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"Affordability of Cash – From Stocktaking to Why and How"

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Affordability of Cash – From Stocktaking to Why and How*

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Abstract:

This paper analyzes the affordability of cash in an international context. After outlining why cash should remain a core component of a diversified payment mix within a resilient and efficient payment system, we discuss methodological challenges associated with measuring the costs of payment instruments and explain why consumers should ultimately be at the center of the analysis. The paper then reviews the existing literature on the costs of payment instruments and subsequently traces the cost structure across the entire cash cycle—from printers and mints to central banks, cash-in-transit companies, commercial banks, ATM operators, and merchants. Finally, we examine the regulatory frameworks, including cash usage limits and reporting requirements, and analyze their implications for cash demand and the sustainability of cash infrastructure. Building on these findings, the paper derives policy implications and practical recommendations for regulators and cash-cycle participants, emphasizing the need to keep cash affordable.

JEL: E41, E51, E58, O57

Keywords: Cash, payments, costs, cash cycle, affordability

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Table of Content

1. Introduction

As payment technologies evolve, the landscape has become increasingly diverse, encompassing cash, debit and credit cards, mobile payments, and emerging digital currencies. While each payment instrument offers distinct benefits, they also entail different costs for providers and ultimately for consumers. Understanding these costs and benefits is crucial for designing a resilient, efficient, and inclusive payment system. The present paper examines the role of cash within a diversified payment mix, with particular focus on its affordability. Unlike other payment instruments, cash provides unique advantages: inter alia, it ensures universal payments access, protects privacy, supports financial inclusion, and acts as a stabilizing force in times of economic or technological disruption. Maintaining a robust cash infrastructure is therefore not only a matter of convenience, but also of economic resilience. However, for these benefits to materialize, cash has to be affordable.

Our analysis begins by explaining why an efficient payment mix requires cash (the use cases of cash), emphasizing the concept of "institution cash" as a public good, and why the consumer should ultimately be the focus. Given that consumers base their choice of payment instruments on a cost–benefit analysis of all available payment options, Chapter 3 offers a comprehensive and critical review of the literature on payment costs for consumers, distinguishing between monetary and non-monetary costs. Chapter 4 then examines the costs associated with cash along the entire cash cycle—from printers and mints, central banks, cash-in-transit (CIT) companies, and commercial banks to ATM operators and merchants—and investigates how these costs ultimately affect affordability for consumers. Finally, Chapter 5 discusses policy implications and practical recommendations for central banks, other cash-cycle participants, and regulators as well as governments, presenting a "Playbook" for safeguarding the cash infrastructure. Chapter 6 summarizes and concludes.

2. Why the consumer is decisive and an efficient payment-mix needs cash

As pointed out by Rösl & Seitz (2022a) cash contributes to stabilizing the economy in times of crisis better than any other means of payment due to its unique characteristics. Therefore, empirical studies confirm that cash demand rises during periods of heightened uncertainty, regardless of the specific type of crisis (Faella & Zamora-Pérez, 2025; Bartzsch et al., 2025;

Rösl & Seitz, 2024; Deutsche Bundesbank, 2024a; Judson, 2024; Beckmann & Zamora-Pérez, 2023). The nature of the crisis, however, shapes the demand for specific denominations: when cashless systems are disrupted—due, for example, to cyber-attacks, power outages, or natural disasters—demand primarily rises for lower denominations to maintain transactional capacity. In contrast, during confidence-related crises, such as financial instability or political uncertainty, demand increases mainly for higher denominations, reflecting a preference for cash as a liquid store of value. In this context, central banks can enhance resilience by ensuring a fully elastic supply of cash (Rösl & Seitz, 2022a). Nevertheless, the stabilizing role of cash can only fully materialize if it remains widely used, easily accessible, generally accepted and available in all denominations in normal times (Clipal & Zamora-Pérez, 2025). A robust and resilient cash infrastructure is also essential to ensure a well-functioning cash cycle that can respond swiftly to surges in demand (Rösl & Seitz, 2025).

Therefore, a cashless economy entails a substantial societal cost: reduced resilience during crises. Maintaining sufficient cash in circulation mitigates this risk. In this sense, cash acts like an insurance.[1] Crucially, this "resilience service" in times of turmoil is non-excludable—consumers who previously paid cashless cannot be excluded from using cash in times of crisis—and non-rival—if one consumer benefits from the resilience service provided by cash in times of crisis, the resulting increase in payment security is not at the expense of other individuals. On the contrary, the greater the availability of cash to individuals during a crisis, the higher the overall resilience of the payment system. Thus, the provision of the "resilience service" of cash in times of crisis constitutes a public good in the strict economic sense.[2] Consequently, assigning central banks the responsibility of safeguarding a stable cash cycle is strongly based on economic theory.

However, cash offers multiple economic and societal advantages that extend far beyond its role in stabilizing in times of crisis (Krüger & Seitz, 2017). Therefore, a multitude of use cases for cash exist. For instance, Rösl & Seitz (2025) emphasize that cash ensures universal accessibility, as it can be used in principle without bank accounts and does not necessarily need a digital infrastructure, thereby supporting financial (payments) inclusion and broad participation in economic life. It also protects privacy since transactions do not generate

[1] For a general discussion of money services, see, for instance, Rösl (2024).
[2] This argument provides an example of the often-mentioned public good characteristics of the "institution cash", see, for instance, Labat et al. (2024); ECB (2023b, 3); Beretta & Neuberger (2021).

electronic data trails (Kahn, 2018). One might argue that cryptocurrencies also offer an anonymous digital payment solution for consumers. In such systems, however, transaction data are inherently transparent, while only the payment addresses are cryptographically obscured. If an address is decoded and attributed to a particular holder, the complete history of transactions sent to or from that address becomes publicly accessible to any interested party, even to people who do not participate in the cryptocurrency network. Consequently, these systems are more accurately described as "pseudonymous" rather than anonymous (Rösl & Seitz, 2022a). Another important feature of cash is that it functions independently of private intermediaries which reduces transaction costs (Schreft, 1992). Moreover, cash provides transparency and simplicity in everyday transactions, allowing consumers to monitor spending and manage budgets effectively (Deutsche Bundesbank, 2024b; Esselink & Hernández, 2017, Bagnall et al., 2016) and, hence, stabilizes the financial system (Hall et al., 2022). In addition, ATMIA (2017) notes that cash is particularly important in promoting access to financial services for unbanked and underserved populations. Cash further imposes natural discipline on payment systems by limiting fees and the pricing power of retail payment providers, offering a low-cost alternative to electronic payments (Hung et al., 2025). Last but not least, cash as part of a payment mix increases the welfare of the society by helping citizens to safeguard their monetary savings against negative interest rates (Rösl et al., 2019).

In summary, cash is not only a fallback solution in times of crisis but should be seen as a necessary part of an efficient payment mix in normal times. Therefore, cash should be sufficiently provided and supported by public institutions. In addition, it should be generally accepted by merchants to secure a stable and resilient cash cycle.

While using cash at the point of sale should not be mandatory for consumers, it should nonetheless be available as a convenient and cost-effective payment option. For cash to compete with digital payment instruments, however, it needs to remain affordable, as consumers' choices ultimately depend on the relative cost–benefit ratio of the available means of payment. It is finally the consumer who bears the costs of payment instruments, whether directly through fees and charges or indirectly through higher product prices.[3] Over time, consumer usage behavior plays a decisive role in shaping which payment instruments remain viable within the market. In the very end, it is the consumer who determines which

[3] However, in a case study on the benefits and costs of cash, the Reserve Bank of New Zealand (2021) finds that New Zealanders prefer the funding of the cash system primarily through banks or the taxpayer, not the user.

