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THE ROLE OF CARD PAYMENTS IN EUROPE'S ECONOMY

Evidence on the socio-economic benefits of card payments and the ecosystem that sustains them

PAYMENTS EUROPE
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Copenhagen Economics

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PREFACE

Payments Europe has commissioned Copenhagen Economics to assess the socio-economic contribution of the European card payment ecosystem. The study examines the value that card payments create for consumers, merchants, and governments, the remaining socio-economic gains that continued shifts from cash to card payments could realise, and the ecosystem that supports the reliable delivery of these benefits. Alongside the analysis for the European Union (EU) as a whole, we examine eight focus countries: Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, and Sweden. These countries span different parts of Europe and capture variation in payment behaviour, market maturity, and market structure, which illustrates how the role and socio-economic value of card payments differ across Europe.

This study focuses on card payments. Throughout the report, we define card payments as payments initiated using debit, credit or prepaid cards and processed through card payment infrastructure. This includes payments made at the point of sale, online and in-app, as well as the ecosystem of issuers, acquirers, processors and card schemes that enable the authorisation, clearing and settlement of these transactions.[1]

The study does not assess the broader market for electronic payments. In particular, it does not analyse account-to-account (hereafter, "A2A") payments, e-money or digital wallets[2] as standalone payment solutions. These payment methods are considered only where they interact with, complement or provide alternatives to card payments.

The study is based on a combination of desk research, stakeholder interviews and our own economic models. It draws on the academic literature, publicly available statistics and industry data to quantify the socio-economic benefits generated by card payments and assess the remaining potential for further value creation.

We would like to thank the following industry participants for generously sharing their time and expertise through interviews conducted for this report: *AirPlus International, Deutsche Kreditbank (DKB), Mastercard, Nordea Bank, PSA Payment Services Austria, Visa, and WEX Inc.* The interviewees provided input and perspectives that informed the study. Copenhagen Economics is solely responsible for the analysis and conclusions presented in this report.

[1] See also Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, see link.

[2] A2A payments transfer funds directly between bank accounts without relying on card payment infrastructure. E-money refers to electronically stored monetary value issued on receipt of funds and accepted as a means of payment. Digital wallets are applications that enable consumers to initiate electronic payments using one or more underlying funding sources, including payment cards, bank accounts, e-money or stored balances. (See e.g. European Banking Authority (2025) Definition of electronic money, link; Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on payment services and electronic money services in the Internal Market amending Directive 98/26/EC and repealing Directives 2015/2366/EU and 2009/110/EC, see link.)

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KEY STUDY FINDINGS AT A GLANCE

- Cards are a widely accepted means of payment within a diverse European payments ecosystem that also includes cash, A2A and mobile payment solutions. **Cards' share of EU point-of-sale (hereafter, "POS") transactions by number rose from 27 per cent in 2016 to 48 per cent in 2024**, although adoption still differs across Member States (Section 1.1).
- We estimate that card payments generated **annual benefits close to EUR 20 billion for merchants and consumers in the EU in 2024. Merchants realised around EUR 8.8 billion** in resource savings from lower payment-handling costs, while **consumer benefits amounted to approximately EUR 11 billion** through faster payments, fewer cash withdrawals, convenience, fraud protection, and chargeback protection. **The wider value of card payments extends beyond what we quantify**. Cards support trusted e-commerce, cross-border trade, market access for small and medium-sized enterprises (SMEs), contactless and tokenised payments, digital wallet integration, and continued payment innovation (Section 1.2).
- **In a projected scenario in which recent adoption patterns continue, annual merchant and consumer benefits could reach approximately EUR 33 billion by 2035**, with cards from domestic and international schemes projected to account for around 72 per cent of EU POS transactions by number (Section 1.3).
- Higher card usage is associated with stronger value added tax (VAT) compliance. We estimate that increased card usage since 2014 was associated with around **EUR 21.6 billion in additional annual VAT revenue by 2024**. Further adoption could be associated with around **EUR 24.6 billion in additional annual VAT revenue by 2035** (Section 1.4).
- **Operational resilience is supported by safeguards and risk management throughout the card payment chain.** Market participants invest in fraud prevention, cyber security, monitoring, redundancy, business continuity and recovery capabilities, complemented by secure settlement infrastructure and European regulation and oversight (Sections 2.1 and 2.2).
- **Payment continuity is also supported by the diversity of Europe's payments ecosystem.** Domestic and international card schemes, A2A and mobile solutions, cash, and a diverse acquiring market give consumers and merchants alternatives and reduce dependence on individual providers or payment solutions. This diversity also creates incentives for continued investment in service quality, security, and innovation (Section 2.3).
- Assessments of payment markets should consider the value delivered and the investment needed to sustain it, alongside price and cost. Future regulation should preserve diversity and competition, account for interdependencies across the payment chain and maintain incentives for continued investment. Greater interoperability can broaden payment options, while outcome-focused and proportionate requirements allow existing and emerging solutions to coexist and compete (Section 3).

EXECUTIVE SUMMARY

Consumers and merchants operate within a diverse payments ecosystem that includes cash, domestic and international card schemes, A2A and mobile payment solutions. Within this ecosystem, card payments generate socio-economic benefits through operational efficiency, trust, market reach and continued payment innovation. Our analysis finds measurable benefits for both merchants and consumers, alongside wider benefits from secure e-commerce, broader market access, consumer protection and new payment experiences. Further voluntary adoption could generate additional benefits where existing card infrastructure is used less intensively, while greater transaction traceability is also associated with stronger VAT compliance.

Card payments now account for almost half of all POS transactions in the EU

Card use has increased substantially across the EU, although adoption continues to differ across Member States. Cards' share of POS transactions by number rose from 27 per cent in 2016 to 48 per cent in 2024. Cash continues to play an important role in accessibility, inclusion and payment continuity, while competition between payment methods gives consumers and merchants choice and creates incentives for continued investment in service quality, security and innovation.

Card payments have already generated socio-economic benefits for consumers and merchants across the EU

We estimate that card payments generated close to EUR 20 billion in quantifiable annual merchant and consumer benefits in the EU in 2024. We take a societal perspective and measures resource savings and wider consumer welfare gains rather than the fees transferred between consumers, merchants, banks and payment providers. Around EUR 11.1 billion reflects resource efficiencies from faster transactions and lower payment-handling costs, while EUR 8.7 billion reflects wider consumer welfare benefits from convenience, fraud protection and chargebacks.

For merchants, we quantify around EUR 8.8 billion in annual resource savings from lower payment-handling costs in 2024, around EUR 5.4 billion more than in 2016. Card payments reduce operational frictions by speeding up transactions and reducing the resources devoted to cash counting, reconciliation, storage, transport, and banking. As card volumes increase, merchants can also spread some fixed card-acceptance costs across more transactions. This estimate captures only the operational efficiencies that we can measure consistently. It does not capture wider merchant benefits such as simpler back-office processes, broader access to online and cross-border customers, reduced trust barriers in remote commerce, or continued payment innovation.

For consumers, we quantify around EUR 11 billion in annual benefits in 2024, including EUR 2.3 billion in measurable resource savings from faster card payments and fewer cash withdrawals. Consumers also receive wider welfare benefits from card access and protection mechanisms. We estimate the convenience value associated with holding less precautionary cash at around EUR 7.1 billion, fraud protection at around EUR 0.7 billion and chargeback protection at around EUR 0.9 billion. Chargebacks are particularly important to consumer trust because they provide an established recovery channel when a transaction is disputed or a merchant cannot provide the purchased good or service.

The quantified estimates capture only part of the value created by card payments. Card payments can also support online and cross-border commerce and give SMEs access to larger and more

diverse markets. Established authentication, fraud-protection and dispute-resolution mechanisms can reduce the risks of transacting with unfamiliar counterparties, while contactless payments, tokenisation and integration with mobile and digital wallets continue to expand how cards can be used. We do not assign a monetary value to these benefits because they cannot be measured consistently across the EU. The EUR 20 billion estimate should therefore be understood as a partial measure of selected socio-economic benefits rather than a complete valuation of card payments.

Continued voluntary adoption could generate further benefits from existing card infrastructure by 2035

Further adoption can in part make greater use of card infrastructure that is already in place. In many markets, consumers already have access to cards and merchants already have the infrastructure to accept them, while actual card usage remains comparatively low. Around 92 to 93 per cent of consumers in the euro area hold a payment card, and 88 per cent of merchants with physical points of sale accept card payments. This creates scope for additional transactions to move to cards without requiring an equivalent expansion of the underlying acceptance infrastructure, allowing consumers and merchants to realise more of the benefits described above.

Under a scenario in which card adoption follows historical trends, we project that quantifiable annual consumer and merchant benefits could rise from close to EUR 20 billion in 2024 to approximately EUR 33 billion by 2035. We project card usage based on the historical pattern that adoption has generally grown faster in countries where card usage was initially lower and more slowly in mature markets approaching saturation. Under this scenario, cards could account for approximately 72 per cent of POS transactions by number across the EU in 2035. Future developments, including measures safeguarding access to and acceptance of cash, could affect the pace of adoption.

Merchants account for the largest share of the projected additional benefits. Annual merchant resource savings could increase to approximately EUR 19.1 billion by 2035 as card payments account for a larger share of transactions and merchants devote fewer resources to handling cash. Consumer benefits would also increase as more payments are completed quickly, consumers make fewer cash withdrawals and a larger volume of purchases benefits from fraud and chargeback protections. We hold the convenience benefit associated with card access constant because card ownership is already close to saturation.

Card payments improve transaction traceability and support VAT compliance

Higher card usage is associated with stronger VAT compliance by increasing transaction traceability. Empirical studies find that greater use of cards and other traceable payments is associated with higher VAT revenues and lower VAT gaps. Electronic transaction records can make under-reporting more difficult and complement tax enforcement, electronic invoicing, digital reporting, and wider business digitalisation.

We estimate that the increase in card usage since 2014 was associated with around EUR 21.6 billion in additional annual VAT revenue by 2024, all else equal. The estimate is indicative and should not be interpreted as a causal decomposition of the EU VAT Gap, which is influenced by several factors, including enforcement, fiscal administration, digitalisation and economic conditions.

Further card adoption could also be associated with around EUR 24.6 billion in additional annual VAT revenue by 2035, holding other factors constant. This estimate isolates the contribution

associated with greater use of traceable card payments under our model assumptions and is not a forecast of the overall development of the EU VAT Gap.

Taken together, the results show that the economic contribution of card payments extends well beyond replacing cash at the POS. Trusted card payments reduce operational frictions, widen access to markets, support SMEs and cross-border commerce, strengthen consumer protection and enable continued payment innovation. The benefits arise within a diverse European payments ecosystem in which consumers and merchants retain choice between payment methods and providers continue to invest in security, service quality and new payment experiences.

A reliable card payment ecosystem underpins its socio-economic benefits

The benefits described above depend on card payments working securely and reliably. Transactions need to be authorised, processed and settled securely, and consumers and merchants need clear protections when something goes wrong. This matters most in e-commerce and cross-border trade, where buyers and sellers often do not know each other. We highlight four features of the card payment ecosystem that support this: specialised risk sharing, operational resilience, secure settlement, and a diversity of providers and payment solutions.

Specialised providers distribute responsibilities and financial risks across the card payment chain. In the four-party model, issuers serve cardholders, acquirers serve merchants and card schemes establish the common rules and infrastructure that connect them. Issuers authenticate cardholders and monitor transactions, while acquirers assume financial risks associated with merchant payment acceptance and therefore have incentives to assess merchants and manage fraud. Chargeback arrangements provide consumers with an additional recovery channel when qualifying transactions are disputed or goods and services are not delivered. Together, these arrangements create multiple layers of risk management and support trust in card payments.

Operational resilience is managed across the full payment chain rather than by individual providers in isolation. Card payments depend on issuers, acquirers, schemes, processors, authentication services, telecommunications networks, and other technology providers. Market participants therefore invest continuously in resilient technology, redundancy, monitoring, cyber and fraud controls, incident response, third-party risk management, business continuity, and recovery capabilities. Regular testing helps identify vulnerabilities and assess whether these arrangements remain effective under disruption. European regulation and oversight, including the Digital Operational Resilience Act (hereafter, "DORA"), the Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (hereafter, "PISA"), and the Threat Intelligence-Based Ethical Red Teaming framework (hereafter, "TIBER-EU"), reinforce these practices by establishing common expectations for operational resilience and cyber security. In this context, operational resilience concerns the ability of providers and infrastructures to prevent, withstand, and recover from disruption.

Secure settlement provides a further layer of protection by ensuring that obligations between financial institutions are discharged with finality. Interbank obligations linked to card payments can ultimately be settled in central bank money through the Eurosystem's TARGET Services, reducing dependence on the creditworthiness of individual commercial institutions. Legal and operational safeguards, including the Settlement Finality Directive and contingency arrangements, further support the reliable completion of payments.

Payment continuity is also supported by **the availability of alternative payment solutions and providers** across Europe's diverse payments landscape. International card schemes accounted for around 61 per cent of card payments acquired within the euro area in 2022, while national schemes accounted for around 39 per cent. Nine domestic card schemes operate in the EU, alongside domestic A2A and mobile payment solutions such as iDEAL, BLIK, Swish, Bizum, MobilePay and Vipps. New pan-European solutions may broaden this choice further, including Wero and, potentially, the proposed digital euro. Cash also remains an important alternative, particularly for accessibility and when electronic payments are unavailable. Competition also takes place within acquiring, where merchants can choose between pan-European, domestic, bank-linked and global providers, and larger merchants may use more than one acquirer. This diversity reduces dependence on individual providers or payment solutions and creates incentives to improve service quality, security, functionality and innovation.

Taken together, specialised risk sharing, operational resilience, secure settlement and provider diversity support the continued delivery of card payments and the benefits identified in Chapter 1. Individual incidents can still cause disruption, but layered safeguards within the card ecosystem and alternative payment options across the wider payments landscape reduce dependence on individual points of failure.

Considerations for policymakers

The future development of the European payments framework should preserve the strengths of a diverse and competitive payments ecosystem. Assessments of payment markets should weigh the value that payment services deliver and the investment needed to sustain it, alongside their price and cost. Where consumers and merchants already have access to card infrastructure, avoiding unnecessary barriers to voluntary card use would allow more of its value to be realised, particularly in markets where card usage remains comparatively low. Allowing card schemes, A2A and mobile solutions, cash and emerging pan-European initiatives to coexist and compete supports consumer and merchant choice, reduces dependence on individual providers and preserves incentives to invest in security, service quality and innovation. Greater interoperability can broaden European payment options further without requiring existing solutions to be displaced. Regulation should focus on outcomes, remain proportionate so that providers can continue investing in secure and reliable payment services, and take account of interdependencies across the payment chain.

CHAPTER 1

CARD PAYMENTS GENERATE SOCIO-ECONOMIC BENEFITS IN EUROPE

Card payments are a core part of Europe's diverse payments ecosystem. Alongside domestic and international card schemes, consumers and merchants can use cash, credit transfers and domestic A2A and mobile solutions, including iDEAL in the Netherlands and Swish in Sweden. Competition between these solutions expands consumer and merchant choice and creates incentives for providers to improve service quality, security and innovation.[3] European integration, including the Single Euro Payments Area (SEPA), has supported the coexistence of these payment methods by reducing differences between domestic and cross-border transactions.[4]

Within this broader landscape, cards create value through efficiency, trust, market reach, and continued payment innovation. They provide consumers and businesses with a convenient, secure, and widely accepted means of payment and support e-commerce, cross-border trade, digital innovation, and new digital payment experiences. International card schemes also provide broad cross-border acceptance and interoperability, while domestic card schemes primarily serve transactions within individual national markets. Cards operate as one complementary layer within Europe's broader payments ecosystem rather than as a standalone system.[5]

In this chapter, we assess how the growing adoption of card payments has generated socio-economic value across Europe and how these benefits could develop if recent adoption patterns continue. We consider both benefits that we can quantify consistently across the EU and wider benefits related to trust, market reach and payment innovation. Specifically, we find:

- Card use has increased substantially across the EU, rising from 27 per cent of POS transactions in 2016 to 48 per cent in 2024. Measured by transaction value, the card share increased from 47 per cent to 62 per cent over the same period (see Section 1.1).

- Card payments already create substantial value for consumers and merchants through efficiency, trust, market reach and innovation. They support faster and more convenient payments, secure e-commerce, cross-border trade, fraud protection, chargebacks, contactless payments and integration with mobile and digital wallets. International card schemes additionally support cross-border commerce through broad geographic acceptance and interoperability. We quantify part of this wider value at close to EUR 20 billion annually in 2024, comprising merchant resource savings and consumer benefits from faster payments, fewer cash withdrawals, convenience, fraud protection and chargebacks (see Section 1.2).

- Continued card adoption could generate substantial further benefits for consumers and merchants by 2035. Wider use can increase operational efficiencies, consumer time savings, and the value of fraud protection and chargebacks, while expanding access to the broader benefits of card-enabled commerce and innovation. We estimate that quantifiable

3 BIS (2026). Competition in retail digital payments, see link.
4 ECB (2008). Single Euro Payments Area (2008), see link.
5 ECRI (2026). Payment sovereignty without walls: the case for Europe's multi-rail payment ecosystem, see link.

annual merchant and consumer benefits could increase to approximately EUR 33 billion by 2035 if recent adoption patterns continue (see Section 1.3).

