assign weights, providing a more accurate representation of the factors contributing to our index.

Nonetheless, this composite index effectively reflects the degree of digitalisation in payment systems. Higher index values indicate more efficient payment infrastructures, sophisticated consumer knowledge, and payments habits favouring digital payment methods. Consequently, countries with higher index values are likely to experience lower social costs, given the positive relationship between highly digitalised payment systems and greater cost-effectiveness (as discussed throughout the report).

Limitations*:* Following the construction of our index, it is imperative to address its inherent limitations, particularly considering the central issue of severely limited data availability. This gives rise to two primary concerns regarding our index, namely the data collection and the broader issue of representativeness.

As stated throughout its construction, numerous shortcomings are specific to the data collection associated with the index. The infrastructure category data, derived from reputable sources such

as GlobalData, ECB Data Portal, and Eurostat, may face challenges due to variations in data collection methodologies across countries. Similarly, the consumer knowledge category data heavily relies on Eurostat surveys, introducing the possibility of biases such as inaccurate recall or social desirability. Furthermore, the payment habits category data combines two sources, namely GlobalData and the ECB SPACE study, to overcome limited availability. While such an approach is relatively common for reports on cost of payments, it introduces challenges in consistency and accuracy. The temporal variations between the two sources, i.e., 2023 and 2022 respectively, further emphasise the need for consideration regarding the data's ability to accurately capture shifts in payment habits.

In addition to these data collection limitations, the representativeness of the index also warrants consideration. Firstly, the aggregation of all aforementioned sources introduces the potential for inconsistent and unreliable data feeding into the index. Combining factors with different underlying assumptions, methodologies, scopes, time periods, and measurement units can be particularly complex, potentially affecting the integrity of the index. Moreover, the selection of sub-elements and principal categories is ultimately subjective, which might result in the exclusion of factors important to the assessment of payment efficiency. The same rationale applies to the equal weighting approach, as this might overlook certain indicators with more or less substantial impact on payment efficiency. These concerns collectively suggest that the index might be unable to account for all factors that could have an impact on the degree of digitalisation observed in the payments market.

Therefore, caution is advised when interpreting the results of the index, as underlying assumptions and limitations should be considered. This again emphasizes that the following serves as catalyst for further research and exploration, rather than providing definitive numerical conclusions.

6.2. Linear Interpolation

Once the foundation of our model has been constructed, we employ linear interpolation by leveraging known social cost figures for Denmark, Portugal, Poland, Italy, and Hungary, alongside the derived index, to extrapolate estimates for EU countries lacking such data.

Data Adjustments*:* Before delving into the linear interpolation process, we address a challenge arising from the temporal discrepancies in social cost figures for countries with available data. Given this method's assumption of consistent and linear progression between known data points, establishing a common timeframe is crucial for accurate estimations. To achieve this, we use the CAGR formula to standardise the social cost timeframe to the year 2022 (see **Equation D 2** for detailed formula). Implicit in the use of CAGR is the assumption that the metric changes at a steady rate each year, implying a smooth and continuous growth or decline without significant fluctuations. However, this assumption may overlook non-linearities, such as an inverted U-shape curve associated with economies of scale, underscoring the model's need for further research.

A clear example of this limitation arises in Hungary's recent substantial infrastructure investments, which presents challenges in applying a linear growth assumption. To address this, we consider an alternative metric, namely the average change in cash usage from 2019-2021, which equates to a decrease of 2.38% (GlobalData 2023). This metric is deemed an appropriate proxy for efficiency gains in social costs through increased adoption of digital payments while reducing cash payments (as observed in Chapter 5). However, it is important to note that using this metric remains an oversimplification and may not fully capture the complex dynamics of social cost decreases. Despite associated limitations, the use of CAGR remains relevant and pragmatic for the remaining countries, considering matching trends, limited data availability, and the imperative of standardisation.

These challenges further emphasise the importance of ongoing research and robust data

collection in this area. Having made these adjustments, we now transition to the application of the linear interpolation method to estimate social costs for countries with unknown figures.

Application of Linear Interpolation Method: After standardising social costs to a common timeframe, we employ the linear interpolation method to estimate social costs for countries without explicit data. This method relies on available data and certain assumptions, and its accuracy is contingent on the quality and representativeness of the data used in constructing the index.

In the following, countries are categorised with known social costs as 'known' and those without as 'unknown' for clarity. The linear interpolation method operates by using two reference points, representing countries with known social costs, to establish a straight line. These reference points, along with their respective positions on the index, form the basis for estimating social costs for the unknown countries.

In practical terms, the interpolation involves identifying the nearest ‘higher’ and ‘lower’ known index values corresponding to the unknown index of each country. Once these reference points are determined, the relative position of the unknown index is used to interpolate the social costs to GDP. However, it is essential to approach this linear relationship critically, as it may not precisely capture the complexities of non-linear dynamics in social costs across countries, especially considering sudden shifts in payment habits or other external factors.

The accuracy of our estimates relies on the quality and representativeness of the data used to construct the index, which is a potential concern given substantial differences in methodologies employed by benchmark countries, as previously explained. Additionally, extrapolating from a small set of benchmark countries to the entire EU assumes a level of homogeneity and representativeness that may impact the reliability of estimated social costs. Another critical consideration arises from the sensitivity of the model to outliers, as extreme index values could impact the accuracy of extrapolated social costs. To mitigate this sensitivity, edge cases where

an 'unknown' index value falls below or above the range of 'known' index values are addressed by selecting the next two closest values near the 'unknown' index for interpolation. Additionally, to maintain realistic estimates, a range of minimal social costs was defined, with minorisation limits set at 0.15% (upper limits not required as no outliers in that regard).