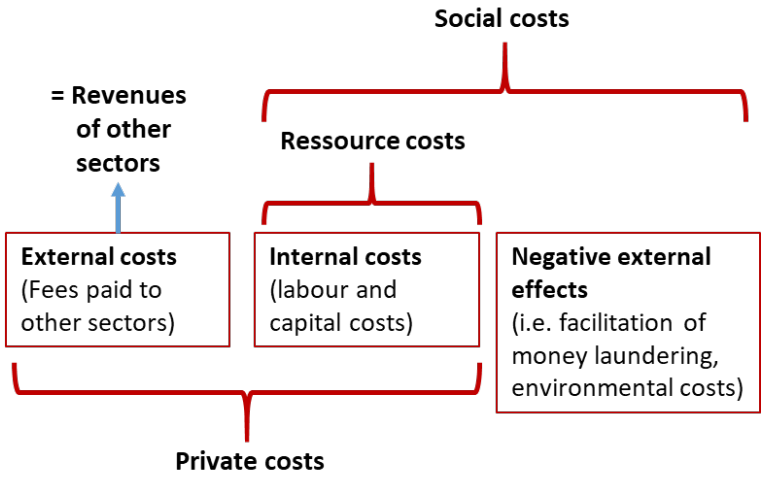
payment instruments are available in an economy within a given legal framework and institutional setting.

3. Measuring the cost of cash for consumers – a literature review

In what follows we review and assess international studies on the costs of cash (payments). However, it makes no sense to only look at cash costs and discard the costs of substitutes (card payments). Therefore, cash and cashless payments together are taken on board to classify and benchmark the results. For comparison reasons, different metrics are calculated on a consistent basis.

As a first step, it is necessary to clarify the cost concepts used in the different investigations (see Figure 1). Social costs include the internal costs of the individual sectors (the resource expenditure) and the negative external effects. The latter are usually not taken into account in cost studies, which means that in these cases "resource costs" correspond to "social costs". At the sectoral level, in addition to the internal costs of a sector (resource costs), there are also external costs, both making up the private costs. From a sectoral (in our case the consumer) perspective, the private costs are the essential ones on which we focus in the following sections.[4]

Figure 1: Different cost concepts



Source: Krüger & Seitz (2025, 4).

[4] There are convincing reasons why this cost concept should also be at the center of macroeconomic analyses.

Table 1 provides an overview of the costs of cash, debit cards and credit cards relevant to consumers. There are monetary and non-monetary costs. The monetary costs include regular and occasion-related fees, as well as financial losses due to the loss of a means of payment or fraud. Non-monetary costs typically refer to opportunity costs of time, but also costs incurred by consumers through data disclosure. The latter are becoming increasingly important as consumers often "pay" for digital payment services with their personal data rather than with explicit fees.[5] Summing-up, all these (monetary and non-monetary) costs represent the private costs of consumers. They are essential for individual decisions.

Table 1: Costs of payment transactions from a consumer perspective

			Cash	Debit card	Credit card
Monetary costs	a	Account fees	x[3]	x[3]	x[3]
	b	Card fees	x[4]	x	x
	c	ATM fees	x		
	d	Transaction fees		x	x
	e	Surcharge[5]	x	x	x
	f	Custody fees	x		
	g	Interest foregone/opportunity costs	x[1]	x[2]	
	h	Theft/fraud	x	x	x
Non-monetary costs	i	Payment time	x	x	x
	j	Time to acquire cash	x		
	k	Checking of account statement	x	x	x
	l	Data disclosure, giving up anonymity		x	x
	m	Negative externalities[6]	x	x	x

Source: Knümann et al. (2025).

Notes: "x": costs incurred in principle 1) Corresponds to the income from (opportunity cost) seigniorage from the central bank's perspective. 2) Debit cards are linked to a current account, on which non-interest-bearing balances are often held, so that seigniorage is incurred by commercial banks. 3) Both the use of a card and access to cash are usually linked to holding a current account. It therefore makes sense to allocate the costs of a current account to both "cash access" and "card payments". 4) In many countries, cash is usually withdrawn using a card. Therefore, card fees are also partly costs of cash withdrawals. 5) Surcharges for card payments that fall under EU Regulation (2015/751) on interchange fees have been prohibited in the EU since 2018 in accordance with the PSD2. In Germany, this is codified in Section 270a BGB. However, discounts depending on the means of payment are permitted. 6) In addition to the valuation problem, there is also an assignment problem on the consumer side.

Besides explicit, also implicit costs from other sectors can be relevant for consumers (not included in Table 1). This is the case when costs are passed on to consumers by retailers and banks, thereby increasing product prices. For example, restrictions on interchange fees

[5] In Germany, this form of payment has been legally equivalent to a regular payment in the BGB (Sections 312 (1a), 327 (3)) since 2022 with the implementation of the European Directive on Digital Content and Services.

between acquirers and card issuers may trigger an increase of card fees for consumers. It is also conceivable that merchants pass on increased costs of a specific payment method to product prices, no matter which payment medium is used, if surcharging is not allowed. In addition, there are several challenges in determining the costs of payments, especially of cash:

A key element in this context is time-related costs, which arise from activities such as withdrawing cash, making payments, and verifying payment receipts or account statements. These time requirements must be identified and assigned a value. In studies, the results vary substantially depending on which types of time costs are considered, how time usage is measured, and how time valuation is carried out. For instance, Knümann et al. (2025) account for all possible variants of time costs, whereas Carbo-Valverde & Rodriguez-Fernandez (2019) limit their analysis to the time taken for payments using non-cash instruments—in their case, debit cards. Recording and valuing time expenditures is far from straightforward, as illustrated by the example of withdrawing cash from an ATM. At first glance, it appears reasonable to measure the time it takes to get to the ATM and assign a price to this in terms of opportunity costs. Many studies follow this approach (Krüger & Seitz, 2025, 15f). In such cases, the time spent on each withdrawal is multiplied by a "representative" hourly wage and by the annual number of ATM withdrawals. However, this raises the question of whether consumers can in practice freely choose between spending additional time at work and making a payment. In many situations, the relevant opportunity cost may instead be the value of leisure time. Moreover, the value of time is not constant. Unlike money, time cannot be transferred or stored; periods of unexpected waiting, for example, typically cannot be used to earn income at one's usual hourly rate. For these reasons, studies often assign only a fraction of the hourly wage as the appropriate opportunity cost of time (see, e.g., Knümann et al., 2025). It is also often observed that consumers simply withdraw cash if they are on their way anyway (so-called trip-chaining) which makes it even more complicated to calculate the time-costs of accessing cash appropriately.

However, revealed preferences indicated by the frequency of ATM visits in many cases and countries show that consumers apparently do not consider the (opportunity) costs of ATM withdrawal to be too severe. Therefore, some authors follow a model-led approach, e.g. based on the Baumol-Tobin model (see, for instance, Mishkin, 2021, ch. 20), to determine the cost per cash withdrawal from the number of ATM transactions per person and an interest rate (opportunity cost of holding cash), see e.g. Carbo-Valverde & Rodriguez-Fernandez (2019). A

major problem with this approach is estimating the opportunity cost of holding cash, i.e. should a credit or debit interest rate be applied?

On balance, the representative-wage approach leads to significantly higher costs (sometimes by a factor of 100) than the opportunity-cost approach (see Knümann et al., 2025, 30ff). Accordingly, the time costs dominate the total cash costs for consumers in the former case, whereas they are negligible in the latter. This complicates the overall assessment of how significant time-related costs of payment instruments are.

Significant uncertainties also arise when calculating fees attributed to different payment methods. The core difficulty is that accessing and depositing banknotes and coins is closely tied to the current account, as most customers use their payment cards to obtain cash. This raises the question of how account and card fees should be allocated. At least a portion of these costs should be attributed to cash usage, but any such allocation is inherently arbitrary. For credit cards, explicit annual fees typically exist, making their assignment more straightforward. Debit cards, however, often do not carry separate fees, meaning that part of the general account fees must be allocated to cash-related activities (see, e.g., Knümann et al., 2025, ch. 3.2.1; Carbo-Valverde & Rodriguez-Fernandez, 2019).