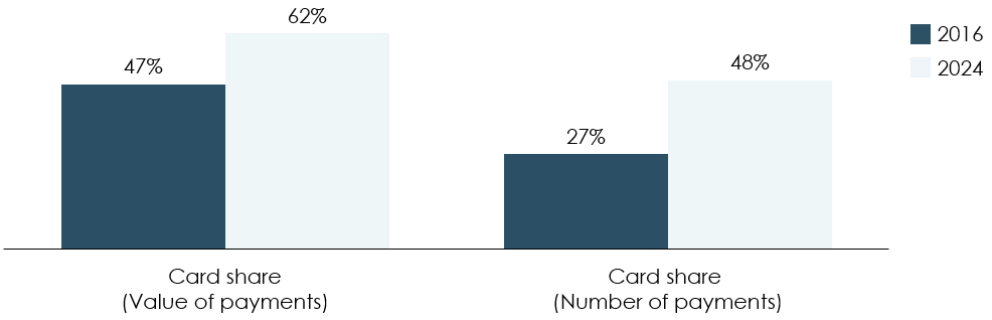
- Higher card usage is associated with stronger VAT compliance through greater transaction traceability. We estimate that the increase in card usage since 2014 was associated with around EUR 21.6 billion in additional annual VAT revenue in 2024, all else equal. Further adoption could be associated with approximately EUR 24.6 billion in additional annual VAT revenue by 2035 (see Section 1.4).

1.1 CARD PAYMENTS NOW ACCOUNT FOR ALMOST HALF OF ALL POS TRANSACTIONS IN THE EU

Card payments are an integral part of everyday commerce across Europe. In 2024, almost 70 billion card transactions were made in the euro area at the POS. That is more than double the level recorded a decade earlier.[6] The widespread adoption of card payments is also reflected in the around 880 million cards in circulation, equivalent to around 2.5 cards per inhabitant in the euro area.[7]

Comparatively, payment cards in the EU now account for almost half of POS transactions. Their share of POS transactions by number (hereafter 'POS card share') increased from 27 per cent in 2016 to 48 per cent in 2024.[8] Measured by transaction value, the card share increased from 47 per cent to 62 per cent over the same period; see Figure 1.

Figure 1
Card payments account for an increasing share of POS payments
Share of the number and value of payments at the POS, EU countries, 2016–2024



Note: Card shares from ECB include digital wallet and mobile payments. Based on 20 EU countries due to data limitations.
Source: Euro-area card shares from ECB (2024). Study on the payment attitudes of consumers in the euro area 2024, see link. Denmark and Sweden shares in 2024 collected from Global Payments Report, see link. Poland shares based on Polish National Bank study, see link.

6 ECB Data Portal (2026), POS transactions with cards issued by resident PSPs at terminals acquired by resident PSPs, EU, Annual, see link.
7 ECB (2026). Payments statistics: first half of 2025, see link.
8 Due to data availability, our card share estimates in the EU are based on 20 EU countries.

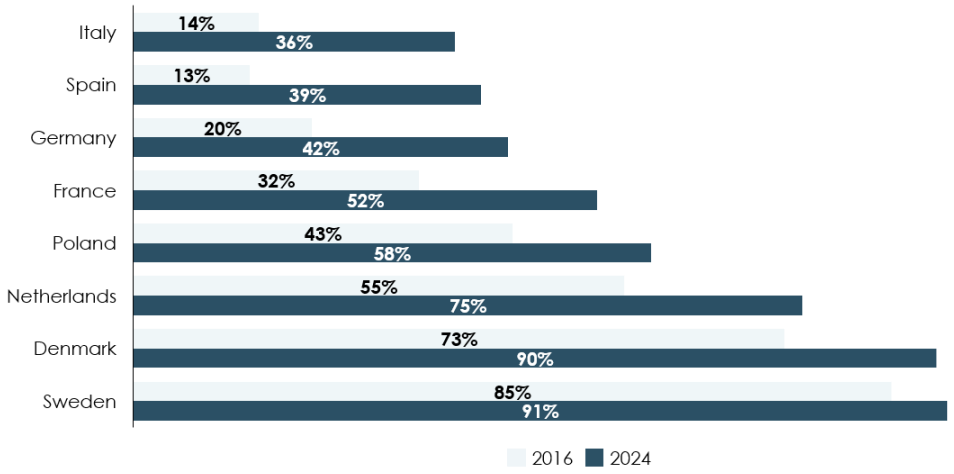
Continuous investment in acceptance, technology and security across the card payment ecosystem has supported the increasing use of card payments. Issuers, card schemes, processors, acquirers and technology providers have expanded acceptance networks, improved payment technologies and strengthened the security and convenience of card payments.[9] These developments have been supported by a more integrated European payments framework. Industry initiatives, including the establishment of the European Payments Council in 2002, helped to integrate and harmonise electronic payments in Europe. Regulatory initiatives complemented these efforts by reducing barriers to card acceptance and supporting innovation, including through the Interchange Fee Regulation and the revised Payment Services Directive (PSD2).[10]

The COVID-19 pandemic accelerated the shift towards card payments. During the pandemic, concerns about physical contact and the rapid expansion of e-commerce encouraged consumers and merchants to rely more heavily on electronic payments.[11] Evidence from the Netherlands shows that, following the first lockdown, the likelihood of consumers using debit cards instead of cash increased by around 12 per cent relative to pre-pandemic trends, with the shift proving persistent even after restrictions were lifted.[12]

Card payment adoption has increased across the EU, but substantial differences between Member States remain. Sweden and Denmark already had high card shares in 2016 and remain the most card-intensive markets in 2024. By contrast, countries such as Italy, Spain, and Germany started from much lower levels but have recorded relatively large increases since 2016. This points to convergence in card use across countries, although sizeable differences in adoption persist; see Figure 2.

9 European Central Bank (2019), Card payments in Europe – current landscape and future prospects, see link.
10 ECB (2018). The revised Payment Services Directive (PSD2) and the transition to stronger payments security, see link.
11 BIS (2021). Covid-19 accelerated the digitalisation of payments, see link.
12 Jonker et al. (2022). Pandemic payment patterns, see link.

Figure 2
Card shares vary significantly across Member States in the EU
Card payments as a share of the total number of payments at the POS, per cent



Note: Card shares from ECB include digital wallet and mobile payments.
Source: Euro-area card shares from ECB (2024). Study on the payment attitudes of consumers in the euro area 2024, see link. Denmark and Sweden shares in 2024 collected from Global Payments Report, see link. Poland shares based on Polish National Bank study, see link.

1.2 CARD PAYMENTS HAVE ALREADY GENERATED SOCIO-ECONOMIC BENEFITS

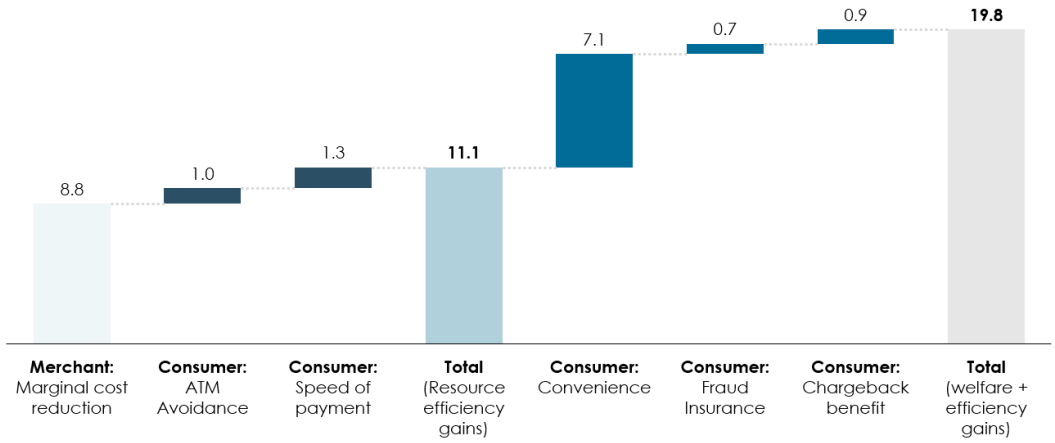
Card payments create value through trust, market reach, innovation and operational efficiency. They support secure e-commerce, cross-border trade, contactless payments, mobile and digital wallet integration, tokenisation and new payment experiences. Established authentication, fraud-protection and dispute-resolution mechanisms can reduce the risks of transacting with unfamiliar counterparties and support commerce beyond local markets.[13]

These benefits accrue to both consumers and merchants. Merchants can serve customers across physical, online and cross-border channels while reducing payment-handling frictions. Consumers benefit from convenient and secure payments and protection against fraud and failed purchases.

We quantify the parts of this wider value that can be measured consistently across the EU. We estimate that card payments generate close to EUR 20 billion in annual socio-economic benefits across the EU. This includes EUR 11.1 billion in resource efficiencies from faster transactions and lower payment-handling costs, and EUR 8.7 billion in wider consumer welfare benefits from greater convenience and protection against fraud and failed purchases; see Figure 3.

[13] Based on input from stakeholder interviews.

Figure 3
Combined social benefits from card payments in 2024 were almost EUR 20 billion
EUR billion

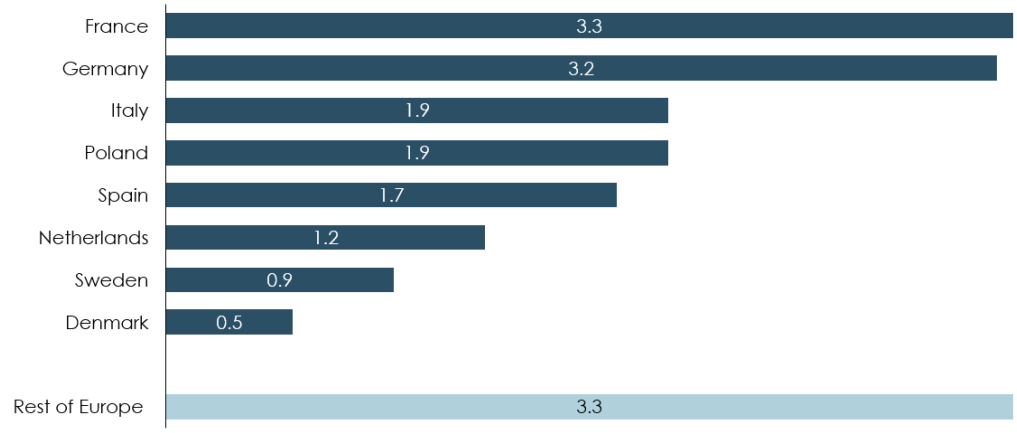


Note: Values in 2024 euros. The total of EUR 19.8 billion represents both direct resource efficiency gains and wider welfare effects. The estimate does not capture the full value of card-enabled innovation, market access and trust.
Source: Copenhagen Economics

Our analysis takes a societal perspective and therefore focuses on resource savings and wider welfare gains, rather than on fees transferred between consumers, merchants and payment providers. Our estimate does not capture the full value created by card payments. We exclude benefits that cannot be measured consistently across countries, including broader market access, payment continuity, card-enabled innovation, digital integration and the wider value of established trust and protection frameworks.

The quantified benefits of card payments at country level differ considerably, reflecting differences in card adoption but also country size. We estimate that annual benefits in 2024 amounted to around EUR 3.3 billion in France and around EUR 0.5 billion in Denmark, see Figure 4.

Figure 4
Economic benefits for consumers and merchants in the focus countries in 2024
EUR billion

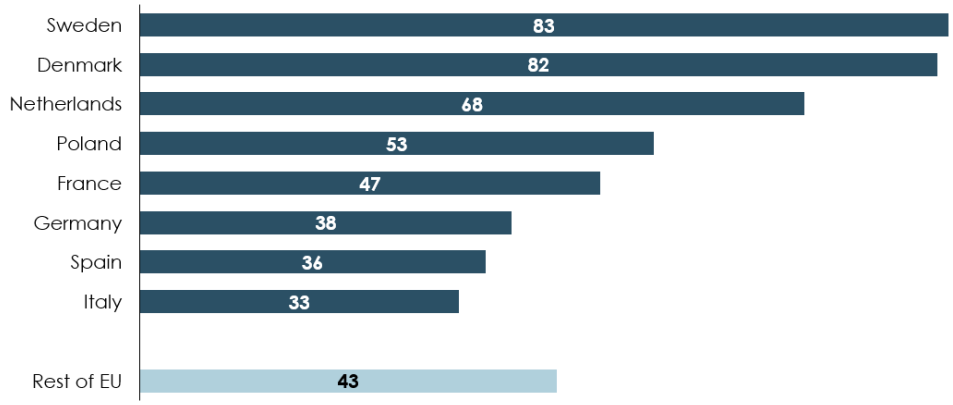


Note: Country-level estimates in Figure 4 are based on total social benefits in Figure 3, using population and card share weights.
Source: Copenhagen Economics

These differences primarily reflect how intensively cards are used in each country. Our country-level estimates allocate the EU-wide benefits according to each country's contribution to card transaction volumes. Countries with more card transactions per person therefore realise a larger share of the quantified benefits per capita. Country size also plays a role: Spain and Italy generate sizeable benefits in absolute terms because of their larger populations, despite lower card usage.

To compare the intensity of benefits across countries, we also express them per capita. Sweden and Denmark record the largest estimated benefit, at over EUR 80 per person in 2024, followed by the Netherlands at around EUR 68 per person. Italy shows the lowest estimated benefit among the selected focus countries, at EUR 33 per person. The rest of the EU sits at around EUR 44 per person; see Figure 5.

Figure 5
Economic benefits per capita for consumers and merchants in the focus countries in 2024
EUR per capita



Note: Country-level estimates are based on total social benefits in Figure 3 and weighted by each country's population and share of card payments in the total number of card payments.
Source: Copenhagen Economics

1.2.1 Card payments create value for merchants through trust, market reach, innovation and efficiency

Card payments can **reduce operational frictions** for merchants across both the POS and back-office processes. They can speed up transactions, reduce cash-handling activities and simplify reconciliation. For business payments, transaction-level payment data can also support integration with expense, approval and accounting systems, reducing administrative effort. Reduced cash handling may additionally lower exposure to theft and improve employee safety.[14]

Card payments also give merchants structured payment data. Each transaction arrives with a time, amount and reference, which simplifies reconciliation with sales and accounting systems. In the Netherlands, back-office work accounts for a much smaller share of merchants' costs for card payments than for cash.[15] Payment data can also widen access to finance. Lenders can use a merchant's transaction history to assess credit risk, and research finds that small firms making more use of cashless payments obtain credit more easily.[16] Some acquirers offer financing based on a merchant's card sales history, repaid as a share of future card sales.[17]

Card acceptance can also **expand the customers, markets and sales channels** that merchants can serve. Established acceptance networks allow merchants to accept remote and online

[14] Based on stakeholder interviews. Corporate payment providers highlighted the importance of transaction-level data and integration with expense-management, approval and ERP systems for reducing reconciliation and administrative frictions.
[15] Panteia (2024), *Kosten van het toonbankbetalingsverkeer, meetjaar 2023* [Costs of point-of-sale payments, 2023], Table 27, see link.
[16] Ghosh, P., Vallee, B. and Zeng, Y. (2026), 'FinTech lending and cashless payments', *Journal of Finance*, 81(2), pp. 1053–1101. The study uses data from a FinTech lender to small businesses in India. Working paper version: NBER Working Paper 34148, see link.
[17] See, for example, Adyen (2025), *Capital*, see link.

payments and, in the case of international card schemes, serve customers across borders without establishing separate payment arrangements in each market. Continued innovation has expanded these possibilities further: contactless functionality enables faster in-person payments, while tokenisation and integration with mobile and digital wallets support more seamless and secure payment experiences across physical and digital channels.[18]

Card scheme rules can **reduce the trust barrier** associated with remote and digital commerce by letting buyers and sellers who do not know each other transact with confidence. The rules set technical and security standards that every participant must meet, so a card issued in one country works at a merchant in another without a direct agreement between the issuer and the merchant's acquirer. They also allocate liability for fraud and disputes between issuers, acquirers, and merchants, for example depending on whether a payment was authenticated, and set out how disputed payments are resolved. Chargebacks are the most visible part of this framework: they reverse qualifying transactions where payments are unauthorised, goods are not delivered, or other conditions are met. Because these rules apply to every transaction on the network, consumers can rely on the card rather than on the merchant alone, which can increase their confidence in buying from unfamiliar merchants.[19]

These benefits can be **particularly valuable for SMEs**, as card acceptance gives them access to larger and more diverse markets. By accepting widely used cards, SMEs can serve tourists, cross-border shoppers and online customers who may not carry local cash or use domestic payment solutions. EU-wide evidence confirms the importance of payment accessibility for cross-border trade. Studies estimate that a 1 per cent increase in the use of efficient and flexible cross-border payment systems could increase cross-border e-commerce by up to 7 per cent.[20]

Operational efficiency represents one measurable component of this wider merchant value. We estimate that card payments generated EUR 8.8 billion in quantifiable merchant-side social benefits relative to cash in the EU in 2024. This was EUR 5.4 billion more than in 2016; see Figure 6.

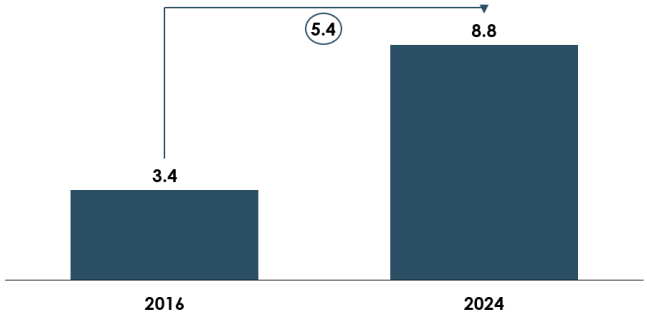
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18 Federation of Small Businesses (2026). *The benefits for your business of taking card payments*, see link; European Central Bank (2022). *Study on the payment attitudes of consumers in the euro area 2022*, see link; European Banking Authority (2023). *Application of SCA to issuing a payment instrument and tokenisation*, see link; EMVCo (n.d.). *EMV Mobile*, see link, and *EMV Payment Tokenisation*, see link.