Despite these limitations, within the current methodological constraints, this approach stands as the most reasonable and practical choice. It provides valuable insights into social costs in the EU and enables scenario analyses, but it is essential to recognise the potential impact of data limitations and assumptions on the results.

Conclusion: In summary, the index, modelled in accordance with the DPI, captures essential factors influencing a country's social costs – infrastructure, consumer knowledge, and payment habits. Leveraging these indexes, we estimate social costs to GDP for targeted countries using the linear interpolation method. This forms the foundation for scenario analysis, which will be expanded on in the next section. Despite offering valuable insights, it is crucial to acknowledge significant limitations in data availability and assumptions, underscoring the urgent need for more comprehensive data collection in this area. However, within these constraints, the conducted approach proves to be the most appropriate, providing valuable insights into the current state of social costs in Europe and enabling scenario analyses on the impact of different payment infrastructures on social costs of retail payments.

6.3. Model Output

Having constructed the model, the analysis now turns towards its output. This section discusses the main outcomes of the base model, as well as alternative scenarios in which the robustness of these findings is tested. This also illustrates the use case of this model, serving as a tool for gauging the potential impact of adopting different payment systems across the EU.

Base Outputs: The base model output presents the extrapolated social costs to GDP for each EU country. Notably, Bulgaria, Cyprus, Malta, and Romania are excluded due to data unavailability.

The aggregated figures equate to social costs of 0.65% relative to GDP for the entire EU in 2022, amounting to around €101bn. This indicates a significant decrease from 2012, when social costs were estimated to be around 1% of GDP, totalling €130bn (ECB 2012). Considering the substantial increase in EU GDP from 2012-2022, the percentage decrease in social costs to GDP may not precisely reflect efficiency gains in payment markets. Instead, focusing on the absolute decrease in social costs, which has reduced by roughly 22%, offers a more indicative measure of efficiency improvements. This substantial reduction in costs aligns with expectations, given the notable shift towards digital payment systems and advanced payment infrastructures across the EU. It also suggests that competition and innovation in the payments market effectively reduce costs, as underlying regulatory initiatives have contributed to substantial savings over the last decade. Moreover, this decreasing trend further reflects the gradual increase in total payments volume, which has enabled scale effects to manifest and reduce unit costs for heavily used payment instruments. Therefore, as a whole, the EU has been performing quite well in the context of reducing social costs through increased digitalisation and associated efficiencies. It is important to note that our sample excludes the four aforementioned countries, which may have resulted in an overestimation of the cost gap between the 2012 study and our current model.

At the country level, regional clusters emerge based on index scores and extrapolated social costs, revealing potential insights into payment market dynamics. While clustering is a complex process influenced by multiple factors, including the interplay of economic, cultural, and historical elements, some patterns emerge. Firstly, the Southern European cluster exhibits relatively high social costs to GDP, as observed in Greece (1.03%), Italy (0.81%), and Portugal

(0.80%). Commonalities here, as explored throughout Chapter 2, include the predominant reliance on cash and limited efficacy in regulatory initiatives promoting the uptake of digital payment methods. For example, limited card acceptance infrastructure is severely impeding the adoption of consumer cards in Portugal, while cultural consumer preferences for cash payments persist in Italy despite available infrastructure to support digital alternatives.

Secondly, the Central and Eastern European cluster includes diverse performances, with Estonia (60%) and Austria (0.67%) showcasing lower social costs, while Poland (1.13%) experiences higher costs. The former aligns with a more balanced distribution between digital payment adoption and traditional cash payments. This is likely due to a greater preference for more efficient payment instruments among consumers, as well as supportive regulatory and commercial initiatives (FIS 2023). For instance, Poland's endorsement of BLIK demonstrates strong e-commerce adoption, with expectations for its use to increase in in-store payments over time to positively impact social costs (as discussed in Chapter 5).

Thirdly, the North and Western European cluster outperforms, featuring advanced and efficient digital payment systems in Sweden (0.38%), Denmark (0.31%), and Belgium (0.51%). As explored in Chapters 2 and 5, the Nordic countries exemplify efficiency through the widespread uptake of payment cards (and A2A payment methods among consumers. This, coupled with substantial investments in efficient payment infrastructure, has resulted in particularly low social costs. For instance, Denmark's multi-layered approach to efficient transaction processing generates an extremely low social cost figure, while Belgium also shows a strong domestic card scheme and A2A presence similarly contributing to a cost-effective payment market (FIS 2023).

In summary, the observed figures align with general expectations, indicating that countries with well-established digital payment markets tend to exhibit lower social costs. However, it is crucial to underscore the importance of considering the limitations and assumptions inherent in our model when interpreting these results.

Alternative Outputs: Expanding upon our base model, the analysis incorporates two distinct scenario analyses. These scenarios enable us to explore the economic implications of manipulating input variables within our model, thereby simulating different circumstances. Firstly, we explore a scenario where each EU country experiences growth rates in social costs mirroring those of Denmark until 2030, providing insights into the broader economic impact of such efficiency gains. Secondly, we consider a scenario where EU countries generate cost-effectiveness from a predominant reliance on A2A systems in the year 2022, recognised as the most efficient payment method concerning social costs (Junius et al. 2022). This approach allows us to assess the robustness of our findings while broadening our scope to include potential cost savings through the widespread adoption of streamlined payment systems across the EU.