Data protection and, hence, protection of privacy is a particular benefit of cash. Conversely, from a conceptual point of view, data collection represents a cost of cashless payment instruments. This cost item is getting increasingly important, yet quantifying is extremely difficult. Knümann et al. (2025, section 3.2.4) is the first detailed study on this subject. They find that the costs of data disclosure account for almost 60% of the total costs for debit cards and around one third for credit cards.

Felt et al. (2021) estimate the net private costs incurred by consumers in the United States and Canada when using cash, credit cards, and debit cards, differentiated by income group. Their findings reveal that credit card transactions are effectively cross-subsidized by lower-cost payment instruments such as debit cards and cash. The largest cost component for consumers stems from the non-transparent pass-through of payment-instrument costs into retail prices. When assessed relative to transaction value, consumers in the lowest income bracket bear the highest net costs, whereas those in the highest income group face the lowest. Consequently, the pricing structures of payment instruments—and the way payment-related

costs are incorporated into (payment-method-independent) sales prices—lead to regressive distributional effects.

One often neglected cost aspect is negative external effects, such as the impact of the use of means of payment on crime or environmental costs. However, it is very difficult to attribute these to individual sectors, especially consumers. Nonetheless, several studies have examined the environmental costs, or ecological footprint, of cash in recent years (see for an overview Krüger & Seitz, 2025, ch. 5). The most significant environmental impacts stem from the operational phase, particularly the energy consumption of ATMs and the transportation of cash as well as from coin production. To assess these costs in a meaningful way, they must be compared with those of close substitutes such as debit cards. However, all respective studies on environmental costs of payment instruments confirm that they are extremely small relative to the total environmental burden generated by the production of goods and services. Using a life-cycle assessment, for example, the ECB (2023a) estimates that the environmental footprint of cash corresponds to the emissions produced by driving a car approximately 8 km per inhabitant—equivalent to just 0.01% of the overall environmental impact.

Extending the scope on payment costs further, some papers (e.g. the international study by Carbo-Valverde & Rodriguez-Fernandez, 2020) also integrate (broadly defined) costs arising from crime and fraud (see Krüger & Seitz, 2025, 22f). As a rule, these costs are only calculated in total but not attributed to individual participants in the payment process. The most comprehensive study on fraud costs, both in terms of the types of costs covered and countries included (52 countries worldwide, see fn 6), is Carbo-Valverde & Rodriguez-Fernandez (2020). Their study covers the years 2014-2018 (with a forecast until 2025) and compares cash with debit and credit cards. The authors find a significant shift from cash fraud to card fraud in their sample period. Cash use in shadow economy activities has decreased significantly and accounted for less than 25% of the estimated volume in the 52 countries surveyed. The illegal economy linked to cash is particularly low in North America and Europe and larger in Central and South America, Asia-Pacific and especially in Africa. Germany, together with Switzerland, Austria and Australia, has the lowest figures. Interestingly, this share has increased in countries with low levels of cash usage (Sweden, Norway). On the other hand, card fraud

typically increases with card use. In particular, card-not-present fraud has grown exceptionally in the last years.[6]

To sum up, the following factors make an international comparison of payments costs challenging:

- integrating different monetary and non-monetary cost concepts,
- measuring the intensity of use of payment instruments,
- estimating the volume of unobserved cash transactions (retail, P2P),[7]
- legal regulations (e.g. on no-surcharge, interchange fees) and competition on the payment transaction markets,
- the recording and evaluation of time (for instance, to access payment instruments),
- measuring opportunity costs of means of payment by representative interest rates.

Not surprisingly, empirical cost studies usually include only a subset of all possible cost categories in Table 1, often due to data limitations. Nonetheless, we summarize the results of all cost studies published since the end of the 1990s that explicitly refer to consumers. Thereby, we draw heavily on Krüger & Seitz (2025) who analyse 13 countries (Australia, Belgium, Denmark, Germany, Hungary, Norway, Poland, South Africa, Sweden, Switzerland, Canada, USA, Uruguay) in total. In addition, we also report on a multi-country (although less-detailed) study with 52 countries from all continents conducted by Carbo-Valverde & Rodriguez-Fernandez (2019). For comparison reasons, the calculations refer to different metrics: share of costs in total payment costs, costs relative to GDP, costs per transaction (in €) and costs as a percentage of transaction value.

As figures 2-4 show (sorted by the amount of cash costs), the findings of the different individual studies vary significantly from study to study and country to country, regardless of the indicator used. The wide range of cost dispersion is also striking, even for estimates for single countries (see Australia, Denmark, Norway, Switzerland).[8] There is no uniform picture regarding the relative costs of the three payment instruments. Consequently, it is very difficult

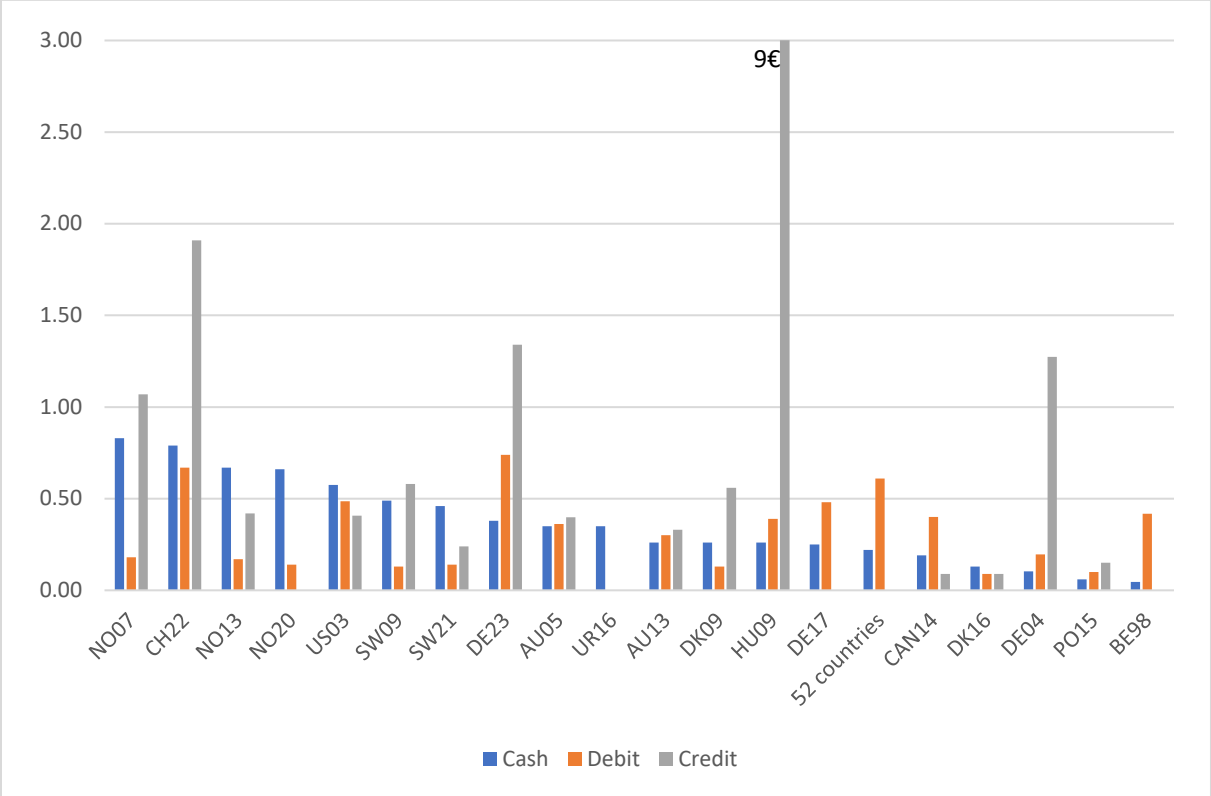
[6] In contrast to card-present transactions (at ATMs and POS terminals), card-not-present transactions occur when a customer does not physically present his payment card to a merchant, e.g. during online, phone, or mail-order purchases.