19 European Consumer Centres Network (2023). *Chargeback in the EU/EEA*, see link; OECD (2016). *OECD Recommendation of the Council on Consumer Protection in E-Commerce*, OECD Publishing, see link. Also stakeholders interviewed highlighted fraud protection and chargeback mechanisms as particularly important for e-commerce and transactions between unfamiliar counterparties.

20 Gómez-Herrera et al. (2014), *The drivers and impediments for cross-border e-commerce in the EU*, see link.

Figure 6
Social benefits increased by around EUR 5.4 billion since 2016 to EUR 8.8 billion annually in 2024
Merchant cost savings, EUR billion



Note: Values in 2024 euros. We use 2016 as a benchmark instead of 2014 due to data limitations.
Source: Copenhagen Economics based on merchant per-transaction cost of cash and card from Panteia (2022). Link; number of card transactions at the POS, ECB Data Portal (2026), see link.

The estimated merchant benefit reflects the time and resources saved when a customer pays by card instead of cash. For each such transaction, the merchant avoids the resource costs associated with accepting, handling and depositing cash and incurs the resource costs associated with accepting a card. The difference between these costs represents the estimated societal saving.

The estimated increase is driven by two reinforcing effects:

- **Volume shift:** card payments grew from around 35 billion transactions in the EU in 2016 to almost 70 billion in 2024, while the number of cash payments declined.
- **Relative cost shift:** the per-transaction cost of accepting cards has fallen, while the per-transaction cost of accepting cash has risen (see below), widening the per-transaction savings from each card payment.

As card payments become more widely used, merchants can process transactions faster and reduce the resources devoted to cash counting, reconciliation, transport, storage, and banking. Card acceptance also involves certain fixed costs, such as payment terminals, system integration, and administrative processes. As card volumes increase, merchants can spread these costs across more transactions, reducing the average cost per card payment. The per-transaction cost of processing an additional card transaction may remain broadly unchanged, but this does not affect the scale effect considered here.

By contrast, the cost of cash handling does not necessarily decline proportionately as cash usage falls. Merchants must continue to perform certain cash-handling arrangements even when the number of cash transactions declines. These costs are therefore spread across fewer transactions, increasing the average cost per cash payment. Merchant surveys across Europe show this general pattern, although the size of the effect varies between countries depending on payment habits, infrastructure and market maturity.[21]

Two merchant surveys show that cash becomes more expensive to accept as its use declines because merchants must spread large, fixed handling costs across fewer transactions:

- A recurring merchant survey in the **Netherlands**, where card usage is high, shows that the cost per cash transaction rose sharply between 2017 and 2023. Relative to 2020, cash transaction volumes fell by 6 per cent, while the cost of accepting cash increased by 17 per cent. This reflects the fixed infrastructure and handling costs that merchants continue to bear as cash volumes decline.[22]
- A recent merchant survey finds a similar pattern in **Italy**, where cash remains more widely used. Both the cost per cash transaction and the cost as a share of transaction value increased, while both measures declined for cards and other digital payments. Cash is now the most expensive payment method for Italian merchants when measured as a share of transaction value.[23]

We do not quantify the infrastructure costs of cash or card payments because the available societal cost studies do not identify a clear net advantage for either system. Both require substantial fixed investment: cards rely on terminals, acceptance networks, processing and settlement systems, while cash depends on automated teller machines (ATMs), cash transport, secure storage, and bank and central bank handling. Their relative cost depends largely on market maturity and transaction volumes, as fixed costs fall per transaction when usage increases. This explains why studies in less card-intensive markets, including Germany and Italy, sometimes find cards more expensive per transaction, even though cards remain cheaper when measured per euro of turnover. We therefore focus on the more robust marginal efficiency gains for merchants and consumers as payments shift from cash to cards, which provide a conservative estimate of the net benefit.[24]

1.2.2 Card payments create consumer value through speed, security, trust and convenience

Card payments give consumers a fast, convenient and widely accepted way to pay while strengthening trust in digital commerce. Consumers can use cards in shops, online and in apps, while international card schemes also provide broad cross-border usability, including when purchasing from merchants with whom they have no previous relationship.[25] Familiar security standards, fraud protection and dispute mechanisms reduce the risks associated with these transactions and support payment choice rather than simply replacing cash at the POS.

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21 Panteia (2022). Costs of point-of-sale payment transactions, see link (in Dutch); Banca d'Italia (2025). The social costs of payment instruments in Italy, see link; Sveriges Riksbank (2023). Cost of payments in Sweden, see link; Bank of Finland (2022). Costs of retail payments in Finland: What paying costs?, see link.

22 Panteia (2022). Costs of point-of-sale payment transactions, see link (in Dutch).

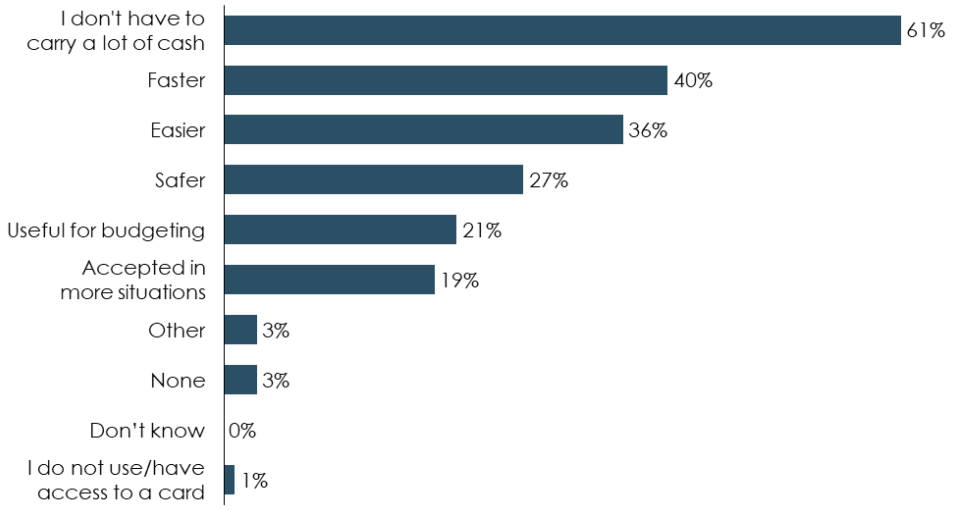
23 Banca d'Italia (2025). The social costs of payment instruments in Italy, see link.

24 Banca d'Italia (2025). The social costs of payment instruments in Italy, see link; Deutsche Bundesbank (2019). *The costs of cash payments in the retail sector*, see link.

25 Stakeholder interviews highlighted broad geographic acceptance as an important advantage of international card schemes, particularly for travel and cross-border transactions.

Consumers' payment preferences reflect these advantages. The increasing use of cards for retail payments across Europe, described in Section 1.1, is consistent with consumers' stated preferences. A survey conducted by the European Central Bank (ECB) shows that consumers rate cards more highly than cash for speed, convenience, and safety, see Figure 7.

Figure 7
Consumers prefer cards due to convenience, speed, and safety
Share of respondents on perceived advantages of cards, per cent, 2024



Note: Perceived advantages of cards, euro area, 2024.
Source: ECB (2024). Study on the payment attitudes of consumers in the euro area 2024, see link.

Trust is particularly important in e-commerce, where consumers often pay before receiving the product or service. Familiar security standards, fraud protection and dispute mechanisms reduce the perceived risks of purchasing from an unfamiliar merchant. Recent ECB evidence confirms that security is central to consumers' willingness to use digital payment solutions: 37 per cent of euro-area consumers identified higher security standards as a factor that would persuade them to try a new payment solution, more than any other factor.[26] By reducing perceived payment risks, card payments can give consumers greater confidence to buy from a wider range of merchants and access more products and markets.

Continuous innovation has expanded the ways in which consumers can benefit from cards. Contactless payments have developed from a relatively limited technology into the dominant form of in-person card payment. In the second half of 2025, 85 per cent of non-remote card payments in the euro area were contactless, and 93 per cent of POS terminals accepted contactless payments.[27]

[26] ECB (2024), 'Study on the payment attitudes of consumers in the euro area 2024', see link.
[27] ECB (2026), 'Payments statistics: second half of 2025', see link.

Contactless technology has made in-person payments faster and easier,[28] while tokenisation has strengthened security by replacing sensitive card details with restricted-use tokens.[29] Strong customer authentication has strengthened fraud prevention in card payments, and integration of cards with mobile and digital wallets allows consumers to retain established card protections when paying through new interfaces.[30] For example, consumers can store their cards in services such as Apple Pay and Google Pay and use them for contactless payments in shops, in-app purchases and online transactions. Stakeholder interviews also highlighted biometric authentication and the increasing integration of online and in-store payment experiences as areas of continued innovation.

Our quantitative analysis captures the consumer benefits that can be measured consistently across the EU and covers two categories:

- Resource efficiency gains arising from faster payments and fewer cash withdrawals; and
- Wider consumer welfare gains, arising from fraud protection, chargebacks and the convenience of holding less cash.[31]

This estimate does not capture the full consumer value of card-enabled innovation, broad acceptance, trusted digital commerce or access to new payment experiences.

Resource efficiency gains arising from faster payments and fewer cash withdrawals

We quantify the value of time consumers in the EU saved at EUR 2.3 billion in 2024 (EUR 1 billion from less time spent making ATM withdrawals and EUR 1.3 billion from faster payments). This marks an increase of EUR 1.6 billion since 2016. This increase is driven entirely by the growth in card usage over the period. These benefits arise because card payments are faster at the POS and because greater card usage reduces the need for time-consuming cash withdrawals, as described below. This estimate represents a measurable resource saving rather than the full consumer value of card payments; see Figure 8.

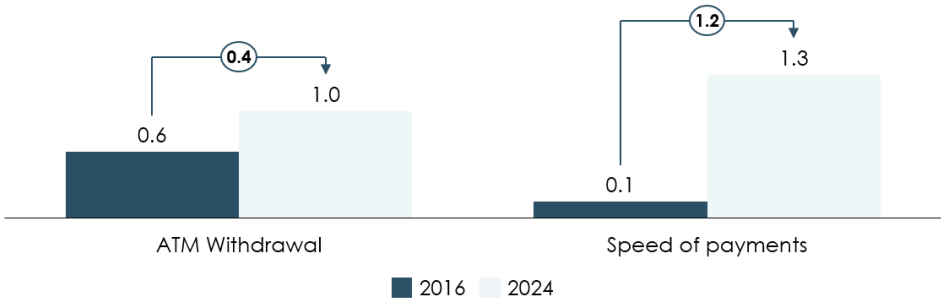
[28] Norges Bank (2022). Costs in the Norwegian payment system 2020, see link.

[29] EMVCo, 'EMV Payment Tokenisation', see link.

[30] EBA and ECB (2024), 'Report on payment fraud', see link.

[31] We quantify fraud, chargeback and convenience benefits, which do not imply efficiency gains, but rather consumer welfare increases that have monetary value to consumers. Deutsche Bundesbank (2025). Costs of Cash and Card Payments from a Consumer Perspective, see link; Sveriges Riksbank (2023). Cost of payments in Sweden, see link; Norges Bank (2022). Costs in the Norwegian payment system 2020, see link.

Figure 8
Consumer benefits from faster payments with cards increased by over EUR 1.6 billion since 2016
EUR billion



Note: Values in 2024 euros. We use 2016 as a benchmark instead of 2014 because of data limitations.
Source: Copenhagen Economics based on time estimates from Norges Bank (2022), see link and number of card transactions at the POS, ECB Data Portal (2026), see link.

This increase is driven by the growth in card usage over the period.

- First, contactless technology has made card payments faster at the POS. A contactless card transaction takes around 8 seconds on average, compared with around 15 seconds for a cash transaction.[32] Although the saving on an individual transaction is small, it becomes substantial when applied across billions of annual payments.
- Second, consumers who use cards more frequently need to withdraw cash less often. Each cash withdrawal takes around 52 seconds on average, excluding any travel or waiting time. Faster payments at the POS and fewer cash withdrawals form the two quantified components of our consumer time-saving estimate.[33]

Previous studies on consumer costs of payments consistently find that electronic payments reduce consumers' payment costs, though estimates vary depending on the scope of benefits included and the valuation approach used. We review the methodologies developed by Sveriges Riksbank, Norges Bank, and Deutsche Bundesbank and adapt their approaches to estimate consumer benefits from increased card use in Europe, focusing on direct resource gains for consumers that can be accurately measured and consistently applied across the EU: faster payments at the POS and reduced time spent on cash withdrawals.[34]

We do not include certain aspects raised in the nation-specific studies. For example, the Deutsche Bundesbank study includes survey evidence of willingness to pay for privacy as a cost of cards. We also do not include fees, as most studies find differences to be negligible. Additionally, consumers do not perceive the costs of their transaction method when paying at the POS.[35]

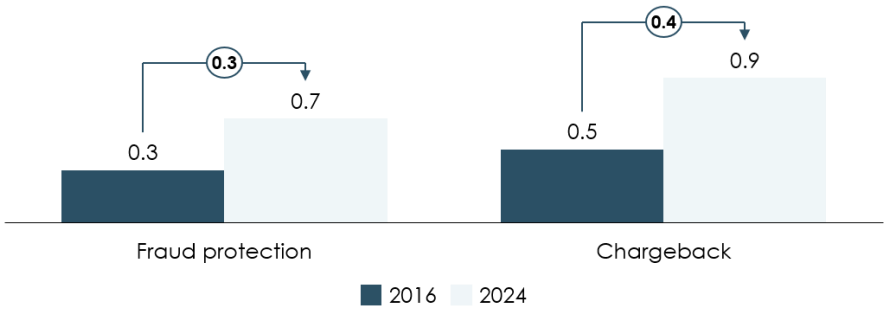
32 Norges Bank (2022). Costs in the Norwegian payment system 2020, see link.
33 Norges Bank (2022). Costs in the Norwegian payment system 2020, see link.
34 Deutsche Bundesbank (2025). Costs of Cash and Card Payments from a Consumer Perspective, see link; Sveriges Riksbank (2023). Cost of payments in Sweden, see link; Norges Bank (2022). Costs in the Norwegian payment system 2020, see link
35 Deutsche Bundesbank (2025). Costs of Cash and Card Payments from a Consumer Perspective, see link. See more detail in the appendix.

Wider consumer welfare gains

Fraud protection and chargebacks create value by reducing consumers' exposure to uncertain losses and strengthening confidence in card payments. These benefits are not primarily time savings. They arise because consumers face less financial risk and have established recovery mechanisms when transactions are unauthorised, disputed or not completed as expected.[36]

We find that fraud protection generates consumer welfare benefits of around EUR 0.7 billion, whereas chargebacks generate welfare benefits of EUR 0.9 billion in 2024; see Figure 9.

Figure 9
Consumer welfare benefits from safer payments amount to EUR 1.6 billion in 2024
Consumer welfare benefits, EUR billion



Note: Values in 2024 euros. We use 2016 as a benchmark instead of 2014 due to data limitations.
Source: Copenhagen Economics based on ECB Data Portal, 'Average value of card payments' and 'Number of card transactions'; EBA, 'Retail Risk Indicators', Figure 83; Mastercard (2025), 'What's the true cost of a chargeback for businesses?'; see average transaction value, fraud rate, transaction volume, and number of charge backs.

Fraud protection reduces consumers' financial exposure to uncertain losses, and this benefit is worth more to consumers than the expected fraud loss alone. We calculate the consumer value of fraud protection in two steps: first, we estimate the expected financial loss avoided by applying a fraud rate of 0.011 per cent and an average transaction value of EUR 38 to the 69.4 billion card transactions made in 2024.[37] Second, we account for consumers' additional preference for avoiding uncertain losses by applying a loss-aversion multiplier of 2.25 from the behavioural literature.[38] The final estimate includes both the expected loss avoided and the additional value consumers place on protection against fraud.

[36] Deutsche Bundesbank (2025). Costs of Cash and Card Payments from a Consumer Perspective, see link; Sveriges Riksbank (2023). Cost of payments in Sweden, see link; Norges Bank (2022). Costs in the Norwegian payment system 2020, see link

[37] ECB Data Portal, 'Average value of card payments' and 'Number of card transactions'; EBA, 'Retail Risk Indicators', Figure 83, see average transaction value, fraud rate and transaction volume. Method: Calculated by taking the fraud risk per transaction multiplied by number of transactions and size of average transaction.

[38] Tversky, A. and Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty, see link. They estimate a loss-aversion coefficient of 2.25, implying that losses are weighted about 2.25 times as heavily as objectively equivalent gains in their preferred parametrisation of the value function.

Chargebacks allow consumers to recover the value of disputed transactions. In a four-party card scheme, consumers are not solely reliant on the merchant to resolve a dispute. They can raise a chargeback through their issuing bank, which pursues the claim through the card scheme and the merchant's acquirer. This provides a recovery channel when the merchant cannot or will not issue a refund. The estimate is based on the number of chargebacks in Europe (23.9 million in 2024)[39] and conservatively does not include a loss-aversion uplift.[40] Stakeholder interviews highlighted merchant insolvency and large-scale travel cancellations as practical situations in which this mechanism can become particularly important, see Box 1.

Box 1 Consumers benefit from chargebacks

Example: A practical example is airline bankruptcy. If a consumer buys airline tickets with a card issued through a four-party card scheme and the airline becomes insolvent before providing the service, the consumer may recover the payment through a chargeback claim via their issuing bank and the airline's acquirer. A consumer who paid in cash would instead need to seek recovery directly from the bankrupt airline, typically as an unsecured creditor in the insolvency process.

Source: Copenhagen Economics based on stakeholder interviews.