Notably, these alternative cases rely on distinct assumptions that are unlikely to reflect the real-world scenarios observed in the EU payment market. These will be explicitly mentioned to ensure transparency in the employed methods. Nonetheless, through these alternative scenarios, we aim to test the robustness of the base model's output and showcase the model's capacity to simulate potential cost savings under different market conditions.

A) Scenario 1 departs from the base model with a twofold adjustment. Firstly, the Denmark CAGR of -8.67% is applied to the social cost figures of the four other countries in our input variables, namely Hungary, Poland, Portugal, and Italy. This adjustment aims to simulate a scenario in which the current payment infrastructures of less advanced countries were to undergo similar strategies as Denmark, leading to long-term efficiency gains.

Secondly, the standardised social cost timeframe is intentionally shifted to the year 2030. This choice is grounded in the assumption that, in the short term, associated investments and scale effects introduce complexities that might impede an immediate and consistent decline in social costs. Initial years could even witness increases in social costs due to upfront investments, as

illustrated in the unique case of Hungary. However, over an extended timeframe, the cumulative impact of efficiency improvements becomes more pronounced. Therefore, we select the year 2030 aiming to capture this effect. That is, while the initial years may not exhibit a CAGR of -8.67%, the subsequent years, with the realisation of scale effects, are anticipated to surpass this average. This twofold adjustment sets the stage for linear interpolation across our sample of missing data, enabling the estimation of these costs across the EU.

The model's output indicates significant efficiency gains and a notable convergence of social costs across individual countries in the simulated scenario. Applying Denmark's CAGR to less advanced countries results in a substantial narrowing of the gap between nations, leading a more homogenised landscape. At a country level, the average social cost to GDP ratio becomes 0.37%, a figure that would rank among the top 5 in the current market (generated by our base model). This reflects the potential for efficiency improvements, levelling the playing field among EU countries. Notably, the most remarkable impact is observed at the EU level, where the total social cost sees a reduction of over 50% (to €51bn) from the current figures (generated by our base model), significantly surpassing the model's earlier predictions for the 2012-2022 period (roughly 22% reduction). This substantial decrease underscores the potential benefits of widespread adoption of more efficient payment systems, reflecting the relatively recent and limited shift to digital payments at the current EU level.

These results suggest that with strategic investments and regulatory initiatives aimed at optimising payment infrastructures, assuming similar consumer preferences to Denmark, the EU could achieve substantial cost savings and enhance economic competitiveness. Further analysis and consideration of potential challenges, such as initial investment costs and regulatory complexities, would be crucial for a comprehensive evaluation of the feasibility and the implications of such a scenario.

While the results suggest significant efficiency gains and convergence of social costs, it is

crucial to acknowledge the inherent limitations of this scenario. The assumptions of homogenous consumer preferences, linear interpolation, and application of Denmark's CAGR to diverse economic landscapes introduce simplifications that may not fully capture the intricacies of payment market dynamics. To assess the impact of variations in the CAGR assumptions, the Excel file "Master Scenario Analysis," specifically in the sheet "Scenario Analysis A (Denmark)" includes scenario outcomes with both an increase and decrease of 25% from the base Denmark CAGR value. In addition, the 2030 timeframe assumes a linear decline in social costs, overlooking potential disruptions or regulatory changes. Moreover, real-world challenges may impede the seamless realisation of efficiency gains and continuous scale effects. Collectively, these limitations highlight the need for caution in interpreting the figures.

B) Scenario 2 deviates from the base model by incorporating a predominant reliance on A2A instant payment systems. The objective is to simulate an environment where the cost-effectiveness of A2A systems is extended throughout the EU, assuming widespread uptake in 2022. To implement this adjustment, we refer to the Swedish National Bank's calculation of the social cost associated with its A2A system (Swish), in comparison to the prevailing social costs within its predominantly card-based payment market. At full-scale adoption (100%), A2A methods exhibit an approximate 17% reduction in current social costs, as they would effectively replace existing payment methods (Riksbank, 2023). Consequently, we apply a uniform 17% reduction in 2022 social costs across each of our five input variables. This adjustment aims to illustrate the potential savings that could be realised across the EU if instant payments were the exclusive payment method in 2022. While acknowledging the simplistic nature of this assumption, the model showcases substantial cost savings. Moreover, it is crucial to note the limitations posed by the scarcity of available data on assessing the capacity of A2A payments to generate savings in systems featuring diverse distributions of digital and cash transactions.

Unfortunately, the scenario cannot be forecasted or supplemented with additional information due to this data gap. This underscores the severe lack of comprehensive and high-quality data in this domain, hindering the ability to draw conclusive insights.

Nonetheless, the alternative model's output reveals significant cost savings, especially at an EU level. The total social costs to GDP would decrease to 0.50%, a notable improvement from the current 0.66% (generated by our base model), resulting in roughly €77bn in total costs. Comparing these results to the 2012 ECB study, there is a remarkable relative decrease in absolute cost figures – approximately 40%. This underscores the considerable potential for savings in an A2A context compared to our base model, which assumes a more realistic distribution of payment methods. Notably, while the figures indicate substantial improvements on an aggregate level, there is no stark convergence in social costs observed at the country level. Wide gaps would persist, particularly evident in Poland (0.96%) and Finland (0.15%). Nonetheless, the average social cost would decrease to 0.59%, highlighting the overall potential for increased efficiency across EU countries compared to the current base model.