[7] Determining the cash share of transactions used in a country is particularly important when cash is not only used for domestic transactions but is also demanded for other reasons (e.g. store of value and precautionary motives) and held abroad. The latter is particularly relevant for the US dollar, the euro and the Swiss franc.

[8] Cash accounts for between 14 % (Norway) and up to 80 % (Uruguay) of consumers' total means of payment costs (Krüger & Seitz, 2025, Table 1A).

to transfer results from one country to another. However, looking at the private payment costs over time and country, there seems to be a downward trend.

Figure 2: Private costs per transaction (in euros)



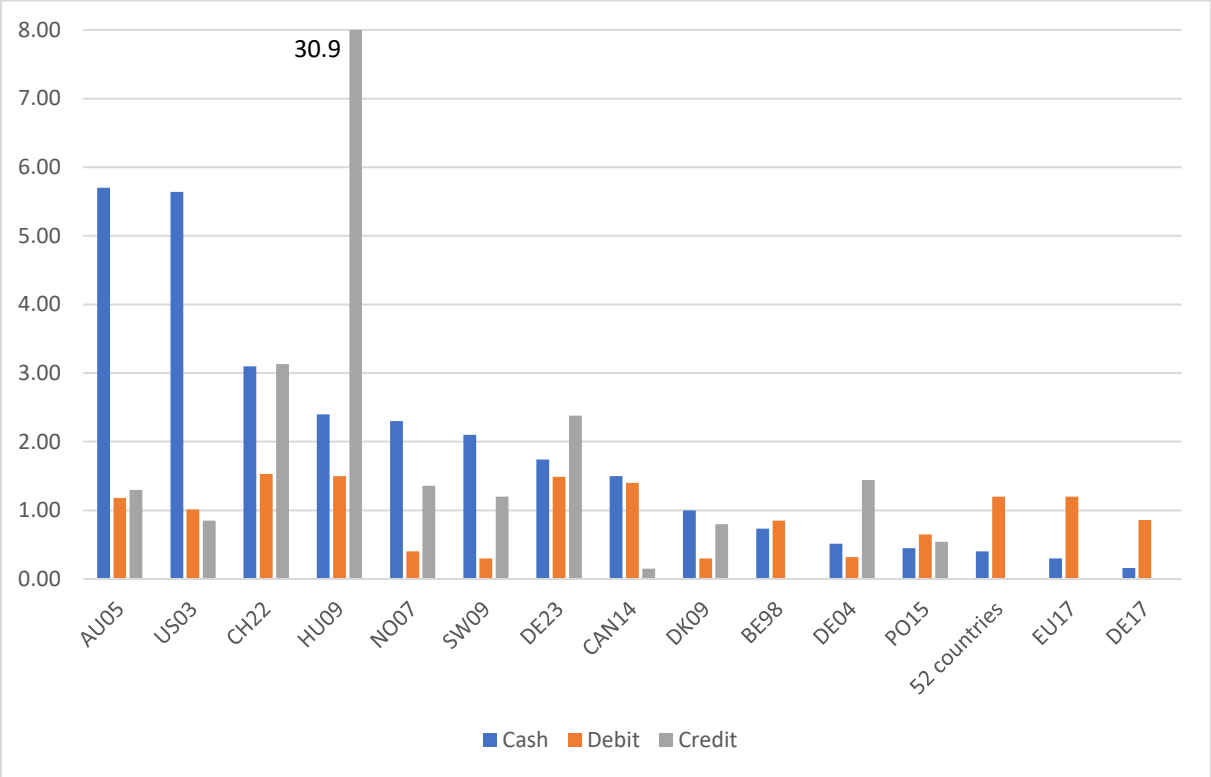
Source: Krüger & Seitz (2025, 9).

Notes: The abbreviation refers to the country (NO: Norway, CH: Switzerland, US: USA, SW: Sweden, DE: Germany, AU: Australia, DK: Denmark, HU: Hungary, CAN: Canada, PO: Poland, BE: Belgium, SA: South Africa, UR: Uruguay), the number to the year of the investigation. DE17 from multi-country study (refers to ATM transactions); DK09/DKeCom: POS/distance selling; US03 (AU05): for selected transaction amounts: Cash $10 ($11), card $50 ($54). Conversion to € using the average exchange rate for the year of the study.

Usually, there is the widespread notion that card payments are cheaper than cash if the respective payment costs are calculated relative to the transaction value since cash is frequently used for low value payments and cards for larger transactions. As shown by figure 3, however, this preconception does also not hold the empirical test on a global level.

In contrast, there is a huge variety in payment instruments costs among countries even if private payment instrument costs are weighted by nominal GDP (see figure 4).

Figure 3: Private costs as a percentage of the transaction amount



Source: Krüger & Seitz (2025, 11).

Notes: See note to Figure 2.

In their multi-country study with countries from every continent, Carbo-Valverde & Rodriguez-Fernandez (2019) compare the costs of cash and debit cards.[9] They also find huge cost differences. The lowest cash costs for consumers can be found in Europe, Africa and the Asia-Pacific region, while the highest costs are in North, Central and South America. No such clustering can be observed for debit cards. Here, high costs are found in the USA, Sweden, Poland and Russia. However, for all countries included cash seems to be generally cheaper than debit cards and the payment instrument costs are driven by fees.

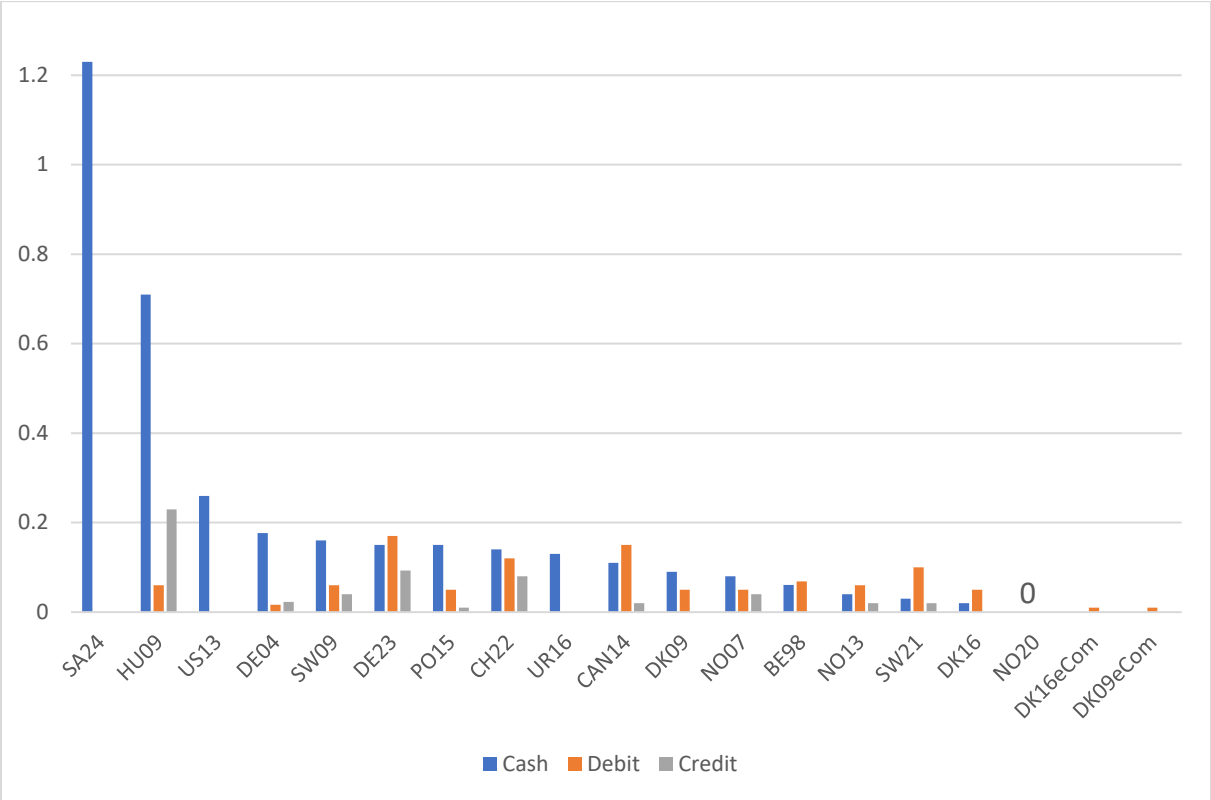
From a regional perspective, Carbo-Valverde & Rodriguez-Fernandez (2019) also provide some insights in the payment costs structure of African (South Africa, Nigeria, Egypt, Morocco, Zambia, Mozambique)[10] and Asian countries (Japan, India, China, Malaysia, Thailand, Hong Kong, South Korea, Russia). In Africa and on average, both the cost of cash and debit cards (as