In addition, card access reduces the burden of carrying cash or planning cash holdings in advance. A recent EU-wide study by Lippi and Moracci estimates that access to a payment card generates convenience savings of around EUR 35 per household per year, mainly by reducing the opportunity cost of holding cash, as card access relaxes the 'precautionary buffer' motive for holding cash, allowing households to smooth transactions while keeping less idle cash on hand.[41] Applied across 203 million EU households,[42] we estimate this corresponds to convenience gains of over EUR 7 billion in 2024.

1.3 CONTINUED VOLUNTARY ADOPTION COULD GENERATE FURTHER BENEFITS FROM EXISTING CARD INFRASTRUCTURE BY 2035

Further adoption can largely build on card infrastructure that is already in place. Around 92 to 93 per cent of consumers in the euro area hold a payment card, and 88 per cent of merchants with physical POS accept card payments.[43] Yet card payments still account for less than half of POS transactions in the EU.

In the following, we consider how the socio-economic benefits may develop if recent card adoption patterns continue. We find that continued growth in card usage could generate more than EUR 13

39 Mastercard (2025), 'What's the true cost of a chargeback for businesses?'; ECB Data Portal, 'Card payments, sent, average value per card payment, EU', see chargeback volume and average transaction value.

40 We estimate this benefit by multiplying the estimated number of chargebacks by the average value of a card transaction.

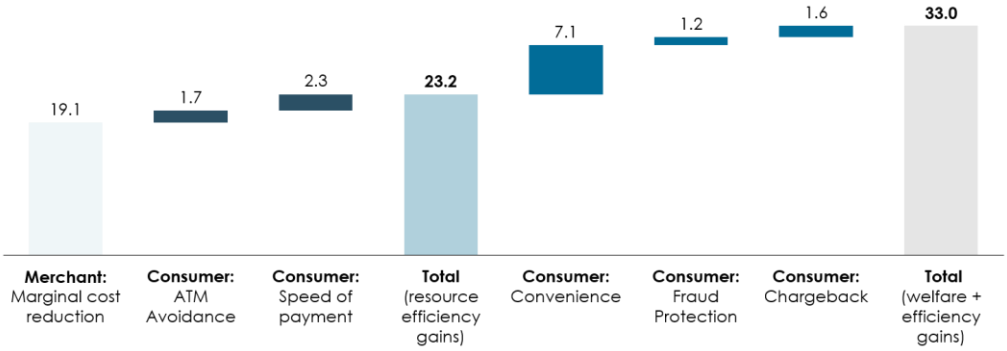
41 Lippi, F. and Moracci, E. (2026), 'Cash or card? A structural model of payment choices', see link.

42 Eurostat (2026). Household composition statistics – Statistics Explained, see link.

43 ECB (2024), Study on the payment attitudes of consumers in the euro area 2024; ECB (2026), Use of cash by companies in the euro area in 2026.

billion in additional annual socio-economic benefits by 2035. The quantified annual merchant and consumer benefit from card payments is projected to increase from close to EUR 20 billion in 2024 to approximately EUR 33 billion in 2035, see Figure 10.

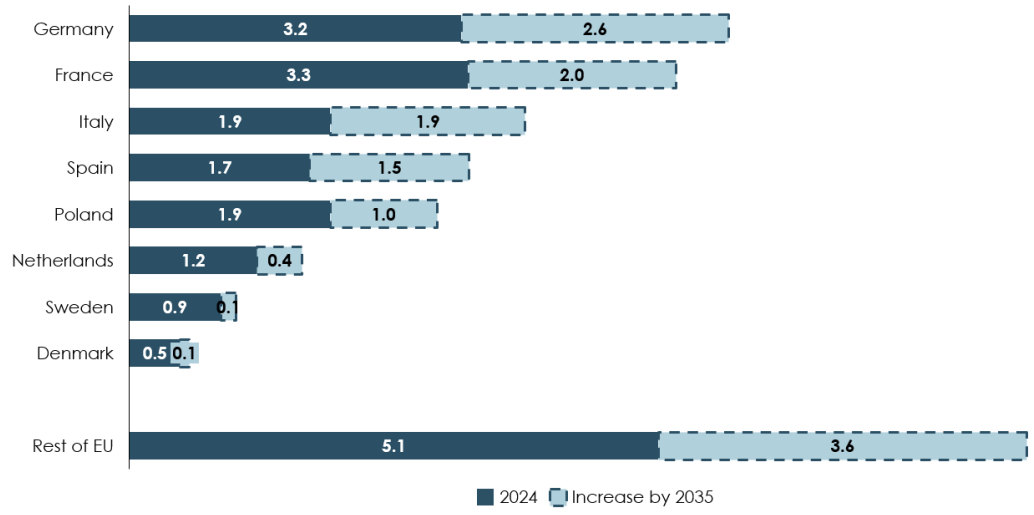
Figure 10
Projected increase in card payments is expected to generate over EUR 30 billion in social benefits in 2035
EUR billion



Note: Values in 2024 euros. The total of EUR 33 billion represents both direct resource efficiency gains and wider welfare effects, see Section 1.2.2. The estimate does not capture the full value of card-enabled innovation, market access, and trust.
Source: Copenhagen Economics

The scope for additional benefits varies across countries, reflecting differences in current adoption levels and the extent of further adoption expected in the future. Countries with lower current adoption and greater scope for future uptake therefore tend to realise larger additional gains, while the gains are more limited where adoption is already relatively high, see Figure 11.

Figure 11
Further card adoption generates additional economic benefits across the focus countries
EUR billion

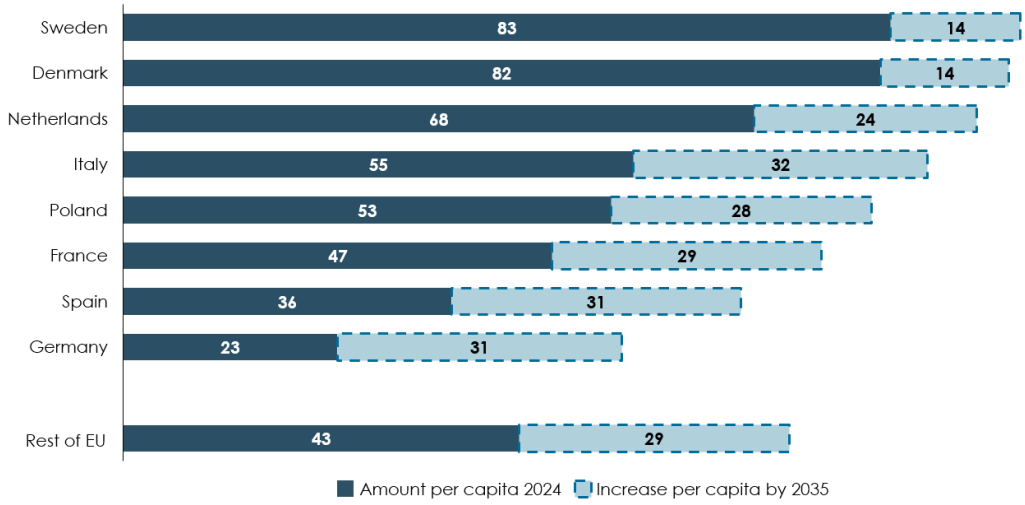


Note: Country-level estimates are based on total social benefits in **Figure 10**, with assigned values based on population and card payments as a share of total payments.
Source: Copenhagen Economics

The size of the projected increase differs across countries as it reflects both growth in the overall payment market and the extent of further card adoption. Italy and Spain illustrate the catch-up effect: both start from comparatively low card shares in 2024 and are projected to experience substantial increases in card usage by 2035. Germany also records a large increase because of the size of its payment market and continued growth in card adoption. By contrast, the additional benefits in Sweden and Denmark are relatively limited, at around EUR 0.1 billion or less, as card usage is already close to saturation. The results therefore illustrate how the remaining potential is greatest where sizeable payment markets coincide with scope for further card adoption.

On a per-capita basis, we observe the lowest increase in Sweden and Denmark, at around EUR 14 per capita. The largest increases are projected in Italy, Spain, and Germany, at over EUR 30, see Figure 12.

Figure 12
Countries with high card usage will see a limited increase in benefits per capita
EUR per capita



Note: Country-level estimates are based on total social benefits in **Figure 10**, with values assigned based on population and card payments as a share of total payments. The increase by 2035 is calculated per capita based on 2024 population figures.
Source: Copenhagen Economics

These differences reflect countries' starting levels of card adoption. Denmark and Sweden already generate relatively high benefits per person in 2024 because cards account for a large share of payments. As card adoption is already close to saturation, the remaining increase is limited by 2035. By contrast, Italy, Spain and Germany currently generate lower benefits per capita but have substantially greater scope for further card adoption. Spain and Germany are projected to almost double their current benefit.

These estimates capture only the benefits that we can quantify consistently across the EU. They do not include wider benefits from trusted e-commerce, access to cross-border customers, payment innovation, digital wallet integration, and broad acceptance. The projected increase should therefore be understood as a quantifiable subset of the additional benefits rather than the total economic value that card payments could create.

1.3.1 We project card usage to increase further by 2035

Card usage at the POS is expected to continue increasing across the EU, with the greatest scope for further adoption in countries where card usage remains comparatively low. Payment behaviour still differs substantially across Member States: cards already account for a large majority of POS transactions in some countries, while cash remains much more widely used in others. Cash continues to play an important role in accessibility, inclusion and payment continuity, but these differences imply that countries with lower card usage have greater scope for consumers and merchants to voluntarily adopt cards and realise the associated benefits.

Countries with lower card usage can realise benefits that have already materialised to a greater extent in more card-intensive markets. These include faster payments and simpler merchant operations as well as broader access to online and cross-border markets, fraud protection and dispute-resolution mechanisms. Countries with high card usage have already captured a larger share of these benefits, although continued payment innovation can generate further value even in mature markets.[44]

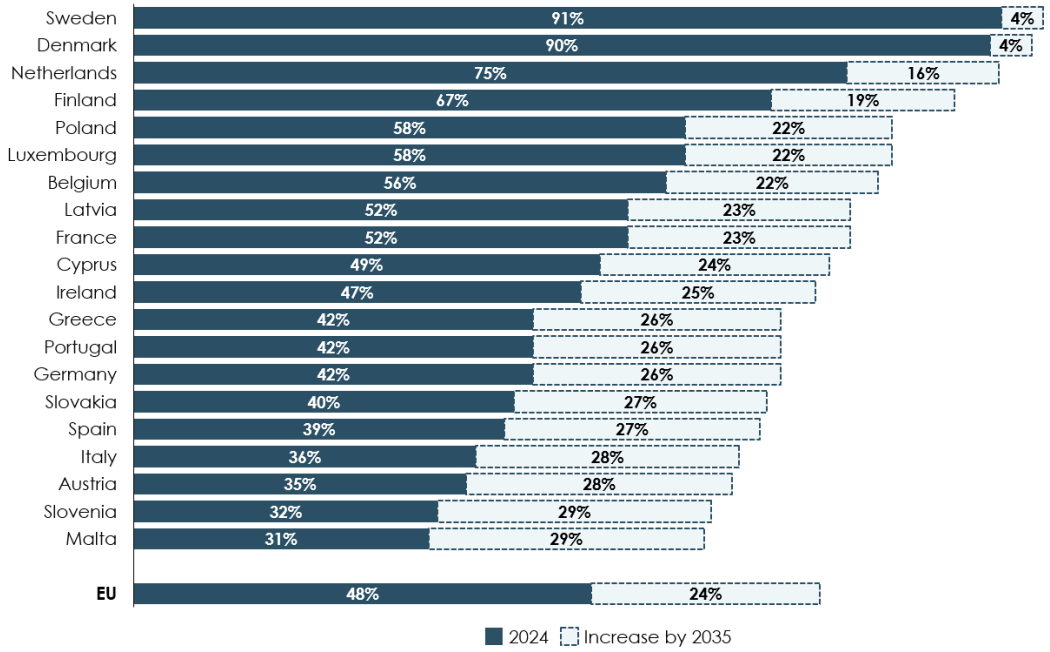
We project future card adoption based on developments in card usage at the POS across Member States between 2016 and 2024.[45] Our analysis shows a pattern of convergence: countries with lower initial card shares have generally experienced faster subsequent growth, while growth has been slower in markets where card usage was already high.[46] We use this relationship between initial adoption and subsequent growth to project country-level card shares to 2035, while adjusting for markets approaching saturation; see Figure 13.

44 Stakeholder interviews similarly highlighted that, where card adoption is already high, continued innovation may improve payment experiences and maintain competitiveness even without materially increasing the card share.

45 We use 2016 and 2024 as they are the most recent ECB studies on use of cash in the euro area and serve as the closest source for an estimate of card usage shares on an EU level. ECB (2017). The use of cash by households in the euro area, ECB Occasional Paper Series No. 201, see link; ECB (2024). Study on the payment attitudes of consumers in the euro area 2024, see link.

46 Between 2016 and 2024, Cyprus, Greece and Spain, which started with card shares below 20 per cent, recorded annual growth of around 3 to 4.5 per cent. Denmark and Sweden, which started above 70 per cent, grew considerably more slowly. Further methodological details are provided in the technical appendix.

Figure 13
Card adoption is projected to increase across the EU by 2035 based on historical trends, with the largest gains in lower-adoption markets
Number of card transactions as a share of the total number of transactions at the POS, per cent



Note: POS card shares include mobile wallets. Based on 20 EU countries due to data availability.
Source: Copenhagen Economics based on ECB, see Link; Denmark and Sweden shares in 2024 collected from Global Payments Report, see link; Poland based on Polish National Bank study, see link.

We combine the projected card shares with growth in the overall number of payments to estimate future card transaction volumes. We assume that the total number of POS transactions grows in line with real economic activity and apply annual real EU gross domestic product (GDP) growth of 1.5 per cent. This provides a simple and conservative basis for projecting transaction volumes and is broadly consistent with recent European Commission projections for EU economic growth.[47] Under this assumption, the total number of POS transactions increases from around 132 billion in 2024 to around 155 billion in 2035. We hold the average transaction value constant at EUR 38 in real terms, based on the average value of an EU card payment reported by the ECB,[48] such that economic growth translates into a proportional increase in the number of transactions rather than an increase in their average real value. Together with the projected increase in card shares, this provides the basis for estimating the additional socio-economic benefits generated by card payments in 2035.

The 2035 results describe a scenario, not a forecast, and show what the quantified benefits would be if card adoption continued to follow the pattern observed between 2016 and 2024, adjusted for saturation. The scenario captures only the continued shift from cash to cards. The 72 per cent card share covers all card payments at the POS through both domestic and international card schemes,

47 European Commission (2026). *Spring 2026 Economic Forecast*, see link.
48 ECB Data Portal, 'Card payments, sent, average value per card payment, EU', see link.

including payments made through mobile wallets. It reflects a shift away from cash and is not a judgement on how the future payment mix of card, cash and other digital payments will evolve.

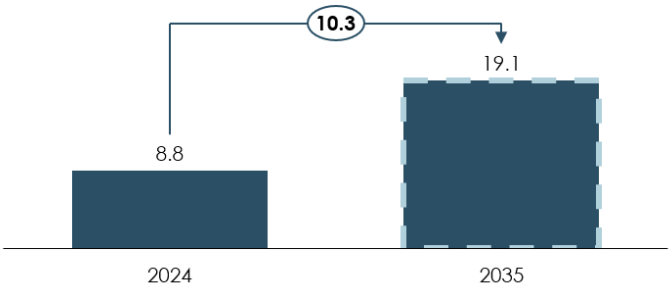
The scenario does not model new payment solutions, which could lead to lower card shares than we project. The historical pattern already covers a period in which domestic A2A and mobile solutions such as Bizum, BLIK and Swish grew in some Member States. It does not capture a possible acceleration of new solutions, including Wero at the POS and, if introduced, the digital euro. However, where such solutions replace cash, we consider it likely that they would generate some of the same benefits as cards.

1.3.2 Continued card adoption can increase merchant benefits

Merchants can realise further benefits from wider card usage through more efficient operations and access to larger and more diverse markets. This potential is greatest in Member States where cards still account for a lower share of retail payments and where merchants devote more resources to cash counting, reconciliation, storage, transport, and banking.

We estimate that merchant benefits could increase by more than EUR 10 billion by 2035, bringing total merchant cost savings to an estimated EUR 19.1 billion by 2035. We apply the same approach as in the historical estimate (Section 1.2.1) and combine the projected number of card transactions (Section 1.3.1) with the expected difference in the resources required to accept card and cash payments, see Figure 14.

Figure 14
Social benefits on the merchant side projected to increase by over EUR 10 billion by 2035, to a total of over EUR 19 billion
EUR billion



Note: Values in 2024 euros. The dotted line implies projected value.
Source: Copenhagen Economics based on merchant per-transaction cost of cash and card from Panteia (2022). Link; number of card transactions at the POS, ECB Data Portal (2026), see link.

The projected increase reflects both higher payment volumes and a continued shift towards cards. As economic activity grows, the total number of payments increases, while cards account for a larger share of those transactions. At the same time, wider card usage allows merchants to reduce the resources devoted to handling cash and to spread fixed card-acceptance costs across more transactions.

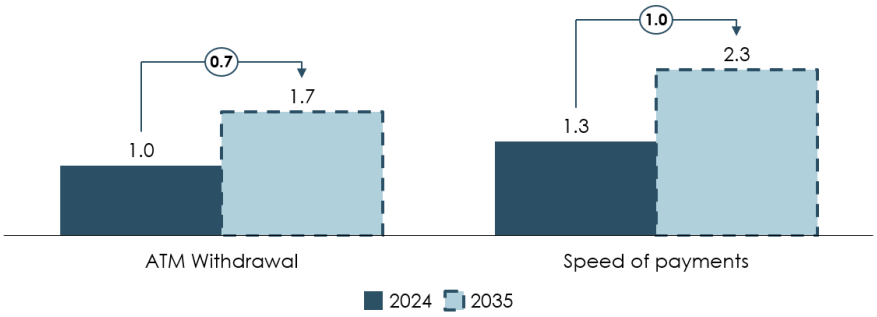
We use a conservative assumption for future cash-handling costs. We cap the estimated cost per cash transaction at its 2016 level, adjusted to 2024 prices using the consumer price index; see Appendix A for further details.