Notably, this scenario is subject to several large limitations that warrant consideration. Firstly, the assumption of a 0.17% reduction following the A2A implementation is an oversimplification and is insufficiently substantiated. As was done for Scenario 1, to assess the impact of variations in this assumption, the Excel file "Master Scenario Analysis," specifically in the sheet "Scenario Analysis B (A2A)" includes scenario outcomes with an increase and decrease of 25% from the base assumption. Secondly, the assumption of uniform and widespread adoption of A2A payments across EU countries oversimplifies the intricate dynamics of varied technological infrastructures, regulatory frameworks, and consumer preferences. Moreover, the stability of A2A systems is assumed, but real-world challenges such as technical issues and security concerns could impede their seamless implementation. Additionally, external factors like economic shifts, geopolitical events, or changes in consumer

behaviour are not explicitly factored into the analysis, introducing a level of uncertainty. Recognising these limitations is imperative for a nuanced understanding of the potential implications and for informing more robust conclusions. In addition, the differences in underlying assumptions and differing time periods restricts the ability to compare the two scenario analyses.

Conclusion: The model's outputs, ranging from base findings to alternative scenarios, provide valuable insights into the complex landscape of EU social costs. Notably, the base model illustrates significant efficiency gains, with regional clusters highlighting payment dynamics. Scenario 1, envisioning EU-wide adoption of Denmark's efficiency gains, shows a promising convergence, yet assumptions demand caution. In Scenario 2, A2A adoption signals substantial EU-level savings, despite persisting country-level disparities. Acknowledging oversimplified assumptions and data limitations is vital for appropriate interpretation.

Overall, showcasing its applicability, the model introduces a measurable dimension to efficiency discussions, enabling decision-makers to weigh economic benefits against social costs. While the scenario analyses operate under assumptions that may not reflect realistic market conditions, the model lays the groundwork for future research, calling for more robust data to enhance its construction as high-quality information and transparency across social cost of payments becomes available.

Chapter 4. Conclusion

This thesis unfolds as a thorough analysis of the European C2B payments market, revealing a dynamic environment shaped by a multitude of factors. Chapter 2 offers an extensive overview of market dynamics towards digital payments, examining prevalent payment instruments, consumer and merchant preferences, and the degree of digitalisation across EU countries. Operational disparities and cost savings linked to digital payment systems are discerned within

diverse domestic markets. The concluding chapter presents a novel model for estimating social costs, addressing data gaps through an index-based approach and linear interpolation. This innovative method offers insights into countries lacking social cost information and lays the groundwork for future research improvements.

While our model aims to address this challenge, it involves assumptions that inherently carry limitations. Informed decision-making in the context of European C2B payments remains contingent upon the availability of high-quality and transparent data.

Overall, this thesis stands as an extensive assessment of the European C2B payment market. Through a thorough literature review, market reports, and the development of our model, this research serves as a foundational step towards a more nuanced understanding of the complexities inherent in the European C2B payments market. Furthermore, the implemented model underscores the urgent need for further research by highlighting the gap in limited research, data, and transparency across the EU C2B payments market.

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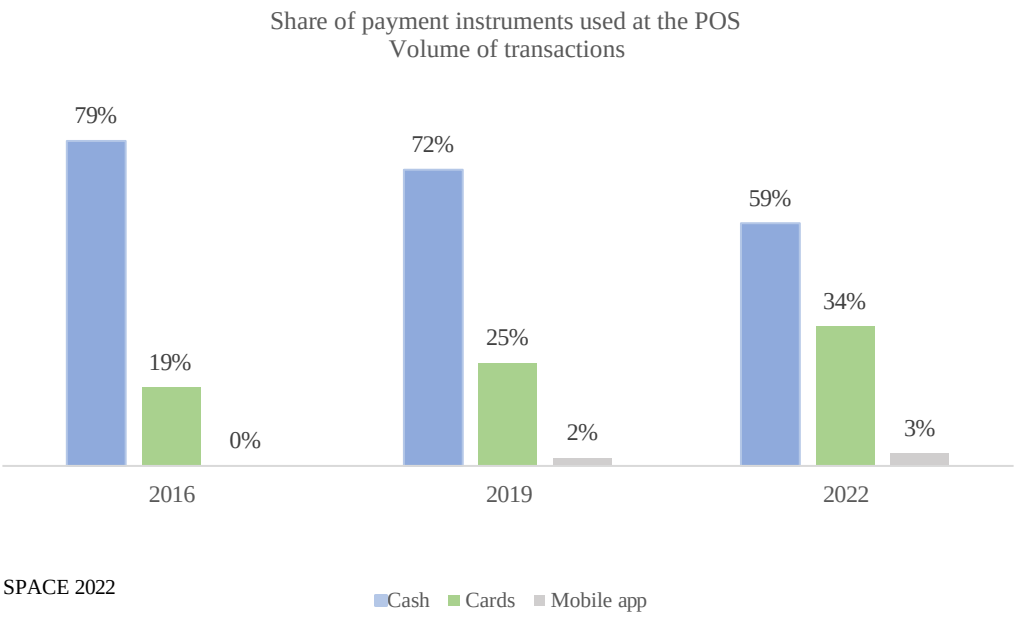
Appendix