[9] The countries included are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom; United States, Canada; Brazil, Mexico, Colombia, Chile, Argentina; Australia, Japan, India, China, Malaysia, Thailand, Hong Kong, South Korea, Russia, South Africa, Nigeria, Egypt, Morocco, Zambia, Mozambique.

[10] In the individual country cost studies, only South Africa is included (see Figure 4). Due to high costs of access and time, South Africa has the highest costs for consumers relative to GDP (South African Reserve Bank, 2025).

% of the transaction amount) for consumers are lower compared to global average, but the latter is around 25% higher than the former. On an individual country level, in Nigeria, Zambia and Mozambique the costs of debit cards are lower than cash costs. The lowest cost of cash is present in Egypt, the highest in Zambia. ATM fees represent the largest share of cost of cash for consumers (about 70%). But time costs in the form of travelling (30%) are very important in the African countries, too. In the Asian countries considered, the costs of debit cards for consumers are more than three times higher than those of cash. ATM fees exhibit the highest cost share followed by travelling costs. In three out of our eight countries costs of debit cards are lower than those of cash (India, Thailand, Hong Kong).

Figure 4: Private costs as a percentage of GDP



Source: Krüger & Seitz (2025, 13), South African Reserve Bank (2025).

Notes: See note to Figure 2.

Unit costs in European countries in Carbo-Valverde & Rodriguez-Fernandez (2019) are in line with the global average of the 52 countries. However, the differences between the two payment instruments are more significant, with those of debit cards being 3 times larger than the costs of cash. The lowest cost of cash is present in Austria, the largest in Ireland, the only European country considered (out of 30) where it exceeds the cost of debit cards.

If a distinction is made between fixed and variable costs, cost functions for payment media can be estimated as a function of the transaction value. A significant part of the costs of non-cash payment media is fixed (neither transaction- nor value-dependent), as it is generally related to the development of the infrastructure or in many cases does not depend on (the number and value of) transactions at consumer level. In contrast, cash incurs relatively high variable costs on the consumer side, but rather low fixed costs. Therefore, the relative advantage of cash seems to decrease with the transaction amount.

To sum up, the analysis showed that there is no clear ranking of costs and great heterogeneity in the results – both on a country (group) level and on a global scale.

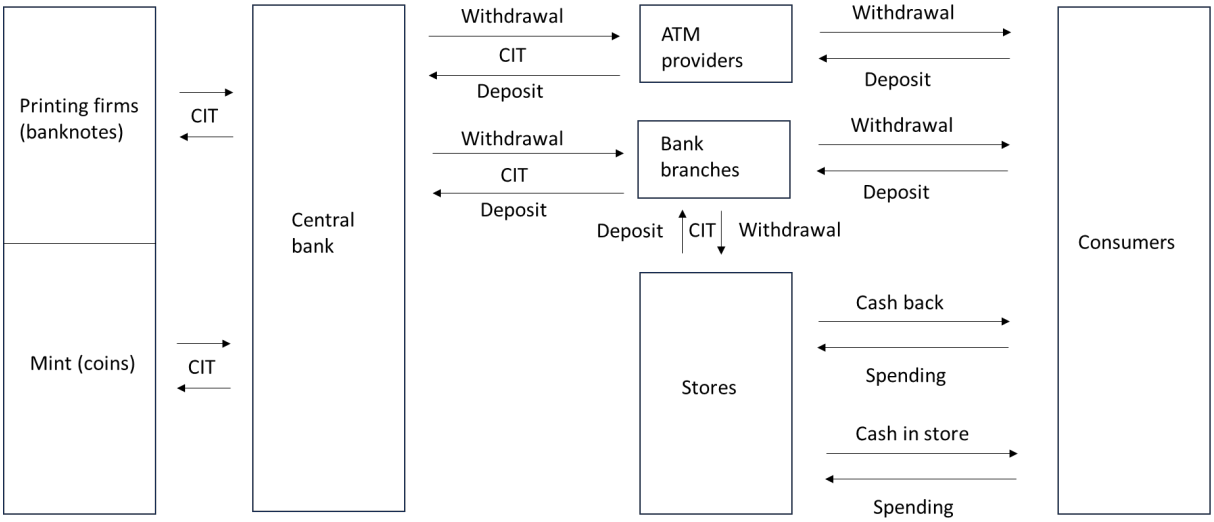
4. Ensuring affordability of cash

As we focus in this chapter on cash as a necessary ingredient of an efficient payment-mix for society, we structure our analysis by first addressing crucial cost factors along the cash cycle and then discussing government regulations on cash usage to change these costs.[11]

4.1. The costs of cash along the cash cycle

Figure 5 highlights in a stylized way that cash-related costs are not concentrated in a single segment of the cash cycle but arise along multiple stages, reflecting the complex infrastructure required to ensure the availability of cash.

Figure 5: A stylized cash cycle



Source: Rösl & Seitz (2025,15)

[11] The SARB (2025) follows a similar approach in its three Cash Smart Strategy pillars: Address the cost of cash; expand cash accessibility; strengthen cash regulation.

The first cost category is printing and minting costs which incur at the upstream stages of the cash cycle followed by the logistics costs of transporting cash to the central bank by CIT companies. At the central bank, cash-related costs arise from ensuring an adequate supply of high-quality banknotes in circulation while minimizing—ideally eliminating—the number of counterfeit notes. Additionally, there are staff, logistics and IT costs. Downstream the cash cycle, costs are incurred to deliver cash to commercial bank branches and independent ATM providers, ensuring public access for withdrawals and deposits. Once being in circulation in a narrow sense, cash is spent by consumers and is given (partly) back by merchants as change. Moreover, in developed countries, it has become common for stores to offer 'cash back' or 'cash-in-store' services, effectively making them new participants in the cash cycle.

Ultimately, all cash-related costs are passed on to consumers, as ATM operators, commercial banks, and stores offering cash services recover their expenses through fees or, indirectly, higher prices—just as with other payment methods like credit cards, debit cards, or mobile payments. Of course, consumers ultimately also bear the central bank's cash-related costs by foregone seigniorage. However, as for the central bank cash is a profitable business, seigniorage profits are usually positive.

4.1.1. Central banks and the costs of cash

In accounting terms, governments and central banks finance their coin minting and banknote printing expenses by themselves. The logistics costs of distributing cash via CIT services, however, are typically passed on to ATM operators and banks, who, in turn, recover these expenses from their customers through fees and charges.