1.3.3 Continued card adoption can increase consumer benefits

Consumers can realise further benefits as card usage increases, particularly in Member States where card adoption remains comparatively low. Wider use of cards can reduce the time consumers spend making payments and obtaining cash, while also increasing the value of fraud protection and chargeback mechanisms as more transactions are made by card.

We estimate that annual **consumer time-saving benefits** could exceed EUR 4 billion by 2035, around EUR 1.7 billion more than in 2024. We apply the projected POS card shares (Section 1.3.1) to our existing estimates of payment time and ATM use (Section 1.2.2), while holding the remaining assumptions constant. As card usage increases, consumers complete more transactions faster and make fewer cash withdrawals; see Figure 15.

Figure 15
Consumer time-saving benefits from card payments could increase by EUR 1.7 billion by 2035
EUR billion

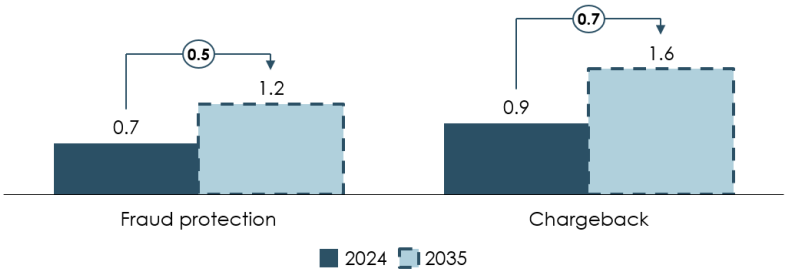


Note: Values in 2024 euros.
Source: Copenhagen Economics based on time estimates from Norges Bank (2022), see link and number of card transactions at the POS, and ECB Data Portal (2026), see link.

Wider consumer welfare benefits from fraud protection and chargebacks are also projected to increase as card usage grows. We estimate that these benefits could reach around EUR 2.8 billion by 2035, approximately EUR 1.2 billion above the 2024 level. We retain the assumptions used in the 2024 estimates and scale the benefits with the projected number of card transactions (Section 1.3.1), while holding the average transaction value constant at EUR 38 in real terms[49], see Figure 16.

[49] We hold the average transaction value constant at EUR 38, so the estimates remain in 2024 prices and reflect higher card usage rather than nominal price growth.

Figure 16
Consumer welfare gains projected to increase by EUR 1.2 billion by 2035 to a total of EUR 2.8 billion
EUR billion



Note: Values in 2024 euros.
Source: Copenhagen Economics based on ECB Data Portal, 'Average value of card payments' and 'Number of card transactions'; EBA, 'Retail Risk Indicators', Figure 83; Mastercard (2025), 'What's the true cost of a chargeback for businesses?'; see average transaction value, fraud rate, transaction volume and number of charge backs.

We **do not project additional convenience benefits associated with having access to a payment card** because card ownership is already close to saturation**.** ECB surveys indicate that around 92 to 93 per cent of consumers owned a payment card in both 2016 and 2024.[50] As this benefit depends primarily on access to a card rather than the number of times it is used, further adoption adds little to this component. Consumers can nevertheless continue to gain from faster payments, fewer cash withdrawals, fraud protection and chargebacks as card usage increases.

1.4 CARD PAYMENTS IMPROVE TRANSACTION TRACEABILITY AND SUPPORT VAT COMPLIANCE

Greater use of traceable payments can strengthen VAT compliance by making transactions easier to verify and harder to under-report.[51] The European Commission's VAT Gap measures the difference between the VAT that should theoretically be collected under full compliance and the VAT actually collected.[52] The gap reflects several factors, including tax evasion, insolvencies, and administrative inefficiencies. Across the EU, the VAT Gap declined by almost EUR 18 billion between 2013 and 2023,[53] coinciding with a marked increase in the use of card payments.

Empirical evidence consistently links greater use of card and other traceable payments with stronger VAT compliance. Alognon et al. (2021) and Hondroyiannis and Papaoikonomou (2020) specifically examine card payments and find that higher card usage is associated with lower VAT gaps or higher VAT revenue. Bohne et al. (2023) reach a similar conclusion using a broader measure of cashless payments. Across these studies, the underlying mechanism is the same: electronic

50 ECB (2024). Study on the Payment attitudes of consumers in the euro area 2024, link; ECB (2017). The use of cash by households in the euro area, ECB Occasional Paper Series No. 201, see link.
51 Stakeholder interviews also highlighted the transaction-level records created by digital card payments, which can support auditability, reconciliation and internal approval processes. These benefits are not unique to cards and also apply to other traceable digital payment methods.
52 European Commission (2025), 'VAT Gap', see link.
53 European Commission (2025), 'VAT Gap in Europe, 2025 Report', see link. (based on the latest available years, 2013–2023)

transaction records increase traceability, reduce opportunities for cash-based under-reporting and strengthen tax enforcement.[54]

Card payments can also be easier to identify as commercial transactions than some other electronic payments. Card payments are typically processed through an acquirer that has onboarded the merchant, and are recorded. A2A and mobile payments can instead be made to a personal account, where a payment for goods or services may be hard to distinguish from a transfer between private individuals and may therefore not be captured for VAT purposes. For example, in Spain since 2026, banks must report to the tax authority the payments businesses and professionals receive through Bizum and similar systems, separately from transfers between private individuals.[55] In this respect, cards can offer more traceability than cash and than some other electronic payments.[56]

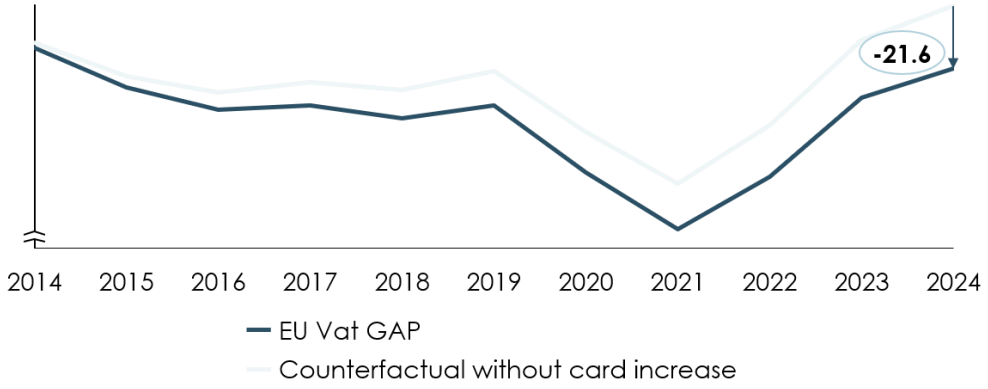
We estimate that the increase in card usage since 2014 was associated with around EUR 21.6 billion in additional annual VAT revenue by 2024, all else equal. See Figure 17.

54 Bohne et al. (2023) examine the relationship between cashless payments and VAT compliance across EU countries from 2001 to 2021. They measure cashless payment use by the value of debit and credit card transactions and VAT non-compliance by the VAT compliance gap. They find that greater e-money use is associated with lower VAT gaps, and their analysis suggests that a 1 percentage point increase in e-money use during the COVID-19 period reduced the VAT compliance gap by 11.9 per cent, see link. Alognon et al. (2021) analyse the effect of credit and debit card use on VAT gaps across EU countries from 2000 to 2016. They find that a 1 per cent increase in card payments is associated with a 0.51 percentage point reduction in VAT gaps, while a 1 per cent increase in cash withdrawals is associated with a 0.6 percentage point increase in VAT gaps, link. Hondroyiannis and Papaoikonomou (2020) focus on the effect of card payments on VAT revenues in euro-area countries from 2000 to 2016. They find that greater card use increases VAT revenues in the long run, with an estimated elasticity of VAT revenue with respect to card payment use of around 0.1, see link.

55 Royal Decree 253/2025 of 1 April 2025 amending, with regard to reporting obligations, the Personal Income Tax Regulation (Royal Decree 439/2007) and the General Regulation on tax management and inspection procedures (Royal Decree 1065/2007), *Official State Gazette* (BOE), link; Spanish Ministry of Finance (2025), *Clarifying note on payments made through Bizum*, 15 December 2025, see link.

56 Based on stakeholder input.

Figure 17
Increased card usage since 2014 is associated with a EUR 21.6 billion reduction in the VAT Gap in 2024
EUR billion



Note: EU VAT Gap in nominal terms.
Source: Copenhagen Economics based on Hondroyiannis and Papaoikonomou (2020), link; and European Commission (2025), VAT Gap in Europe, see link.

We base the estimate on Hondroyiannis and Papaoikonomou (2020), who estimate a long-run elasticity of VAT revenue with respect to the share of private consumption paid by card of approximately 0.1. In other words, a 10 per cent relative increase in the card share is associated with around a 1 per cent increase in VAT revenue.[57]

We apply this relationship to the observed increase in card usage across the EU. We recreate the card share used in the original study by dividing the value of POS card payments by household final consumption expenditure. On this basis, we estimate that the share of private consumption paid by card at the POS increased from around 20 per cent in 2014 to 23.5 per cent in 2024. Applying the estimated elasticity to this change implies around EUR 22 billion in additional annual VAT revenue associated with increased card usage.[58]

This estimate is indicative and should not be interpreted as a causal decomposition of the VAT Gap. The underlying elasticity was estimated for euro-area countries over the period 2000 to 2016, while we apply it to a later period and a broader EU country set. The elasticity captures an average long-run relationship across euro-area countries and does not provide country-specific effects. It also does not isolate differences in VAT rates, economic structure, tax administration, insolvencies, or the starting level of card use.

[57] Equivalently, a 1-percentage-point increase in card share raises VAT revenue by around 1 per cent only when the starting card share is 10 per cent.[57]

[58] We estimate the share of private consumption paid by card by dividing the value of card payments at POS in the EU by household final consumption expenditure. ECB Data Portal, 'Value of card payments at points of sale', see link; Eurostat, 'Final consumption expenditure of households by consumption purpose', see link.

The focus countries illustrate the wide variation in VAT compliance outcomes across Europe. Italy recorded the largest long-run nominal reduction, from EUR 40 billion in 2013 to EUR 25 billion in 2023. Poland's gap fell to EUR 2.5 billion in 2021 before rising to EUR 10.5 billion in 2023. The Commission identified Italy and Poland as two of the countries with the largest improvements in 2021 and noted that the wider EU reduction coincided with greater use of electronic payments and online shopping, alongside digital reporting, real-time transaction monitoring, and e-invoicing.[59] However, Italy and Poland still recorded relatively high VAT compliance gaps of 15 and 16 per cent in 2023, respectively. Germany had the largest nominal gap among the focus countries, at EUR 31.3 billion, although its gap rate of 9.7 per cent was close to the EU average of 9.5 per cent.[60] These differences reflect many factors beyond payment behaviour, including enforcement, electronic invoicing, digital reporting and broader economic conditions. We therefore do not allocate the estimated EUR 22 billion across individual countries.

A further increase in card usage could be associated with approximately EUR 24.6 billion in additional annual VAT revenue by 2035. We apply the same relationship between card usage and VAT revenue to the projected increase in card adoption developed in Section 1.3.1. The estimate captures the contribution associated with greater transaction traceability rather than a forecast of the overall VAT Gap. Wider card usage creates verifiable electronic transaction records that can make underreporting more difficult and complement tax enforcement, electronic invoicing, digital reporting and broader business digitalisation. Card payments therefore form one part of a wider set of measures that influence VAT compliance.[61]

59 European Commission (2023), *VAT Gap Report 2023*, see link; European Commission (2023), 'VAT Gap: Progress made in VAT compliance in 2021, though losses remain considerable', see link; European Commission (2024), 'Member States made significant progress in VAT Compliance in 2022, but continued efforts are still needed', see link.

60 European Commission (2025), VAT Gap in Europe 2025, see link.

61 European Commission (2026) VAT in the Digital Age (ViDA), see link.

CHAPTER 2

A RELIABLE CARD PAYMENT ECOSYSTEM UNDERPINS ITS SOCIO-ECONOMIC BENEFITS

The economic benefits identified in Chapter 1 depend on consumers and merchants being able to trust card payments. Card payments create this value only if transactions are authorised, processed and settled securely, and if clear protections apply when something goes wrong. This matters most in e-commerce and cross-border trade, where buyers and sellers often do not know each other. This trust rests on continuous investment across the card payment ecosystem. Issuers, acquirers, card schemes, and processors invest in fraud prevention, authentication, tokenisation, cyber security, and redundancy. These investments have helped reduce fraud relative to card use, keep payments running during disruptions, and give consumers a recovery channel when a purchase fails. Two of the benefits we quantify in Chapter 1 depend directly on these arrangements: fraud protection (EUR 0.7 billion) and chargebacks (EUR 0.9 billion). The same trust also supports value we do not quantify, including access to online and cross-border customers, and continued payment innovation. This chapter describes the capabilities, protections, and investments that sustain it.

Several mutually reinforcing features sustain this trust. Specialised providers share responsibilities and financial risks across the payment chain (Section 2.1). Operational and cyber safeguards strengthen the ability of individual providers to prevent and recover from disruptions, while the settlement layer provides a robust foundation for completing financial obligations (Section 2.2). Multiple payment solutions and acquiring providers reduce reliance on individual actors and support payment continuity at the ecosystem level (Section 2.3).

Reliable payments depend both on the operational resilience of individual providers and infrastructures and on the ability of the wider payments ecosystem to maintain payment continuity. Operational resilience concerns the capacity of individual systems to prevent, withstand and recover from operational and cyber incidents. At the ecosystem level, continuity is also supported by the availability of alternative payment solutions and providers when individual parts of the system are disrupted. These considerations are distinct from questions of strategic autonomy, which concern the geographic origin and control of payment providers and infrastructures.

Card payments operate alongside other payment methods that also contribute to choice and continuity. Cash remains important for accessibility and as an alternative when electronic payments are unavailable, while A2A and mobile payment solutions provide additional electronic payment options in many Member States. Several national authorities, and the European Commission in its 2025 Preparedness Union Strategy, advise households to keep some cash for emergencies in case

digital payment services are temporarily disrupted.[62] Within this broader payments landscape, card payments are supported by established risk-sharing arrangements, operational and cyber safeguards and a diverse provider base that together keep payments running, even when individual parts come under strain.

2.1 CARD PAYMENTS ARE ENABLED BY AN ECOSYSTEM OF SPECIALISED PROVIDERS

When a consumer taps a card at a payment terminal or enters card details online, the payment is completed within a few seconds. Behind this simple user experience lies an ecosystem of specialised providers that each perform a distinct function in processing the transaction. Rather than relying on a single provider, most card payments in Europe are processed through four-party card payment schemes,[63] in which specialised providers work together to authorise, clear, and settle transactions. The main participants are the issuer, which provides payment cards to consumers; the acquirer, which enables merchants to accept card payments; and the card scheme, which provides the common rules and infrastructure that connect them, see Figure 18.[64]

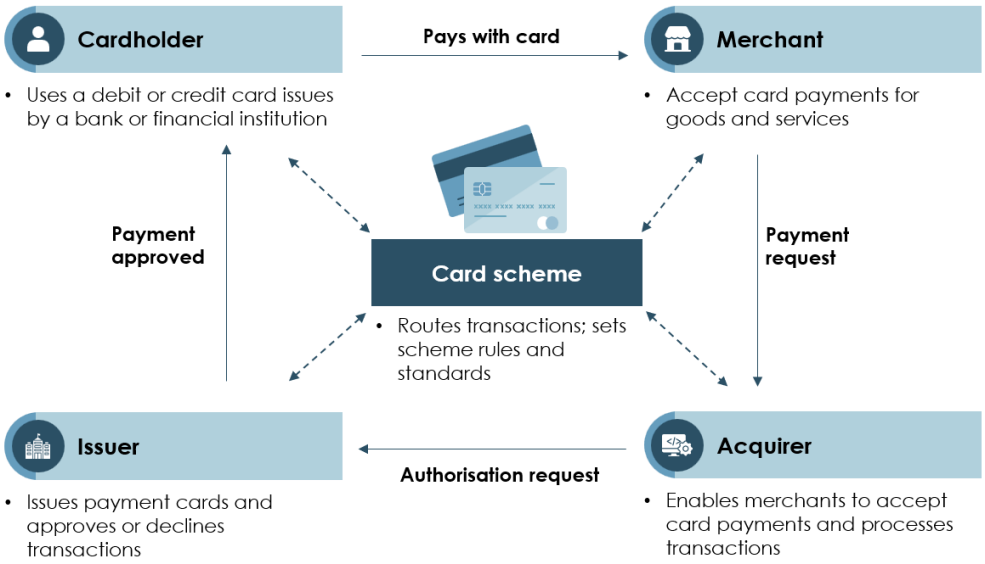
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62 In March 2025, the European Commission's Preparedness Union Strategy called on Member States to help households be self-sufficient for at least 72 hours in a crisis; the Commission's public guidance on the strategy lists cash among the recommended supplies. Sweden, the Netherlands, and Norway all have official preparedness guidance advising households to keep cash available alongside other payment methods. Sweden gives a benchmark of SEK 1,000 per adult; the Dutch guidance recommends EUR 70 per adult and EUR 30 per child for a 72-hour disruption; Norway recommends keeping some cash available, with the amount depending on household needs. See, European Commission and High Representative (2025), *European Preparedness Union Strategy*, JOIN(2025) 130 final, see link; Sveriges Riksbank (2026). *Recommendations to the general public regarding payments*, see link; De Nederlandsche Bank (2025). *NFPS advice: Prepare for a three-day disruption of electronic payments*, see link; Norges Bank (2026). *Self-preparedness for making payments*, see link.