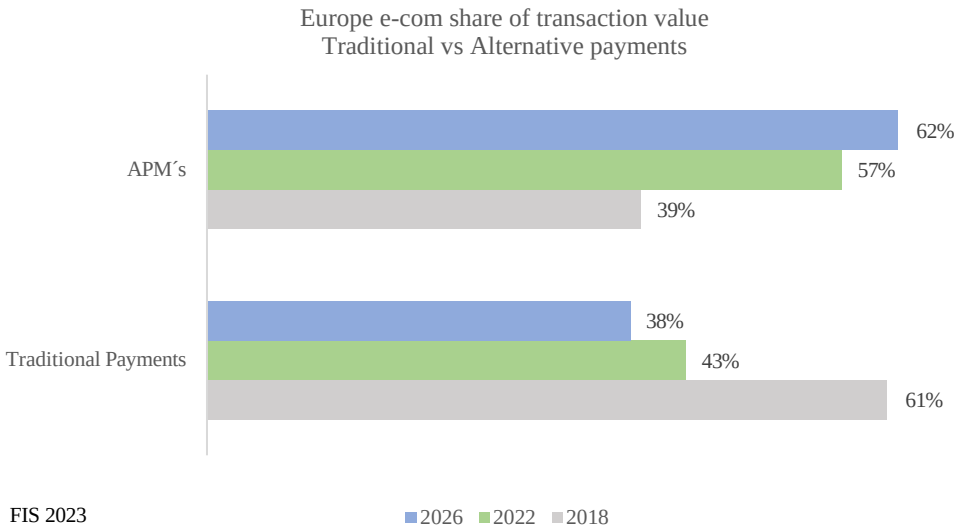
A. Appendix of Section 2 – Overview of EU C2B Payments Market

Figure A 1: Share of payment instruments used at POS in terms of volume of transactions