When commercial banks are responsible for putting cash into circulation, a structural conflict of interest arises. Because banks issue their own book money, which competes directly with cash in the payments market, they face an inherent incentive to substitute cash with cashless payment instruments. As documented by Rösl & Seitz (2025,10), there is empirical evidence that banks in the European Union have, at least to some extent, steered customers toward cashless payment systems—for example by actively promoting payment cards while simultaneously dismantling ATM networks. Consequently, cashless payments expanded while cash-based transactions declined, reinforcing a downward spiral in cash usage. Consequently, costs for using and accessing cash increased.

4.1.2. Cash transportation costs of CITs

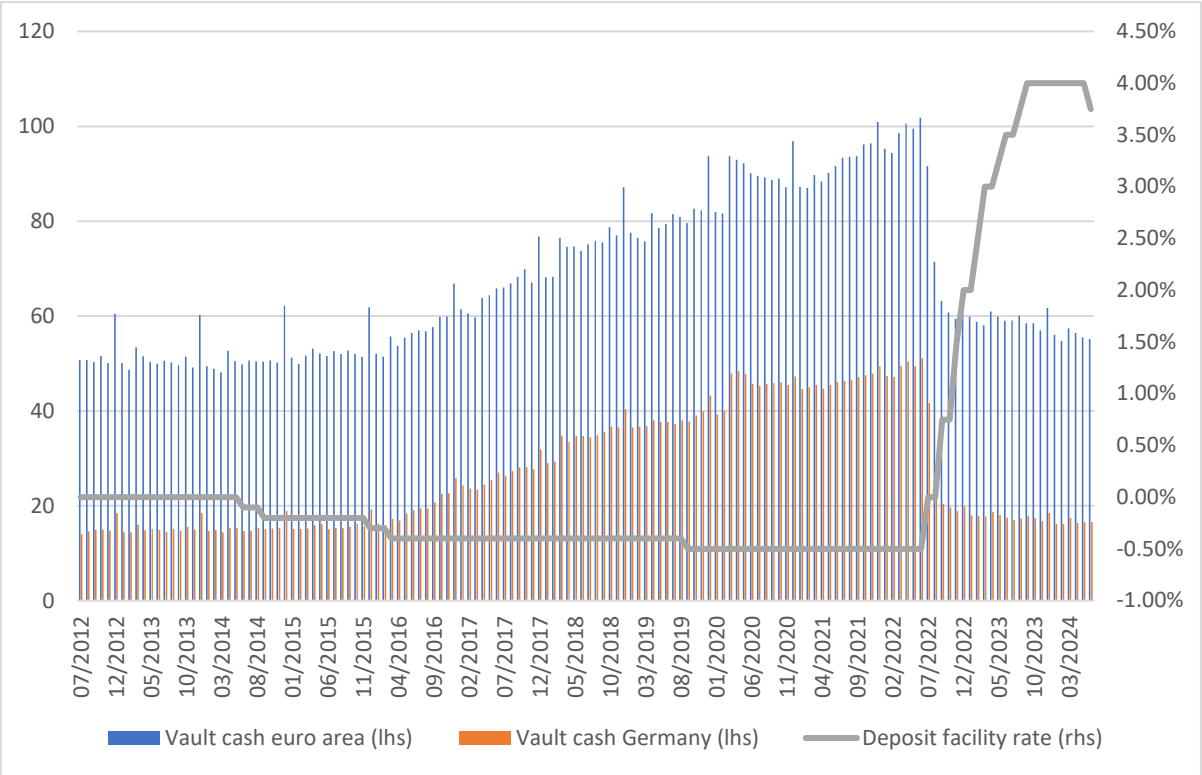
In 2024, the market share of CIT companies in the cash logistics market amounted to 47%.[12] CIT transportation costs should be low to keep cash as an attractive means of payment. However, both globally and even within the euro area, national cash markets remain highly segmented. For instance, a German bank near the Austrian border with excess cash cannot simply sell it to an Austrian bank; instead, the German bank deposits cash at a Bundesbank branch, while the Austrian bank obtains new banknotes and coins from the Oesterreichische Nationalbank (OeNB).[13] This fragmentation largely reflects divergent national security regulations. Consequently, competition intensity in the national cash logistics market among euro area member states is heterogeneous. Although industry reports (e.g., KingsResearch, 2023; Grand View Research, 2022) compare selected national CIT markets on general grounds, no comprehensive cross-country research study on competition in the cash logistics markets exists.

Therefore, we adopt an indirect approach to assess the competition intensity in the cash logistics market across European countries.[14] The rationale is as follows: During the period of negative deposit rates of the Eurosystem from June 2014 – June 2022, banks faced interest income losses that could have been avoided by withdrawing cash from their national central banks (NCBs). However, this only makes sense if logistics costs of acquiring cash were sufficiently low. Observing substantial differences in the intensity with which banks withdrew cash from their national central banks may, beyond storage costs (which may themselves be influenced by government security regulations) and insurance costs (which should be uniform across euro area countries), largely reflect variations in cash transportation costs, which in turn may indicate differing levels of competition faced by CIT companies in national cash logistics markets.

Figure 6 depicts the increase in cash holdings by euro area banks during the negative interest rate period, highlighting the particularly strong growth among German banks.

[12] See https://www.mordorintelligence.com/industry-reports/cash-logistics-market.
[13] As an exception, some cross-border trade in cash takes place between Austria and Slovenia as well as between Belgium and the Netherlands.
[14] We analyze only those euro area countries that were members of the Eurosystem throughout the entire zero and negative interest rate period since mid-2012.

Figure 6. Vault cash of banks in the euro area and Germany and interest rates



Source: own figure. Data: national central banks.

Notes: Vault cash in billion euros.

As shown by table 2, vault cash in the euro area increased on average during the negative interest rate period by around 43%. The magnitude of banks' responses to negative interest rates, however, varied enormously across euro area countries. While German and Austrian banks more than doubled their vault cash holdings, banks in Finland, Slovenia, Luxembourg, Slovakia, Cyprus, and France stockpiled their cash by "only" 66% to 21%. Next in line, Estonia, Spain, and Ireland raised their cash holdings by roughly 15% to 12%, whereas Malta and Portugal effectively maintained unchanged cash balances. Unexpectedly, banks in Italy, Greece, and the Netherlands even reduced their cash holdings at that time.[15]

[15] One plausible explanation could be a severe liquidity shortage in the national banking systems, although further investigation is clearly needed.

Table 2: Increase in banks' vault cash during ECB's negative interest period (06/2014 - 06/2022)

Euro area	GER	AUT	FIN	SLO	LUX
43.2%	111.6%	101.9%	66.1%	48.5%	38.1%
SLK	**CYP**	**FRA**	**EST**	**ESP**	**IRL**
31.9%	23.5%	20.9%	14.9%	12.8%	12.5%
MLT	**PTL**	**ITA**	**GRE**	**NED**	
2.5%	1.2%	-5.8%	-10.9%	-19.0%	

Source: own calculations. Data: National central banks.

Notes: Percentage changes calculated as average vault cash during negative interest rate phase (06/2014 - 06/2022) divided by average vault cash during zero interest rate phase (07/2012 - 05/2014).

Table 2 indicates that notable differences exist in national vault cash holdings which may reflect varying degrees of competition in the national cash logistics markets and finally determine the cost structure of cash transportation for banks across the euro area. If that is indeed the case, a unified European CIT regulatory framework could enhance competition among CIT companies, potentially leading to cost reductions for banks and, ultimately, for consumers.

4.1.3. Cash costs for commercial banks

Beyond independent ATM operators and retailers, commercial banks are typically the next entities required to absorb cash transportation costs passed on by CIT companies. These costs are particularly significant in countries where cash transportation involves elevated security risks (South African Reserve Bank, 2025, 71). One approach to reduce the frequency of cash transportation is the implementation of so-called notes-held-to-order (NHTO) arrangements or broader cash deposit schemes (Rösl, 2012).