63 Four-party card schemes are the most common model for card-based payments in Europe, see Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC, link. Three-party payment card schemes exist but are less common, see ECB (2025). Report on card schemes and processors, link; Mastercard (n.d.). We make payments happen in more than 210 countries and territories, link; Visa (n.d.). Overview of Payments & Card Product Solutions, link.

64 In contrast, three-party schemes, such as American Express, combine the issuing and acquiring functions within the scheme itself. Payments therefore move from the payer's account to the payee's account within the same scheme. However, in the EU, a three-party scheme is treated as a four-party scheme if it involves other payment service providers in issuing cards or acquiring transactions, or if it issues cards with a co-branding partner or through an agent, see Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, link.

Figure 18
Four-party payment card schemes enable the issuer and acquirer to transact



Source: Copenhagen Economics based on Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, see link.

The **card scheme** provides the common standards that enable issuers and acquirers to transact with one another.[65] Examples include Visa, Mastercard, and girocard in Germany. Rather than issuing cards or serving merchants directly, card schemes operate the network through which issuers and acquirers exchange payment messages and process transactions. They establish the technical, operational, and security standards governing participation in the scheme and allocate financial responsibilities among participants.[66] In doing so, they support the interoperability, reliability, and security of card payments.[67]

The **acquirer** specialises in serving merchants. Examples include Nexi, Worldline and Adyen, which provide acquiring services to merchants across Europe. The acquirer enables merchants to accept card payments, processes payment transactions and transfers funds to the merchant once the transaction has been settled. Beyond providing the technical infrastructure for payment acceptance, the acquirer also assumes financial risks associated with providing payment acceptance services to merchants. For example, if a completed card transaction is later reversed through a chargeback because it is disputed, unauthorised or fraudulent, the acquirer is responsible for reimbursing the issuer and subsequently recovering the funds from the merchant where possible. As a result, acquirers assess merchants before providing acquiring services and continuously monitor

65 Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, see link.

66 Stakeholder interviews also highlighted that common scheme rules and infrastructure allow these responsibilities to continue functioning in exceptional circumstances, including through predefined fallback and risk-sharing arrangements.

67 European Payments Stakeholders Group (2022) SCS Volume Version 10.0, see link.

fraud and other risks throughout the commercial relationship.[68] In practice, acquiring services may involve intermediaries, and the acquirer does not always contract directly with the merchant.[69]

The **issuer** specialises in serving cardholders. It issues payment cards, authorises transactions and manages the relationship with the consumer. When a payment is initiated, the issuer verifies that the transaction complies with the scheme rules, checks that sufficient funds or credit are available and returns an approval or decline within seconds.[70] Examples include BNP Paribas, Sparkasse and Intesa Sanpaolo.

The specialised roles of issuers, acquirers and card schemes allow each participant to focus on its core function while relying on common standards and infrastructure to interact with other participants. This specialisation provides the foundation for the operational safeguards, risk-sharing arrangements and provider diversity discussed in the following sections.

Card payments operate alongside cash and other electronic payment solutions, which provide additional choice and continuity. Cash remains important for accessibility and as a fallback when electronic payments are unavailable, while A2A and mobile payment solutions offer alternative electronic payment options in many Member States (see Section 2.3). This wider mix of payment methods also creates incentives for card providers to continue improving security, service quality, and innovation.

2.2 RELIABLE PAYMENT SERVICES ARE SUPPORTED BY MULTIPLE LAYERS OF INFRASTRUCTURE AND SAFEGUARDS

Reliable card payment services depend on both operational resilience at the level of individual providers and robust infrastructure across the payment chain. Issuers, acquirers, card schemes, processors and other service providers invest in preventing, detecting and responding to operational and cyber incidents, while the settlement layer provides a secure foundation for completing financial obligations. In this section, we examine these two elements in turn.

2.2.1 Operational and cyber security are embedded throughout the card payment ecosystem

Operational and cyber resilience are integral to the day-to-day operation of the card payment ecosystem. Given the critical role of card payments in the economy, market participants continuously invest in measures designed to reduce the likelihood of disruption, detect incidents quickly and restore affected services in a controlled manner. These arrangements also need to evolve as cyber threats, technology dependencies and the complexity of payment supply chains change over time.[71]

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68 Payment Systems Regulator (2020), Market review into the supply of card-acquiring services – Annex 1 Industry background, see link.

69 Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, see link.

70 Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions, see link.

71 Based on stakeholder interviews. Interviewees highlighted the increasing sophistication of cyber threats and the growing complexity of technology and supply-chain dependencies as important drivers of continued resilience investment.

The need for these investments is reinforced by the evolving threat environment facing the financial and payment sectors. The European Union Agency for Cybersecurity (ENISA) identified finance as one of the most targeted sectors in Europe. The ECB and the European Banking Authority (hereafter, "EBA") report that fraud involving cards issued in the EEA reached EUR 1.3 billion in 2024.[72] While the absolute value of card fraud remains material, fraud has declined relative to overall card use over the longer term**.** ECB data show that the value of fraudulent card payments fell from 0.042 per cent of total card-payment value in 2015 to 0.028 per cent in 2021. In terms of the number of transactions, the share of fraudulent payments was stable at 0.015 per cent of the volume of card payments in 2022 and 2023. The ECB attributes part of the longer-term reduction to improvements in fraud prevention and authentication, including strong customer authentication.[73]

Preventive measures seek to build resilience into technology and operational processes before disruptions occur. These include resilient system architectures, geographically separated processing capacity, redundant network infrastructure, cyber and fraud controls and continuous monitoring of transaction patterns to identify unusual activity or service disruptions at an early stage.[74] At the issuer level, these measures are complemented by controls around customer authentication, third-party risk management and customer-facing security features. Stakeholders interviewed also highlighted redundant network components, alternative routing and geographically distributed processing capacity, and failover arrangements that allow processing to be shifted to alternative systems or locations, as practical ways of avoiding reliance on individual points of failure.[75]

Card payment systems can also include **fallback mechanisms** that allow some transactions to continue when normal connectivity or processing is unavailable. Stakeholders highlighted offline functionality, stand-in authorisation and other predefined fallback arrangements that can maintain payment functionality for a limited period when normal processing is disrupted. These mechanisms do not eliminate disruption but can limit its impact on consumers and merchants.[76]

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72 See ENISA, *Threat Landscape: Finance Sector*, 2025, which analyses publicly reported incidents affecting the European finance sector between January 2023 and June 2024 and identifies social engineering as a prevalent cybercrime technique, see link; and EBA and ECB, *Joint report on payment fraud*, 2025, which reports that fraud involving cards issued in the EEA increased by 29 per cent in 2024 and finds that strong customer authentication remains effective in reducing fraud based on stolen credentials, particularly for card payments, see link.

73 European Central Bank, *Seventh report on card fraud*, October 2021, Chart 1a, p. 6, see link; European Central Bank, *Report on card fraud in 2020 and 2021*, May 2023, Section 2 and Chart 1a, see link; European Banking Authority, *Retail risk indicators*, Payment services section, Figure 83, see link.

74 Based on stakeholder interviews. Interviewees highlighted transaction-volume monitoring and anomaly detection as tools for identifying potential disruptions quickly.

75 Based on stakeholder interviews.

76 Based on stakeholder interviews. The availability and conditions of offline and stand-in processing vary by payment product, provider and transaction.

Box 2 Card networks continued to operate during the July 2024 global IT outage

On 19 July 2024, a faulty software update from the cyber security firm CrowdStrike disabled Windows systems worldwide, disrupting airlines, banks, retailers and media. Visa and Mastercard reported that their networks continued to process payments normally. Where consumers or merchants had problems paying by card, these arose at banks, merchants or service providers that relied on the affected systems.

The incident shows that the core card networks can keep running when widely used IT systems fail elsewhere. It also shows that dependencies across the payment chain matter: a disruption at one participant can affect its customers even when the wider network is working.

Source: Payments Dive (2024), *Visa, Mastercard networks unscathed by CrowdStrike snafu*, link

Providers also maintain dedicated **capabilities to detect and respond** rapidly when incidents occur. These include 24/7 operational monitoring, predefined escalation procedures, incident-response teams, crisis-management arrangements, and customer communication processes. Together, these capabilities help providers identify affected services, prioritise critical functions, coordinate with other participants, and restore services in a controlled manner. The objective is not to eliminate all operational incidents, but to contain their impact and restore critical payment services as quickly and safely as possible.[77]

Operational resilience depends on **coordination across the full payment chain**. A single card transaction can involve issuers, acquirers, card schemes, processors, authentication services, telecommunications providers, digital wallets and other technology providers. Disruptions can therefore propagate across several parts of the ecosystem if dependencies are not well managed. Market participants address this through third-party risk management, partner coordination, redundancy and recovery arrangements across critical services.[78]

Dependencies are most critical where substitutability is limited, real-time connectivity is required or disruption could affect several parts of the payment chain at once. Examples include issuer processing, scheme connectivity, authentication, fraud monitoring, telecommunications, hosting and other critical technology services. Managing these dependencies therefore requires not only controls within individual firms but also third-party oversight, redundancy, coordination and tested recovery arrangements across organisations.[79]

Regular testing is used to assess whether these arrangements remain effective under adverse conditions. Market participants conduct business-continuity and disaster-recovery exercises, cyber and failover testing, third-party resilience tests and scenario-based simulations. These exercises test escalation and recovery procedures, identify vulnerabilities and allow lessons from incidents and exercises to be incorporated into operational arrangements.[80]

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77 Based on stakeholder interviews.

78 Based on stakeholder interviews. Interviewees consistently emphasised that operational resilience is an ecosystem-wide responsibility because individual transactions depend on several interconnected providers and infrastructures.

79 Based on stakeholder interviews.

80 Based on stakeholder interviews. Interviewees reported business-continuity and disaster-recovery exercises, failover testing, cyber exercises, penetration testing and scenario simulations as regular elements of operational resilience management.

These market practices are reinforced by a European regulatory and oversight framework. Stakeholder interviews indicate that many resilience practices and investments predate recent regulation, while frameworks such as DORA have formalised common expectations across the sector.[81] DORA establishes requirements for information and communication technology (ICT) risk management, incident reporting, resilience testing, and third-party risk management across financial entities. The Eurosystem's PISA framework provides oversight of payment instruments, schemes, and arrangements, while TIBER-EU provides a common framework for intelligence-led cyber testing; see Box 3.

Box 3 European regulation and oversight establish a common framework for operational resilience

European regulation and oversight establish common expectations for operational resilience, cyber security and risk management across the card payment ecosystem.

DORA
DORA establishes a common framework for digital operational resilience across financial entities. It sets requirements for ICT risk management, incident reporting, resilience testing, and the management of third-party ICT providers. DORA applies to many of the organisations involved in card payments, including issuers, acquirers, and payment institutions.

PISA oversight framework
The Eurosystem's PISA framework provides oversight of payment schemes and arrangements, including card payment schemes. It assesses whether payment schemes have appropriate governance, risk management and operational resilience arrangements in place to support the safe and efficient functioning of payment services.

TIBER-EU framework
TIBER-EU provides a common European framework for intelligence-led cyber resilience testing. It supports financial institutions and critical financial market infrastructures in assessing their resilience against sophisticated cyber threats through controlled testing exercises.

Together, these frameworks provide a common regulatory baseline that complements the operational investments and risk-management practices of market participants.

Source: DORA, link; ECB, Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (PISA), 2021, link; ECB, TIBER-EU framework, 2018, see link.

2.2.2 The settlement layer provides a robust foundation for card payment continuity

The settlement layer provides the financial foundation for card payments by ensuring that obligations between financial institutions are discharged securely and with finality. While issuers, acquirers, processors and card schemes authorise, route and process card transactions, the final transfer of funds between participating institutions is typically settled in central bank money through the Eurosystem's TARGET Services.[82]

[81] Based on stakeholder interviews.
[82] ECB (n.d.). TARGET services, see link.

Central bank settlement reduces systemic risk by removing reliance on the creditworthiness of individual commercial banks for the final discharge of payment obligations. Before settlement, payment obligations between participants are typically netted, reducing the number and value of interbank transfers that need to be settled. Although netting creates interdependencies between participants, settling the resulting obligations in central bank money limits the risk that the failure of an individual participant could undermine confidence in the wider payment system.[83]

The settlement layer is supported by both legal and operational safeguards. The Settlement Finality Directive[84] provides legal certainty by ensuring that transfer orders and netting arrangements in designated payment systems remain legally enforceable even if a participant becomes insolvent. Operationally, TARGET Services provide resilient infrastructure and contingency arrangements for critical settlement activity, including the Enhanced Contingency Solution (ECONS II) for the most critical payments. While operational disruptions cannot be eliminated entirely, these safeguards help contain their impact and support the continuity of critical settlement services.

2.3 CHOICE BETWEEN PAYMENT SOLUTIONS AND PROVIDERS SUPPORTS PAYMENT CONTINUITY

Payment continuity is supported not only by operational resilience within individual payment systems, but also by the availability of alternative payment solutions and providers. Consumers and merchants can access multiple payment solutions, while merchants can typically also choose between multiple acquiring providers. Together, these features reduce reliance on any single provider or payment solution.[85]

In this section, we examine how the availability of multiple payment solutions, see Section 2.3.1, and a diverse acquiring market, see Section 2.3.2, contribute to payment continuity. Together, they limit the impact of disruptions affecting individual payment solutions or service providers and support the continued acceptance of electronic payments.

2.3.1 Multiple payment solutions reduce reliance on any single payment network

Europe's diverse payments landscape gives consumers and merchants access to multiple payment solutions and creates incentives for providers to continue investing in service quality, security and innovation. For domestic payments, consumers and merchants in many Member States can choose between international card schemes, domestic card schemes and, in some countries, domestic A2A and mobile payment solutions. For cross-border payments, international card schemes continue to play a central role by providing broad geographic reach and interoperability across jurisdictions. However, emerging pan-European payment initiatives, such as Wero and the proposed digital euro, have the potential to further diversify the payments landscape over time.

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83 European Commission (2021). Settlement Finality Directive review: Summary of responses to the public consultation, see link.

84 Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 on settlement finality in payment and securities settlement systems.

85 Stakeholder interviews similarly highlighted that maintaining access to several payment methods, including cards, account-based solutions and cash, can support continuity when individual services are disrupted.

International card schemes, primarily Visa and Mastercard, provide broad domestic and cross-border acceptance across the EU and accounted for around 61 per cent of card payments acquired within the euro area in 2022.[86] Together, they ensure that merchants and consumers can rely on more than one internationally accepted payment network.[87]

In several Member States, **domestic card schemes** operate alongside international card schemes, providing merchants and consumers with additional payment options. According to the ECB, nine domestic card schemes are currently active across the EU, each operating within a single Member State. These schemes differ in the card products they offer, ranging from debit-only schemes to schemes supporting debit, credit, and prepaid cards.[88] In countries where they operate, domestic card schemes provide an additional payment network for domestic transactions. In several Member States, domestic and international schemes are combined on the same payment card through co-badging, enabling the same card to access both networks. For example, Cartes Bancaires in France, girocard in Germany, and Bancontact in Belgium are commonly co-badged with Visa or Mastercard. This enables the same payment card to access more than one payment network, allowing domestic transactions to be processed through either scheme while maintaining broad cross-border acceptance through the international scheme. Norway and Switzerland also operate domestic card schemes, complementing the nine domestic schemes currently active in the EU; see Figure 19.

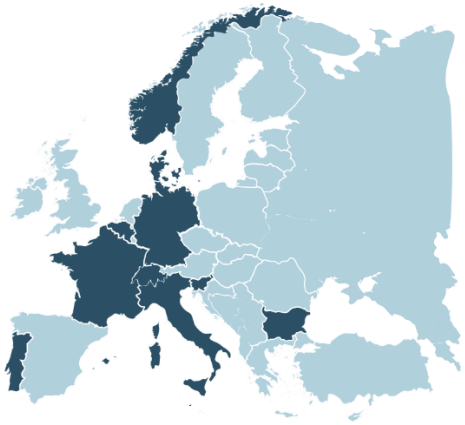
86 ECB (2025), Report on card schemes and processors, see link.

87 Stakeholder interviews highlighted broad cross-border acceptance as a distinctive practical benefit of international card schemes relative to payment solutions that remain primarily domestic.

88 The schemes differ in the card products they offer: Belgium, Denmark, Germany and Malta provide debit-only schemes; Italy and Portugal provide debit and prepaid schemes; Slovenia provides a credit-only scheme; and Bulgaria and France provide debit, credit and prepaid schemes.

Figure 19
Domestic card schemes operate in nine EU Member States as well as Norway and Switzerland

Country (Year introduced)	Local card schemes
Belgium (1978)	Bancontact
Bulgaria (2016)	Bcard
Denmark (1983)	Dankort
France (1984)	Cartes Bancaires (CB)
Germany (1990)	girocard
Italy (1983)	Bancomat
*Malta**	*APS Bank Card*
Portugal (1983)	Multibanco (MB)
Slovenia (1992)	Activa
Norway (1990)	BankAxept
Switzerland (1991)	PostFinance Card



Note: *APS Bank Card is the national card scheme in Malta but operates as a three-party scheme, unlike the four-party schemes listed for the other countries. The ECB therefore treats it separately in its classification of national card schemes.
Source: ECPA (2025), Safeguarding Europe's financial future, link; ECB (2025), Report on card schemes and processors, see link.