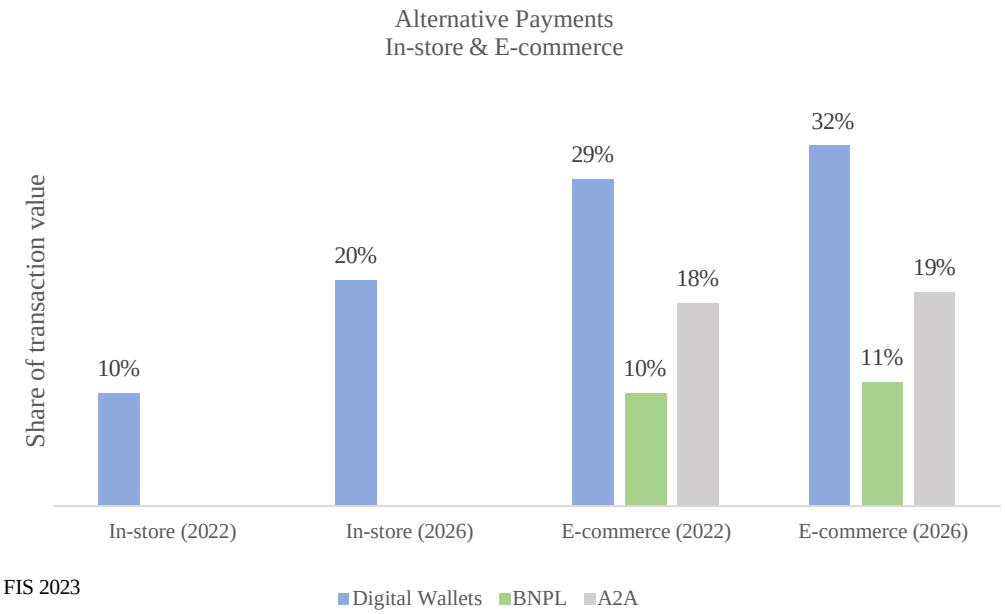
SPACE 2022

Figure A 2: Europe e-commerce share of transaction value



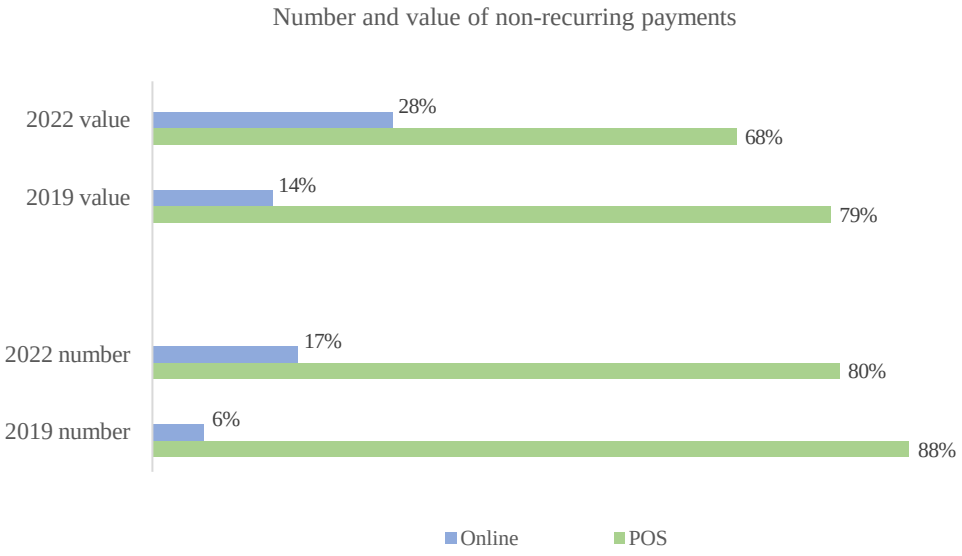
FIS 2023

Figure A 3: Share of Alternative payments



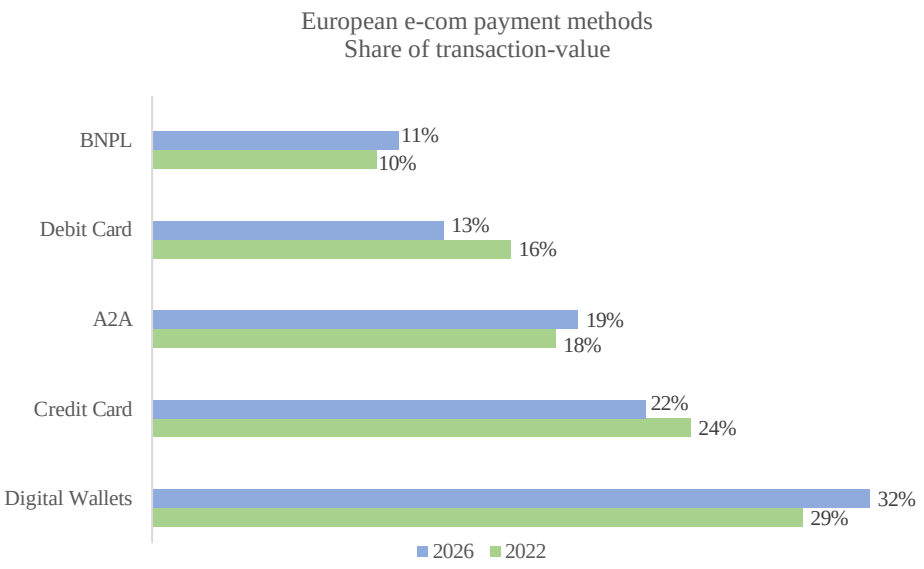
FIS 2023

Figure A 4: Number and value of non-recurring payments



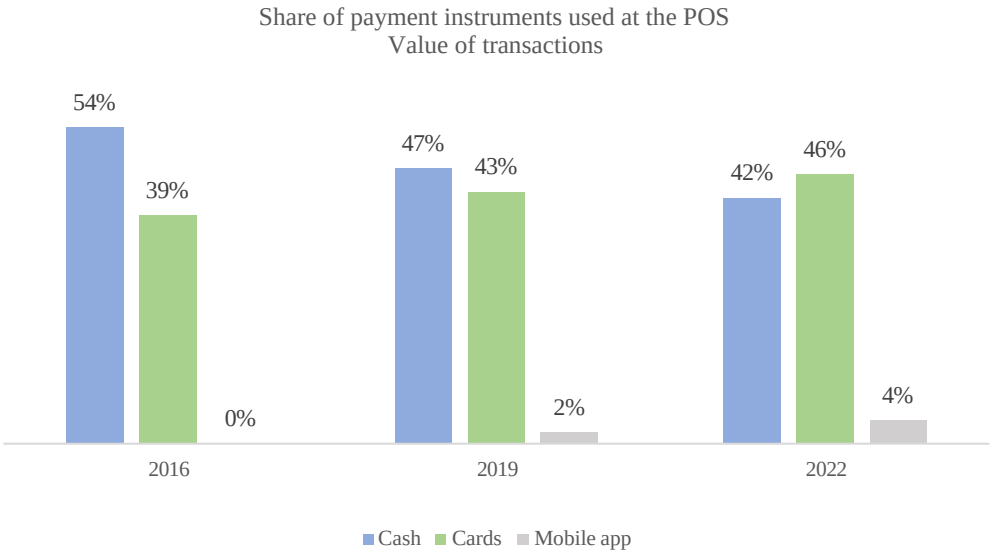
ECB - Study on the payment attitudes, 2022