Under NHTO systems, commercial banks are not required to physically return surplus banknotes to the national central bank. Instead, the banknotes remain stored in the vaults of the commercial banks but are legally recognized as having been deposited with the central bank and are credited accordingly. This framework enables banks to recirculate the same banknotes locally to satisfy future withdrawal demand. By eliminating unnecessary round-trip transport between commercial banks and the central bank, these systems streamline the cash

cycle, making it more regionally concentrated and operationally efficient. As a result, banks' expenditure on armored transport might be significantly reduced.

Banks incur a range of costs associated with holding and handling cash that go beyond CIT expenses. Direct costs include storage and vault expenses, such as the rent or depreciation of safes, vaults, and cash rooms, as well as security systems and own ATM costs. Personnel costs arise from security staff handling cash and administrative staff performing counting, verification, and reconciliation of cash balances. Insurance costs cover the risk of theft, fire, or other damages associated with storing cash. Processing and handling costs are incurred in counting, sorting, batching, and packaging banknotes and coins. Banks also bear costs related to cash management, IT and software systems used for forecasting cash needs.

Indirect costs are also important. Opportunity costs reflect foregone interest income on cash held in vaults that could otherwise be invested or lent, and these are particularly significant in periods of high interest rates. Additional costs can arise from over- or under-stocking, where excess cash increases storage and insurance expenses, while shortages may trigger extra CIT trips or operational delays. Regulatory compliance adds another layer of indirect cost, as banks must adhere to anti-money laundering regulations, security standards, and reporting (supervisory) requirements.

4.1.4. ATM Interchange fees

A relatively new topic on the payments landscape is ATM interchange fees and their repercussions on the deployment, viability and economic sustainability of ATM networks (see, e.g., Lepecq & Sikes, 2026; Shaw, 2025). ATMs are by far the most important channel for distributing cash, specifically banknotes, to the public.[16] However, there have been drastic changes in the network of ATMs in the recent past: The number of ATMs has declined nearly everywhere (Rösl & Seitz, 2025) and the share of bank-owned/operated ATMs has decreased relative to independent (white-label) ATMs whose providers rely predominantly on interchange fees to cover their costs. Moreover, customers make fewer trips to ATMs but withdraw larger amounts (Shaw, 2025, 12).

[16] Alternative cash disbursement methods, such as cash-back at retail stores or cash-in-shop have due to several disadvantages only achieved a small market share so far.

An ATM interchange (fee) is a wholesale fee paid between financial institutions within a card network. It is paid by the issuer (typically the cardholder's bank) to the ATM operator when a customer withdraws cash from an ATM that is *not* owned by his bank or an independent ATM operator (see Figure 7). The purpose of the interchange is to compensate the provider of the cash dispensing ATM for providing the withdrawal service, including costs related to machine investment, maintenance, cash replenishment and handling, network connectivity, and fraud as well as operational risk management. The level and structure of interchange fees, however, are typically not negotiated between the issuer and the ATM operator but are determined by the interbank network (scheme)[17] in negotiations with banks, i.e. two parties not interested in supporting cash. At any rate, the consumer does not directly observe the interchange. Nevertheless, it may indirectly affect bank account pricing, for example through monthly fees or withdrawal charges imposed by his own bank.

If surcharging is allowed in a country, then ATM deployers have to choose between receiving interchange fees or implementing surcharges (see Figure 7). In principle, those surcharges can be set freely by ATM operators although in some jurisdictions surcharge caps are applied by regulators.[18] Unlike interchange, a surcharge is a direct access fee charged to the consumer at the point of withdrawal. It is typically disclosed on the ATM screen and must be accepted before the transaction is completed. Whereas interchange is a bank-to-bank transfer within the payment network, a surcharge constitutes a direct payment from the consumer to the ATM operator. Consequently, while interchange reallocates costs within the payments network, surcharges shift costs explicitly and transparently to the ATM user.[19]

The fees arising from an ATM transaction (including interchange) are illustrated in Figure 7. As is obvious, these fees are multi-party based and multi-layered. In a regular ATM transaction, there are usually five parties involved: the cardholder, his bank, the card network, the acquirer and the ATM operator. Potential fees include foreign fees and surcharge of the cardholder;

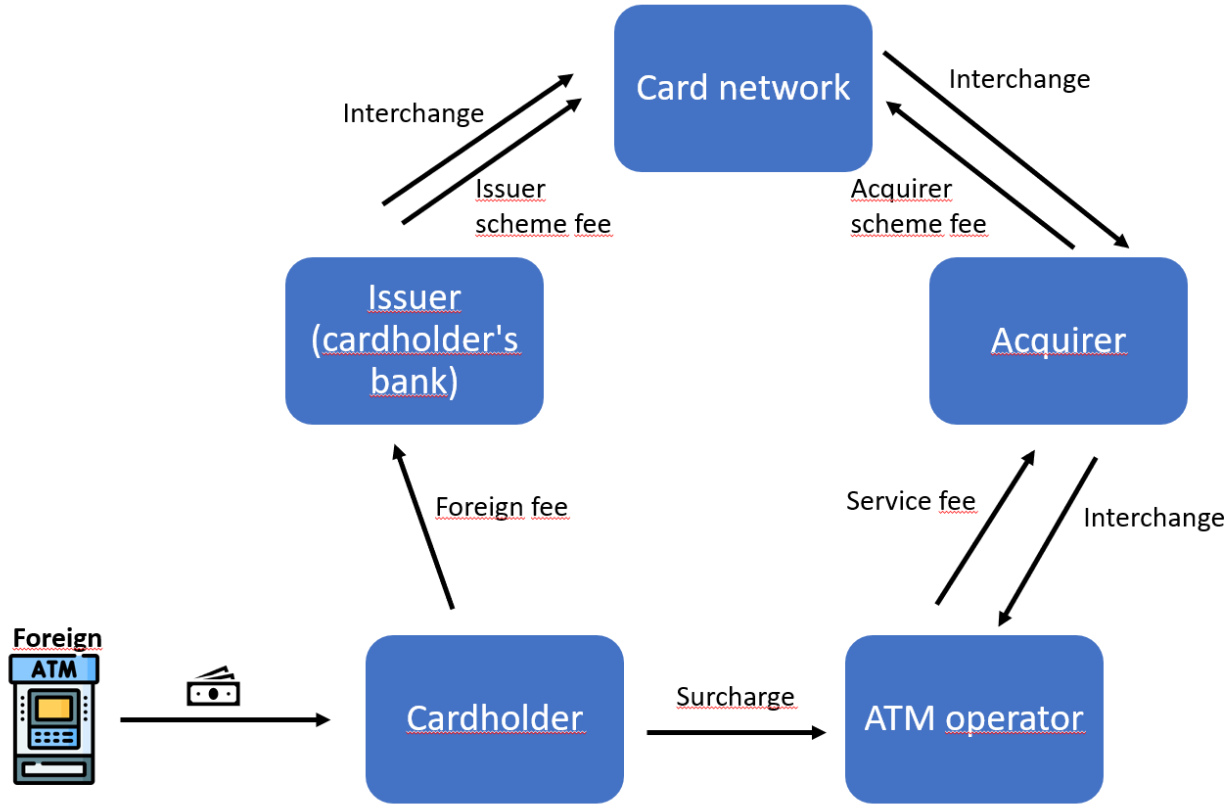
[17] The schemes can be either domestic (e.g. LINK in the UK or Interac in Canada) which are owned by the card-issuing banks or international (like the global ATM networks of Visa and Mastercard). Visa and Mastercard have imposed non-discrimination clauses that prevent ATM operators from charging different fees based on the card network or issuing bank (Lepecq, 2025). This is critical as the international schemes are gaining increasing market shares.

[18] See, for instance, Reserve Bank of India (2025).

[19] Both ATM cost components (interchange fees and surcharges) should not be confused with general scheme fees the participants of a card network (the issuer and the acquirer, typically commercial banks) pay to the network provider (for instance, VISA, Mastercard, Giropay) for the network services.