Beyond card schemes, several Member States have developed **domestic electronic payment solutions** based on A2A transfers or mobile payment technologies. While these solutions fall outside the scope of this study, they provide additional ways for consumers and merchants to make and receive electronic payments. They are particularly prominent in Member States without a domestic card scheme, where they complement international card schemes by providing domestic alternatives for selected payment use cases, particularly for peer-to-peer (hereafter, "P2P") transfers, e-commerce, and, increasingly, POS payments. Examples include iDEAL in the Netherlands, BLIK in Poland, Swish in Sweden, Bizum in Spain, as well as MobilePay in Denmark and Vipps in Norway; see Table 1.

Table 1
Domestic card schemes, A2A and mobile payment solutions provide alternatives to international card schemes across Europe
Exemplary overview for our eight focus countries

COUNTRY	DOMESTIC CARD SCHEME	A2A / MOBILE PAYMENT ALTERNATIVE	DESCRIPTION	MAIN USE CASES
Denmark	Dankort	MobilePay	Mobile payment solution linked to a bank account or payment card	P2P, e-commerce, POS payments, in-app payments; bill and subscription payments
France	Cartes Bancaires	Wero (replaced Paylib)	Pan-European mobile instant A2A payment solution linked to a bank account	P2P and cross-border P2P payments; e-commerce; expanding to POS payments
Italy	BANCOMAT	BANCOMAT PAY	Mobile payment solution linking a bank account to a mobile phone number	P2P, e-commerce, POS payments, public-sector payments
Germany	girocard	Wero	Pan-European mobile instant A2A payment solution linked to a bank account	P2P and cross-border P2P payments; e-commerce; expanding to POS payments
Netherlands	*No*	iDEAL	Online A2A payment solution based on bank authentication	E-commerce, public-sector payments (e.g. taxes and fines), payment requests
Poland	*No*	BLIK	Mobile A2A payment solution integrated into banking apps	P2P, e-commerce, POS payments, ATM cash withdrawals
Sweden	*No*	Swish	Mobile instant A2A payment solution linked to a mobile phone number and bank account	P2P; POS payments (incl. QR payments), payments to merchants, companies and associations
Spain	*No*	Bizum	Mobile instant A2A payment solution linked to a mobile phone number and bank account	P2P, e-commerce, POS payments

Source: Copenhagen Economics based on payment providers' websites.

For **cross-border payments**, international card schemes continue to play a central role by providing broad geographic reach, interoperability and merchant acceptance across jurisdictions. Unlike domestic payments, cross-border electronic payments currently rely to a much greater extent on international payment networks. However, new European payment solutions are emerging.

One initiative seeking to expand European payment options is Wero. Developed by the European Payments Initiative (hereafter, "EPI"), Wero is a pan-European A2A payment solution that is already available in several countries and is progressively expanding its geographic coverage and payment functionalities. Through interoperability agreements with existing national payment solutions, Wero aims to facilitate cross-border payments by connecting domestic payment ecosystems rather than replacing them, see Box 4.

Box 4 Wero is expanding a pan-European A2A payment solution

EPI has developed **Wero**, a pan-European digital wallet and instant A2A payment solution. Unlike card payments, Wero enables payments to move directly between bank accounts. It is being rolled out progressively, beginning with P2P payments and expanding to e-commerce and POS payments.

Today, Wero is available in **Belgium, France and Germany**. The Netherlands is expected to join through the migration of iDEAL, while Luxembourg is also preparing to launch Wero. In parallel, EPI has signed memoranda of understanding with domestic payment providers in **13 European countries**, including Bancomat (Italy), Bizum (Spain), MB WAY (Portugal) and Vipps MobilePay (Denmark, Finland and Norway), to support interoperability between national payment solutions.

Rather than replacing existing national payment solutions, Wero aims to connect them through a common interoperability framework. This enables cross-border payments while allowing participating solutions to retain their existing brands and customer interfaces.

Source: EPI (2026) Bancomat, Bizum, EPI, SIBS and Vipps MobilePay sign MoU to accelerate the rollout of sovereign, pan-European payment solutions, see link

Another initiative is the **proposed digital euro**. The digital euro would be a digital form of central bank money issued by the Eurosystem for everyday retail payments. It is intended to complement cash and existing private payment solutions by providing an additional pan-European means of payment that could be used across the euro area.[89] The ECB has completed the preparation phase of the digital euro project and is continuing technical preparations while supporting the legislative process. A decision on whether to issue the digital euro will only be taken once the relevant EU legislation has been adopted.[90] If introduced, the digital euro could further diversify the European payments landscape and reduce reliance on any single payment infrastructure for cross-border transactions.

2.3.2 A diverse acquiring market reduces reliance on individual providers

The European acquiring market comprises a large number of providers, including pan-European acquirers, domestic acquirers and bank-linked payment service providers.[91] This diversity provides merchants in most Member States with a choice of acquiring providers, reducing reliance on any single provider and supporting payment continuity. It also creates incentives for acquirers to improve service quality, pricing, technology and merchant support.

89 ECB, Digital euro, see link.

90 ECB, Progress on the digital euro, see link.

91 The business models of acquiring providers differ. For example, full-stack PSP-acquirers (e.g. Stripe and Adyen) combine merchant onboarding, payment gateways, acquiring and settlement within an integrated offering. Acquirer-processors (e.g. Nexi and Worldline) combine merchant acquiring with large-scale payment processing infrastructure. Bank-linked acquirers (e.g. PAYONE and Axepta) provide acquiring services through, or in close connection with, banking groups. Domestic acquirers often hold strong positions in individual national markets (e.g. PeP in Poland). These categories are not mutually exclusive, and many providers perform overlapping functions across gateways, processing, acquiring and settlement.

According to TSG, more than 40 entities across 14 European countries each processed more than USD 20 billion in annual payment volume in the European market in 2024, illustrating the presence of numerous sizeable providers.[92]

Alongside pan-European acquirers, such as Nexi, Worldline, and Adyen, operating across multiple Member States,[93] many Member States have domestic and bank-linked acquirers with strong positions in their national markets. Global providers such as Stripe, Worldpay, and Fiserv also compete across Europe, particularly in e-commerce.[94]

Table 2 provides illustrative examples of pan-European and domestic acquiring providers across our eight focus countries.

Table 2
Merchants can choose between pan-European, domestic and global acquiring providers
Illustrative examples of major acquiring providers; not a comprehensive overview

COUNTRY	PAN-EUROPEAN PROVIDERS	DOMESTIC / BANK-LINKED PROVIDERS
Denmark	Nexi (Nets), Worldline	Clearhaus (Unzer)
France	Nexi, Worldline	Axepta (BNP Paribas), CAWL
Germany	Nexi (Concardis), Worldline	PAYONE, VR Payment
Italy	Nexi, Worldline	Axepta Italy
Netherlands	Adyen, Worldline	Rabobank OmniKassa
Poland	Adyen	eService, PeP
Spain	Worldline	CaixaBank Payments & Consumer, Redsys*
Sweden	Nexi (Nets), Worldline	Swedbank Pay

Note: *Redsys primarily provides payment processing infrastructure but is included because it plays a central role in the Spanish merchant payments ecosystem. The table provides illustrative examples and is not intended to be comprehensive. Provider classifications reflect their geographic footprint and market positioning and are indicative; some domestic providers form part of wider European payment groups.
Source: Copenhagen Economics, based on company websites and publicly available market information.

Although pan-European acquirers operate across multiple markets, local providers continue to play an important role. Merchants accepting POS payments often value local-language support, on-site technical assistance and compatibility with domestic payment solutions. As a result, POS acquiring remains more locally anchored than e-commerce acquiring in many Member States.[95]

The presence of both pan-European and domestic acquiring providers gives merchants alternative options if an individual acquirer experiences a disruption. Because acquirers assume financial responsibility for the merchants they serve, switching to a new acquirer requires merchant

92 TSG (2024). Worldpay, Adyen, and Nexi Top TSG's 2024 European Directory Rankings, see link.
93 TSG (2024). Worldpay, Adyen, and Nexi Top TSG's 2024 European Directory Rankings, see link.
94 The Business of Payments, Newsletter (2024), see link.
95 Case M.9776 - WORLDLINE / INGENICO, para. 42, see link.

onboarding, technical integration, and risk assessment. Some medium-sized and large merchants also maintain relationships with more than one acquiring provider. These multi-acquirer arrangements allow merchants to route transactions through alternative providers to optimise authorisation rates, costs, and business continuity.[96] While changing or adding acquiring providers may involve temporary adjustment costs, the diversity of the acquiring market reduces reliance on any single provider and limits the wider impact of disruptions affecting individual acquirers.

[96] European Payments Council & The Paypers (2021), Cross-Border Payments and E-commerce Report 2020–2021, see link.

CHAPTER 3

CONSIDERATIONS FOR POLICYMAKERS

The analysis in Chapters 1 and 2 highlights several considerations relevant to the future development of the European payments framework. Card payments generate substantial socio-economic benefits, while their reliable provision depends on continued investment, effective risk management and coordination across a complex payment chain. At the same time, cards operate alongside cash and other electronic payment solutions that contribute to choice, competition and payment continuity. Against this background, we highlight several considerations for the future development of the European regulatory framework.

Assessments of payment markets should weigh the value delivered alongside price and cost. Card payments generate resource savings, consumer protection, market access and transaction traceability (Chapter 1). These benefits depend on continuous investment in fraud prevention, authentication, tokenisation, cyber security and redundancy (Chapter 2). An assessment that looks at individual price or cost components in isolation may not capture the value delivered or the investment needed to sustain it.

Consumers and merchants should be able to make greater use of the card infrastructure they already have. Around 92 to 93 per cent of consumers hold a payment card, and 93 per cent of POS terminals in the euro area accept contactless payments. Yet card usage remains comparatively low in several Member States, including Italy, Spain and Germany, where we find the largest remaining gains (Section 1.3). Avoiding unnecessary barriers to voluntary card use would allow more of the value of existing infrastructure to be realised without equivalent new investment, while consumers remain free to pay in cash.

The regulatory framework should preserve room for different payment solutions to coexist and compete. Europe already benefits from a diverse payments ecosystem in which consumers and merchants can use cash, international and domestic card schemes, A2A, and mobile payment solutions, while emerging initiatives such as Wero and the proposed digital euro could broaden pan-European options further. These solutions perform different and complementary roles: cash remains important for accessibility and contingency purposes, while electronic payments support digital commerce, security, and transparency. Diversity gives consumers and merchants choice, reduces dependence on individual providers, and creates incentives for continued investment in service quality and innovation.

Efforts to broaden European payment options should promote interoperability and additional choice rather than requiring existing solutions to be displaced. Co-badging already allows domestic and international card schemes to operate alongside one another, while Wero aims to connect payment solutions across borders and the proposed digital euro could add another pan-European option if introduced. These initiatives may also contribute to wider objectives around European strategic autonomy, but this is distinct from operational resilience: the geographic origin or ownership of a provider does not in itself determine whether payment services can withstand and recover from disruption.

European regulation should focus on the outcomes to be achieved rather than prescribing particular technologies or business models. Security, reliability, accessibility and consumer protection are relevant across payment solutions, but different providers can achieve these objectives in different ways. Common standards can establish the level of protection expected while leaving providers flexibility over how to meet them and develop new solutions.

Regulatory requirements should be proportionate and preserve the capacity and incentives for continued investment in secure and reliable payment services. Market participants invest continuously in fraud prevention, authentication, cyber security, monitoring, redundancy, testing, third-party oversight, and business continuity as technologies and risks evolve. Regulation can reinforce these safeguards, but unnecessary complexity, overlap, or duplication can also absorb resources that could otherwise support resilience, security, and innovation.

Operational resilience requirements should take an end-to-end view of the payment chain and be coordinated across overlapping regulatory frameworks. Card payments rely on the coordinated functioning of issuers, acquirers, schemes, processors, technology providers, telecommunications networks and other specialised services. Requirements applied to individual institutions remain important, but may not fully address risks arising from dependencies between participants or the possibility that disruption in one part of the chain affects services elsewhere.

European regulation should build on the existing strengths of a diverse, interoperable and investable payments ecosystem. Preserving competition, payment choice, operational resilience and incentives for continued investment supports the socio-economic benefits identified in Chapter 1, including efficient transactions, consumer protection, wider market access, innovation and stronger transaction traceability.

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APPENDIX A

TECHNICAL APPENDIX

A.1 SCOPE AND METHODOLOGICAL PRINCIPLES

This appendix documents the methodology used to estimate the consumer and merchant benefits of card payments, the association between card usage and VAT revenue, and the projections to 2035 presented in Chapter 1. The estimates represent annual flows. Consumer and merchant benefits are expressed in 2024 euros, while the VAT estimates are reported separately in nominal terms. The geographic scope is the EU, although some inputs and forecast relationships cover only the Member States for which comparable observations are available.

The analysis takes a societal perspective and distinguishes between resource efficiencies, wider consumer welfare benefits and VAT revenue effects. Resource efficiencies capture real resources released through faster payments, fewer cash withdrawals, and lower merchant payment-handling requirements. Consumer welfare benefits capture convenience and protection against uncertain financial losses. VAT effects capture additional public revenue associated with greater transaction traceability and are reported separately because they primarily represent transfers from otherwise unreported activity to the public purse.

The quantified estimates capture only those benefits that can be measured consistently across the EU and therefore do not represent the full value of card payments. Wider benefits from market access, trusted digital commerce, payment innovation, broad acceptance, and payment continuity are discussed in the main report but are not assigned a monetary value where a robust and comparable EU-wide estimate cannot be established.

A.2 MERCHANT VALUE ESTIMATE

We estimate merchant benefits as resource savings generated when a card transaction requires fewer payment-handling resources than a cash transaction. For each year, we multiply the per-transaction difference between the marginal cost of accepting cash and the marginal cost of accepting cards by the number of card transactions.

For a given year:

- Merchant benefit = card transactions × (marginal cash cost per transaction – marginal card cost per transaction)

We focus on incremental resource savings rather than attempting to compare the full infrastructure costs of cash and card payment systems. Both payment methods rely on substantial fixed infrastructure: cards require terminals, acceptance networks, processing and settlement systems, while cash depends on ATMs, cash transport, secure storage, and bank and central-bank handling. Existing societal-cost studies do not identify a consistent cost advantage for either payment method once fixed and variable costs are considered together. The relative cost instead depends strongly on market maturity and transaction volumes, because fixed costs are spread across more or fewer transactions as usage changes. This also explains why national studies can reach different conclusions on the relative cost of cash and cards.

We therefore quantify the more directly observable resource savings associated with individual transactions. These savings are less sensitive to assumptions about system-wide fixed costs and can be measured more consistently across markets. This approach also explains why national studies sometimes reach different conclusions on the average cost of cash and cards: in less card-intensive markets, fixed card-system costs are spread across fewer transactions, while the opposite applies as card usage becomes more mature. The merchant estimate should therefore be interpreted as a conservative measure of incremental resource savings rather than a comparison of the total societal cost of maintaining the two payment systems.

We use the recurring Dutch merchant-cost survey as the main source for marginal cost per transaction for cash and card acceptance. The Dutch series provides comparable observations over a long period and distinguishes between fixed, transaction-related and turnover-related costs. The available observations cover 2006, 2009, 2012, 2014, 2017, 2020 and 2023, and we interpolate linearly between survey years where necessary.[97] The Panteia marginal costs include staff time and the variable fees merchants pay per transaction, valued at banks' standard tariffs. Fixed costs such as terminals and subscriptions are excluded.

The Dutch evidence is used as a benchmark rather than applied directly to the EU. Payment-market maturity differs substantially across Member States, and the Netherlands reached high levels of card adoption earlier than the EU average. Applying Dutch costs from a given year directly to the same EU year would therefore risk comparing markets at different stages of card adoption. Instead, for each EU model year, we use the EU POS card share by value to identify a corresponding point in the Dutch adoption path and interpolate the associated marginal cash and card costs for 2009, 2016 and an assumed 2024 share.[98]

The calculation follows five steps for a given year:

1. identify the EU POS card share by value;
2. map this share to the corresponding point in the Dutch card-adoption path;
3. interpolate the Dutch marginal cash and card costs at that point;
4. convert the resulting costs to the relevant price level using the Dutch consumer price index; and
5. multiply the resulting cost difference by the number of EU card transactions.

We use card share by value for the maturity mapping because it measures the proportion of merchants' turnover processed through cards. A measure based only on the number of transactions can be affected by differences in average transaction size. For example, cards may account for a high proportion of low-value payments while merchants continue to receive a substantial proportion of their total turnover in cash. Card share by value therefore provides a closer indication of the extent to which card payments have displaced cash within merchants' operations and of the scale over which

[97] Panteia (2024), *Kosten van het toonbankbetalingsverkeer: Meetjaar 2023*. Link; Panteia (2021), *Kosten van het toonbankbetalingsverkeer in 2020*. Link; Panteia (2018), *Kosten van het toonbankbetalingsverkeer in 2017*. Link; Panteia (2012), *Point of Sale Transactions, Costs Calculation*. Link

[98] To be conservative, we cap the marginal cost of cash per transaction at the Dutch equivalent of 2016, adjusted to 2024 prices using the consumer price index. This is because the marginal cost of cash per transaction shows a sharp increase, going from around EUR 0.25 between 2006 and 2017 to over EUR 0.5 by 2023. We do not extrapolate this sharp increase in Dutch cash costs recorded in the most recent survey. Using the more conservative assumption reduces the risk that a country-specific development drives the EU projection. It also means that the projected merchant benefits do not depend on an assumption that the cost of accepting cash will continue to rise.

cash-handling and turnover-related costs are incurred. It is also consistent with the underlying Dutch cost evidence, which distinguishes between fixed, transaction-related and turnover-related costs.

Once the relevant cost benchmark has been identified, we use the number of card transactions to convert the estimated per-transaction cost difference into the aggregate merchant benefit. The maturity mapping determines the estimated resource saving per card transaction, while card transaction volumes determine how often this saving is realised.