Figure A 5: European E-commerce payment methods



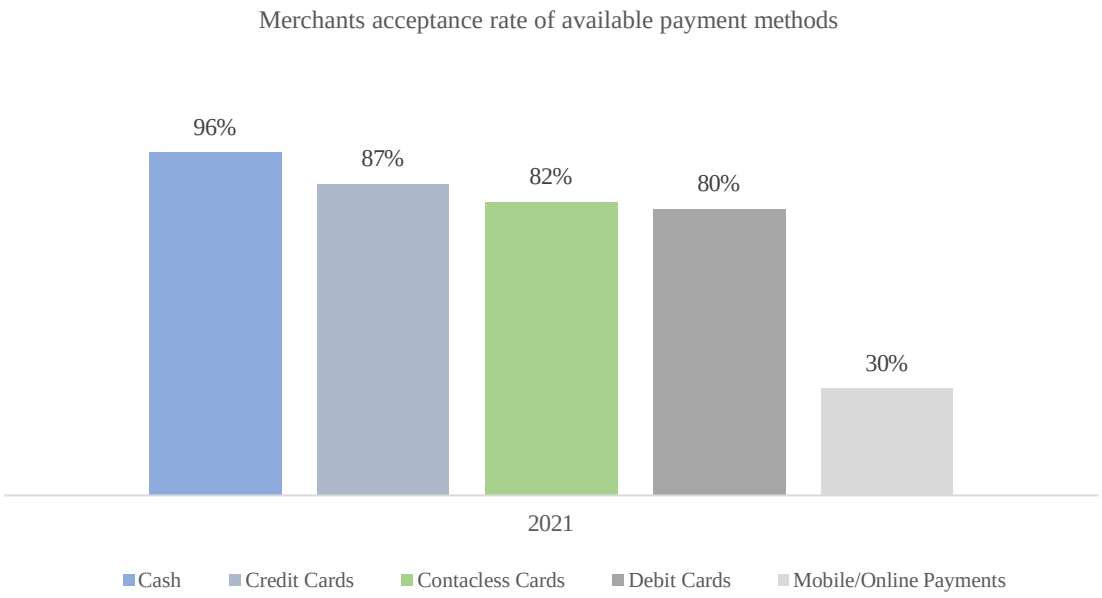
FIS 2023

Figure A 6: Share of payment instruments used at the POS in terms of value of transactions



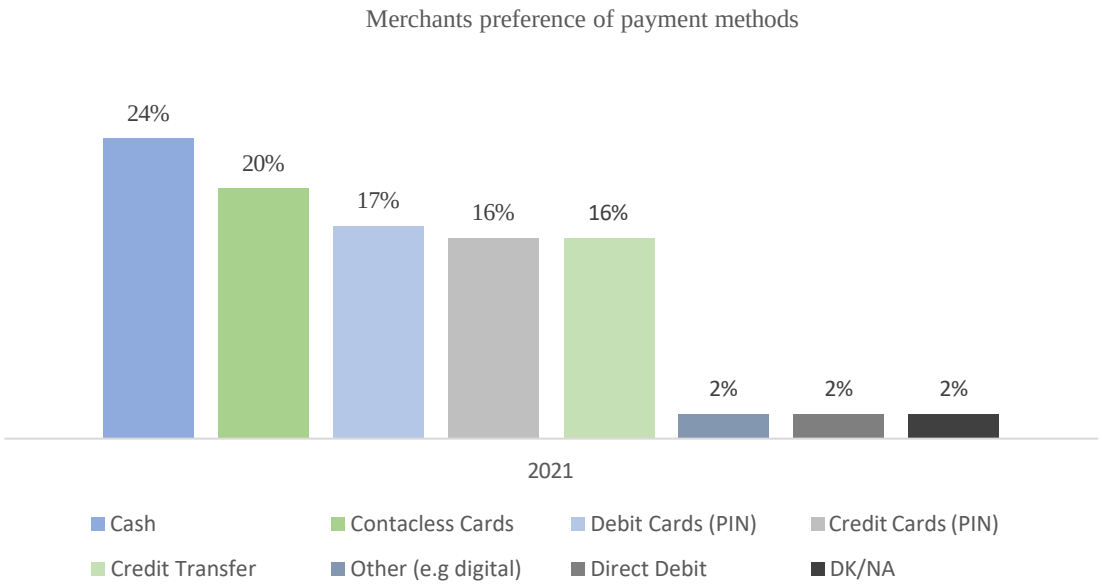
ECB - Study on the payment attitudes, 2022

Figure A 7: Share of payment instruments used at the POS in terms of value of transactions



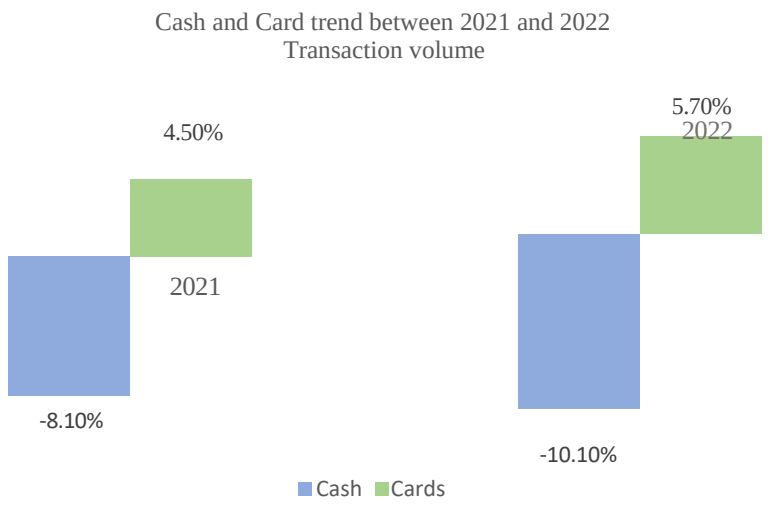
ECB - Use of Cash by companies in the euro area 2022