We convert the Dutch merchant cost observations to comparable price levels before applying them in the model. Marginal cash and card costs are adjusted using the Dutch consumer price index. Historical estimates use the price level relevant to the year being modelled, while the 2024 and projected 2035 merchant results are expressed in 2024 euros.

A.3 CONSUMER VALUE ESTIMATES

We estimate consumer benefits from card payments through two resource-efficiency components and three wider welfare components:

- time saved through faster POS payments;
- time saved through fewer cash withdrawals;
- protection against fraudulent transactions;
- recovery of disputed payments through chargebacks; and
- convenience from holding less precautionary cash.

We exclude privacy and consumer fees from the quantitative estimate, two cost items included in the Deutsche Bundesbank study, because they cannot be applied robustly and consistently across the EU. We expect privacy valuations to be highly country-specific and therefore difficult to extrapolate from individual national studies. We also exclude payment fees because consumers do not directly observe them and generally perceive both cash and cards as free to use at the point of transaction. Existing evidence also suggests the differences in per-transaction fees are small in any case. For example, Sveriges Riksbank (2023) estimates per-transaction costs of EUR 0.07 for cash and EUR 0.08 for cards, and the Central Bank of Ireland (2013) estimates EUR 0.14 for both.[99]

A.3.1 Value of time

We value consumer time using the after-tax earnings of an average EU worker. For each historical year, we use annual net earnings for a full-time single worker without children earning the average wage and divide these by average annual working hours in the EU. Following the literature on the value of non-work time, we value leisure time at 75 per cent of the resulting after-tax hourly wage.[100]

Historical estimates use the value of time applicable in the relevant year. For the 2035 projection, we hold the 2024 value of time constant so that projected benefits remain expressed in 2024 euros.

A.3.2 Faster POS payments

[99] Deutsche Bundesbank (2025). Costs of Cash and Card Payments from a Consumer Perspective, Link; Sveriges Riksbank (2023). Cost of payments in Sweden, link; Norges Bank (2022). Costs in the Norwegian payment system 2020, link; Central Bank of Ireland, (2013). *The Usage, Cost and Pricing of Retail Payments in Ireland*, see link

[100] Goldszmidt et al. (2020), *The Value of Time in the United States*, NBER Working Paper No. 28208. Link; European Commission et al. (2023), *Labour Market and Wage Developments in Europe 2023*, Chapter 3. Link; Eurostat (2026), *Annual net earnings of a full-time single worker without children earning an average wage* (earn_nt_netft). Link

Card payments generate resource savings when they allow consumers to complete transactions more quickly than cash. Based on Norges Bank (2022), we assume an average transaction time of 14.7 seconds for cash, 14.6 seconds for a regular card payment and 7.8 seconds for a contactless card payment.[101] A contactless card transaction therefore saves 6.9 seconds relative to cash, while a regular card transaction saves 0.1 seconds.

For a given year, the estimate equals the sum of the following:

- POS time benefit contactless = card transactions × 6.9 seconds × value per second × share of contactless
- POS time benefit regular card = card transactions × 0.1 seconds × value per second × share of regular card

A.3.3 Fewer cash withdrawals

Greater card usage also saves consumers time by reducing the need to obtain cash. We estimate how many cash withdrawals consumers would have made if all POS transactions had instead been paid in cash. This counterfactual is based on the observed relationship between cash transactions and ATM withdrawals. The estimate of ATM withdrawal time is based on Norges Bank's estimate and is assumed to be constant over time and across EU countries.[102]

For a given year:

- Withdrawal ratio = actual ATM withdrawals / cash transactions
- Counterfactual withdrawals = withdrawal ratio × total POS transactions
- Avoided withdrawals = counterfactual withdrawals – actual withdrawals
- ATM benefit = avoided withdrawals × withdrawal time in seconds × value per second

ATM withdrawal only considers the time spent making the withdrawal. This does not include the time it takes to travel to and from an ATM to make the withdrawal.

A.3.4 Fraud protection

Fraud protection creates consumer value by reducing exposure to uncertain financial losses. We first estimate the expected financial loss avoided and consumers' preference for avoiding uncertain losses. We base the estimate on a fraud probability of 0.011 per cent per card transaction and an average transaction value of EUR 38.[103]

- Expected fraud loss = card transactions × average transaction value × fraud probability
- Fraud protection benefit = expected fraud loss × loss-aversion multiplier

We apply a loss-aversion multiplier of 2.25, based on Tversky and Kahneman (1992). In their study of prospect theory, they find that losses are weighted approximately 2.25 times as heavily as equivalent gains. We use this coefficient to capture that consumers value protection against an uncertain

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101 All payment time estimated based on Norges Bank (2022), *Costs in the Norwegian Payment System 2020*, Norges Bank Papers No. 3/2022. Link

102 Number of ATM withdrawals from European Central Bank (2026), *ATM cash withdrawals with cards issued by resident PSPs at terminals acquired by resident PSPs, EU, Annual* (PTT.A.B0.W2.W0.CW1.2.2221.N.PN). Link, ATM withdrawal times estimate based on Norges Bank (2022), *Costs in the Norwegian Payment System 2020*, Norges Bank Papers No. 3/2022. Link

103 EBA (2026), *Retail risk indicators*. Link; ECB (2026), *Card payments, sent, average value per card payment, EU, Half-yearly* (PAY.H.B0.W0.CP0.1._Z.N.EUR_R_PNT). Link

financial loss more highly than the expected monetary loss alone. Thus, the multiplier does not increase the estimated amount of fraud avoided but rather the additional consumer welfare associated with avoiding exposure to that risk.

For the 2035 projection, the average transaction value and fraud probability are held constant at their 2024 levels, so the projected increase reflects higher card transaction volumes rather than nominal price growth or an assumed change in fraud incidence.

A.3.5 Chargeback protection

Chargebacks create additional consumer value by providing a mechanism to recover qualifying disputed transactions. We value this protection by multiplying the estimated number of chargebacks by the average value of a card transaction.[104]

We do not apply an additional loss-aversion adjustment to chargebacks. The estimate therefore captures the value of the transaction recovered but not any additional welfare consumers may derive from avoiding uncertainty about whether the payment can be recovered.

For the 2035 projection, chargebacks are scaled with the projected number of card transactions, while the average transaction value is held constant at EUR 38 in 2024 prices.

A.3.6 Convenience from reduced cash holdings

Access to a payment card creates convenience by reducing the amount of precautionary cash that consumers need to hold. We apply the estimated convenience value per household of approximately EUR 35 from Lippi and Moracci (2026) to the number of households in the EU, that is, 203 million EU households.[105]

The estimate captures the value of reducing the precautionary cash buffer that households hold to avoid running out of cash. It is classified as a wider consumer welfare gain.

The projection holds the benefit constant on the basis that card ownership is already close to saturation: ECB surveys indicate average ownership of approximately 92–93 per cent in both 2016 and 2024. Further transaction growth therefore increases time, fraud and chargeback benefits but adds little to the convenience associated with having access to a card.

A.4 PROJECTING CARD USAGE TO 2035

A.4.1 Country-level card-share projections

We project the card share of POS payments for each Member State, separately by number and by value of transactions. The projection uses the observed relationship between a country's card share in 2016 and the annual growth in that share between 2016 and 2024; see Figure A.1. Countries with lower card shares in 2016 recorded faster growth.
For each country, we calculate observed growth as:

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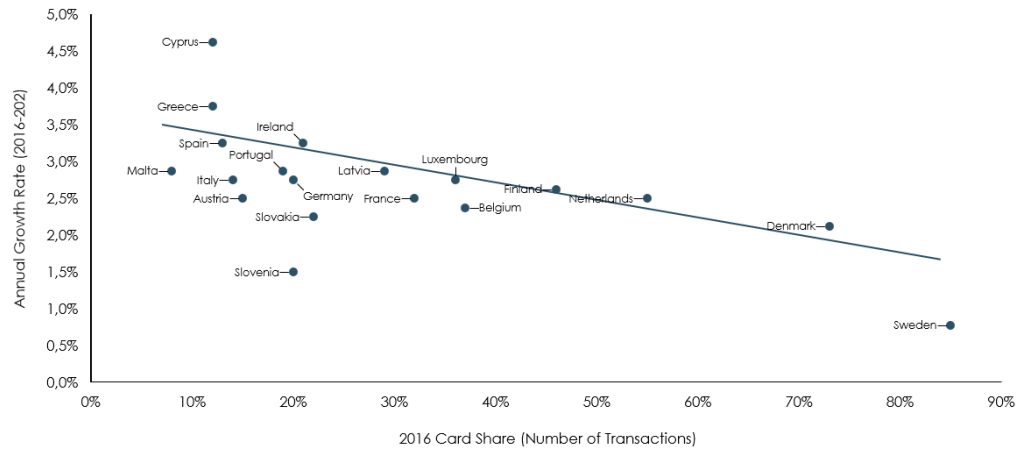
[104] Number of chargebacks in EU based on Mastercard (2025), *What's the true cost of a chargeback for businesses?* Link and average value of card payment based on: ECB (2026), *Card payments, sent, average value per card payment, EU, Half-yearly* (PAY.H.B0.W0.CP0.1._Z.N.EUR_R_PNT). Link

[105] Eurostat (2026), *Household composition statistics*. Link and Lippi and Moracci (2026), 'Cash or card? A structural model of payment choices', *Journal of Monetary Economics*. Link

Observed annual growth = (card share in 2024 – card share in 2016) / 8

Figure A.1 plots these two variables for the available EU Member States. The relationship is negative: countries with lower initial card usage generally recorded faster subsequent growth. This pattern indicates convergence across Member States and informs our projections to 2035.

Figure A.1
Countries with lower card share in 2016 have higher annual growth than countries with high card shares
Per cent



Note: Denmark and Sweden shares collected separately.
Source: Copenhagen Economics

We fit a linear trend across countries:

Observed annual growth = intercept + slope × card share in 2016

We then apply this trend to each country's 2024 card share. This gives each country a fixed annual increase in percentage points, which we add to the previous year's share from 2025 to 2035.

Annual increase = intercept + slope × card share in 2024
Card share in year t = card share in year t–1 + annual increase

The estimated intercept and slope by number are [0.0339] and [–0.0244], and by value are [0.0249] and [–0.0175].

For markets close to saturation, we cap the annual increase at Sweden's observed annual growth in card share between 2016 and 2024. The cap applies to Denmark and Sweden throughout the projection, and to other markets once their projected share approaches 90 per cent. The projection by number covers 20 Member States. The remaining Member States are excluded because comparable data are not available.

A.4.2 EU card shares

The EU card share by number is the population-weighted average of the country card shares:

EU card share = sum over countries of (population weight × country card share)

The EU card share by value is calculated in the same way, weighting each country by its share of total card payment value in 2024. The weights are held constant at their 2024 levels.

A.4.3 Total transaction volumes

The model reconstructs total POS transactions in 2024 from card transactions and the card share by number:

Total transactions = card transactions / card share

It assumes that total transaction volumes grow with EU economic activity at 1.5 per cent per year. The projection compounds this rate for eleven years:

Total transactions in 2035 = Total transactions in 2024 × (1.015)^11

The projected card transaction volume feeds the merchant, POS time, fraud and chargeback estimates. The cash transaction volume feeds the withdrawal projection.

Payment values are projected in the same way. Chargebacks and ATM withdrawals in 2035 are scaled with card and cash transactions respectively, holding their 2024 ratios constant. The projected card transactions feed the merchant, POS time, fraud and chargeback estimates. The projected cash transactions feed the withdrawal estimate.

A.5 VAT ESTIMATE

We estimate the VAT effect of card usage using an empirical relationship between card payments and VAT revenue identified by Hondroyiannis and Papaoikonomou (2020), who estimate a long-run elasticity of VAT revenue with respect to the share of private consumption paid by card of 0.1. This implies that a 10 per cent relative increase in the card share is associated with a 1 per cent increase in VAT revenue.

We estimate the **historical VAT effect** by applying the elasticity from Hondroyiannis and Papaoikonomou (2020) to the observed increase in card usage across the EU. Because the original study defines card usage as card payment value relative to private consumption, this measure differs from the POS card shares used elsewhere in the report.

We define:

- *s_2014* = card payment value in 2014 / private consumption in 2014
- *s_2024* = card payment value in 2024 / private consumption in 2024
- *e* = elasticity = 0.1; and
- *R_2024* = EU VAT revenue in 2024

The model calculates the VAT effect in 2024 as follows:

$$\text{VAT effect}_{2024} = R_{2024}\left[1 - \left(\frac{S_{2014}}{S_{2024}}\right)^{e}\right]$$

We recreate the card-share measure used in the original study using EU data on POS card payment values and household final consumption expenditure. On this basis, the share of private consumption paid by card increased from around 20 per cent in 2014 to around 23.5 per cent in 2024. Applying the estimated elasticity to this change gives an indicative estimate of around EUR 22 billion in additional annual VAT revenue associated with greater card usage by 2024.

The estimate is an indicative extrapolation. The underlying elasticity was estimated for euro-area countries over 2000–2016, while the application covers a later period and a broader EU country set. The model's card-share measure is also close to, but not identical to, the original study's variable. Private consumption includes items such as imputed rents that cannot normally be paid by card.

We estimate the **potential VAT effect of further card adoption** by applying the same empirical relationship to projected card usage through 2035. The projection uses the increase in card adoption developed in Section A.4 and holds the estimated relationship between card usage and VAT revenue constant. Thus, we scale the historical EUR 21.6 billion estimate by the ratio of the projected percentage-point increase in the POS card share by number to the historical percentage-point increase:

- Scaling factor = (projected EU 2035 card share - EU 2024 card share) / (EU 2024 card share - EU 2016 card share)

- Projected VAT effect = 2024 VAT result × scaling factor = 2035 VAT result

This result represents the additional annual VAT revenue associated with the projected increase in card use between 2024 and 2035, holding other factors constant. It should not be interpreted as a projection of the overall EU VAT Gap. Future VAT compliance will continue to depend on tax administration, enforcement, electronic invoicing, digital reporting, economic conditions, and other structural developments.

Table A.1 Overview of inputs

INPUT	CURRENT VALUE	MAIN SOURCE USED IN THE DRAFT
EU card transactions	35 billion in 2016; 69 billion in 2024	European Central Bank Data Portal (2026), 'POS transactions with cards issued by resident payment service providers at terminals acquired by resident payment service providers, EU, annual'. ECB Data Portal
EU POS card share by number	27 per cent in 2016; 48 per cent in 2024	European Central Bank (2017), *The use of cash by households in the euro area*, ECB Occasional Paper Series No. 201; European Central Bank (2024), *Study on the payment attitudes of consumers in the euro area 2024*; Worldpay (2026), *Global Payments Report 2026* for Denmark and Sweden. ECB 2017; ECB SPACE 2024; Worldpay Global Payments Report.
EU POS card share by value	Approximately 47 per cent in 2016; approximately 62 per cent in 2024	European Central Bank (2017), *The use of cash by households in the euro area*; European Central Bank (2024), *Study on the payment attitudes of consumers in the euro area 2024*; Worldpay (2026), *Global Payments Report 2026* for Denmark and Sweden. ECB 2017; ECB SPACE 2024; Worldpay Global Payments Report.
Average card transaction value	EUR 38	European Central Bank Data Portal (n.d.), 'Card payments, sent, average value per card payment, EU'. ECB Data Portal
Payment time	14.7 seconds for cash; 14.6 seconds for regular card, 7.8 seconds for contactless card; 0.1 to 6.9-second saving	Norges Bank (2022), *Costs in the Norwegian payment system 2020*, Norges Bank Papers No. 3/2022. Norges Bank
Time per cash withdrawal	51.6 seconds, excluding travel and waiting time	Norges Bank (2022), *Costs in the Norwegian payment system 2020*, Norges Bank Papers No. 3/2022. Norges Bank
Value of non-work time	75 per cent of after-tax mean wage; EUR 11.9 per hour in 2024	Eurostat, 'Annual net earnings of a full-time single worker without children earning an average wage' ; Goldszmidt, A., List, J.A., Metcalfe, R.D., Muir, I., Smith, V.K. and Wang, J. (2020), *The Value of Time in the United States: Estimates from Nationwide Natural Field Experiments*, NBER Working Paper No. 28208. Eurostat; Goldszmidt et al..
Working hours in EU	1,600 hours	European Commission, Directorate-General for Employment, Social Affairs and Inclusion (2023), *Labour Market and Wage Developments in Europe 2023*. European Commission
Fraud rate	0.011 per cent per card transaction	European Banking Authority (n.d.), *Retail Risk Indicators*, Figure 83. EBA
Loss-aversion multiplier	2.25	Tversky, A. and Kahneman, D. (1992), 'Advances in prospect theory: Cumulative representation of uncertainty', *Journal of Risk and Uncertainty*, 5, pp. 297–323. DOI
Chargebacks	23.9 million in the base year	Mastercard (2025), 'What's the true cost of a chargeback for businesses?' Mastercard
Convenience value	EUR 35 per household; 203 million households	Lippi, F. and Moracci, E. (2026), 'Cash or card? A structural model of payment choices', *Journal of Monetary Economics*, 159, 103930; Eurostat (2026), *Household composition statistics – Statistics Explained*. Lippi and Moracci; Eurostat
Merchant marginal costs	Dutch recurring merchant cost surveys, 2006–2023	Panteia/Payments Association Netherlands series
VAT elasticity	0.1	Hondroyiannis, G. and Papaoikonomou, D. (2020), 'The effect of card payments on VAT revenue in the euro area: evidence from a panel VECM', *Journal of Economic Studies*, 47(6), pp. 1281–1306. DOI
Total transaction growth	1.5 per cent per year from 2024 to 2035	Copenhagen Economics assumption, informed by European Commission (2026), *Spring 2026 Economic Forecast*. European Commission