Figure A 8: Merchants preference of the different payment methods



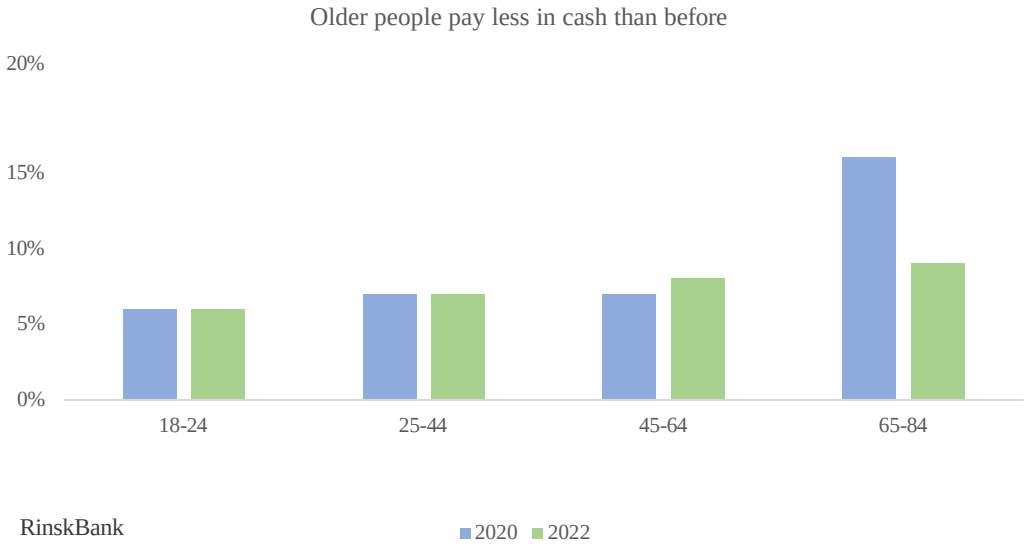
ECB - Use of Cash by companies in the euro area 2022

Figure A 9:Cash and Card trend in 2021 and 2022



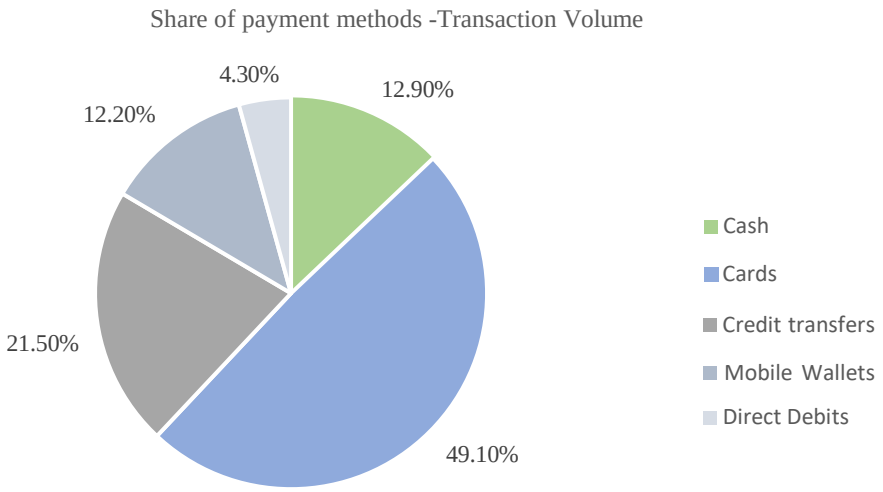
Global Data 2023

Figure A 10: Use of cash among aged groups



RinskBank

Figure A 11: Share of payment methods in Denmark



GlobalData 2023

Table A 1: Economic and technological indicators

Country	Unbanked people (2022)	Digital Skills	Internet penetration (2023)	Number of POS terminals per 1,000 inhabitants
Highly Digitalised Payment Countries			**97.30%**	-
Denmark (DK)	16%	68.70%	98.10%	26
Sweden (SE)	17.10%	66.50%	97.20%	21
Moderately Digitalised Payment Countries			**93.70%**	-
Germany (DE)	16.30%	48.90%	93.10%	18
Poland (PL)	27.20%	42.90%	88.40%	30
Highly Cash-Based Payment Countries			**88.70%**	-
Portugal (PT)	23.40%	55.30%	85.10%	37
Italy (IT)	20.90%	45.60%	86.10%	66

GlobalData, Statista, EuroStat

B. Appendix of Section 3: Social Cost Model

Equation D 1: Formula Min-Max Normalization

$$X' = \frac{x - xmin}{xmax - xmin}$$

Equation D 2: Formula CAGR

$$CARG = \left(\frac{Final\ Value}{Starting\ Value}\right)^{\frac{1}{N}} - 1$$

Equation D 3: Formula Interpolation

$$y = ymin + \frac{(x - xmin) \cdot (ymax - ymin)}{(xmax - xmin)}$$

Table D 1: Overview Social Cost in Europe

Countries	Available Social Cost/GDP *national report*	Index	Total Social Cost/GDP (2022) *extrapolated*
Denmark	0.53%	0.50	0.00%
Hungary	1.75%	0.12	0.00%
Italy	0.80%	0.16	0.00%
Poland	1.21%	0.19	0.00%
Portugal	0.99%	0.20	0.00%

Countries *extrapolated*	Index	Total Social Cost/GDP (2022) *interpolated*
Austria	0.28	0.67%
Belgium	0.38	0.51%
Czech Republic	0.25	0.72%
Estonia	0.32	0.60%
Finland	0.54	0.24%
Germany	0.26	0.71%
Ireland	0.45	0.39%
Greece	0.18	1.03%
Netherlands	0.64	0.15%
Spain	0.27	0.69%
France	0.33	0.59%
Croatia	0.18	1.03%
Latvia	0.22	0.77%
Lithuania	0.14	1.22%
Luxembourg	0.71	0.15%
Slovenia	0.21	0.79%
Slovakia	0.21	0.79%
Sweden	0.46	0.38%

Extrapolated Social Cost to GDP for all countries in the scope and calculations described in Chapter 7