Interchange fee paid by the issuer (cardholder's bank) to the acquirer via the card scheme and finally forwarded to the ATM operator; various access and services fees.

Figure 7: Cash withdrawals and fees



Source: own graph based on Lepecq & Sikes (2026).

Interchange fees vary significantly from one country to another, even within the same card network. In practice, they are typically expressed as a fixed amount which have been more or less constant in many countries for years, while operating costs have been steadily rising (Shaw, 2025, 9ff). By contrast, interchange rules vary across markets, ranging from interchange being practically the only fee model available to ATM operators to interchange being abolished and not part of the fee model for ATM operators at all.

ATM interchange fees, while intended to support the viability of shared ATM networks, have become a source of significant dysfunction in the cash infrastructure by setting incentives for low such fees, against initial intentions. The current system is characterized by a lack of transparency (even to regulators, governments and central banks), inconsistent fee structures, and a fundamental disconnect between the fees charged and the actual costs of operating ATMs. These issues not only undermine the viability of ATM business models but

also threaten access to cash for consumers, particularly in underserved regions, so-called "ATM deserts" (see https://fedcommunities.org/data/banking-deserts-dashboard/).

Some changes are already emerging, and several authorities have intervened in recent years. In 2009, for example, the Reserve Bank of Australia and the payments industry agreed on a reform of the Australian ATM system, abolishing interchange and foreign fees while introducing surcharges for off-us ATM withdrawals (Lepecq & Sikes, 2026). Similarly, the launch of Geldmaat in 2019 by the three largest Dutch banks replaced the previously bilateral ATM fee arrangements between issuers and acquirers with a standardised interchange fee. Independent studies later showed that ATM owners faced rising transaction costs, prompting the card schemes to increase ATM interchange fees in 2024 (van Anholt, 2025; Shaw, 2025, 21). In Poland, very low interchange fees introduced in 2010 by Visa and Mastercard encouraged many banks to outsource their ATM fleets to independent deployers. A cost study for Poland (Borkowski et al., 2023) found that, under current interchange levels and transaction volumes, these deployers incur average losses on domestic ATM transactions. As a result, ATM operators have become increasingly reliant on alternative revenue sources such as surcharges on international withdrawals and dynamic currency conversion fees. In response, one Polish scheme announced an interchange fee increase effective 1 February 2026—conditional on the other scheme adopting similar measures (Szafirski, 2025; Shaw, 2025, 21f). Germany provides another noteworthy example, as the domestic Girocard scheme operates alongside the international Visa and Mastercard networks. Girocard permits ATM deployers to set a direct access fee (a surcharge), and no interchange fee applies. However, the growing share of Mastercard and Visa debit cards means that an increasing number of customers avoid surcharges altogether. In these cases, ATM operators receive only the international scheme interchange, which is significantly lower than the fee collected under the Girocard surcharge model. As in other countries, these interchange revenues are insufficient to cover the actual cost of providing ATM services (Shaw, 2025, 22f).

Ultimately, the ATM interchange topic is about profitable and viable ATM business models.

4.1.5. Merchants and cash costs

Handling cash in stores generates multiple costs for retailers. Direct costs include fees for CIT services and charges for bank deposits. Operational costs arise from staff time spent counting, reconciling, and safeguarding cash, as well as the potential for losses due to theft, fraud, or

human error. Opportunity costs also occur, since cash held in tills cannot be deployed elsewhere until deposited in a bank. Additional costs may arise when stores provide cash withdrawal services, such as cash back and cash-in-shop. Cash back allows customers to receive cash when paying by card, dispensed from the retailer's register as part of the purchase, while cash-in-shop enables withdrawals independent of any purchase via debit or credit card at the point-of-sale terminal. By transforming the shop into a mini-ATM, these services improve cash accessibility, particularly in areas with limited ATM coverage, and help maintain financial and payments inclusion for consumers who rely on cash. However, when customers withdraw cash in shops, this often incurs costs for the retailer. These consist of fees that they have to pay to banks and bonus programs.

From a microeconomic perspective, offering these services also benefits retailers in several ways. They can increase foot traffic, boost customer convenience and loyalty, simplify cash handling by consolidating withdrawals, differentiate stores from competitors, and generate small additional revenue through fees or commissions. From a macroeconomic perspective, cash back and cash-in-shop services contribute to the robustness and efficiency of the overall cash cycle, ensuring that cash remains widely available, circulating smoothly across the economy, and resilient to fluctuations in demand (ECB, 2024a). Merchants might also enter into new and innovative cooperation, e.g. with banks or CIT firms.

A literature review of a large number of international studies (Ego et al. (2025, section 2.3) shows that (similar to the results of consumer studies, see chapter 2) the costs of payment methods vary considerably in international comparison – both per transaction and relative to turnover. The results depend heavily on the market penetration of the respective payment methods, on merchant negotiations with service providers, and on the transaction structure (e.g., average amount, frequency). In terms of payment costs for merchants per transaction, cash tends to outperform cards because cash is used for many smaller payments. In terms of costs per turnover, however, debit cards usually prove to be advantageous, as they are used to pay higher amounts on average. Credit cards almost always incur the highest costs for retailers due to high fees. If, however, surcharging is prohibited, as in many countries (e.g. in the EU), fees will eventually show up in higher product prices no matter which payment instrument is used.

4.2. Cash usage regulations and reporting obligations

Restrictions on the use of a specific payment instrument place its issuer at a competitive disadvantage and increase the non-monetary costs faced by users. Such interventions distort the payments market and tend to reduce demand for the regulated instrument. While cashless payment methods—such as debit and credit cards or mobile payments—are regulated primarily at the stage of issuance, their use is generally unrestricted. Cash, by contrast, is supplied elastically by central banks, yet its use is subject to payment limits and reporting obligations in a number of countries. From a global perspective, explicit limits on cash payments are currently confined to Europe although similar measures are contemplated in Australia and New Zeeland. By contrast, reporting obligations for cash payments exceeding certain thresholds are very commonly observed worldwide (for instance, in EU, USA, Japan, China).

Table 3: Explicit cash usage limitations in Europe

	Upper limit for cash payments
Belgium	EUR 3,000
Netherlands	EUR 3,000
Croatia	EUR 10,000
France	EUR 1,000 exceptions for non-tax residents.
Greece	EUR 500
Hungary	HUF 1.5 million per month (~ EUR 40,000)
Italy	EUR 5,000
Latvia	EUR 7,200
Lithuania	EUR 5,000
Malta	EUR 10,000 for certain high-value items (e.g. gold)
Poland	PLN 15,000 for merchants only
Portugal	EUR 3,000
Romania	LEI 5,000 for merchants. Exceptions for delivery services.
Slovakia	EUR 15,000
Slovenia	EUR 5,000
Spain	EUR 1,000 exceptions for non-tax residents.
Bulgaria	LEW 10,000
Czech Republic	CZK 270,000

Source: European Consumer Centre Germany.

Notes: In some European countries with no explicit cash usage restrictions like Germany, implicit cash limits exist due to Anti Money Laundering regulations (EUR 10,000).

Table 3 provides an overview of countries that currently impose restrictions on cash usage. From 10 July 2027 onward, however, a new EU regulation will cap cash payments at €10,000 for business transactions across all 27 EU member states, while allowing countries to maintain or introduce lower national thresholds. The stated rationale for this regulation is the prevention of tax evasion, shadow-economy activities, and the financing of terrorism (EU Commission, 2024; Buiter, 2023; Rogoff, 2016; Sands, 2016). However, the empirical evidence supporting the effectiveness of cash usage restrictions in achieving these objectives remains limited (Rainone, 2023; Deutsche Bundesbank, 2019, 46). Moreover, as argued by Rösl & Seitz (2025), such measures may generate a self-reinforcing decline in cash usage. Restrictions that conflict with users' payment preferences reduce cash demand, weaken the cash infrastructure (notably the provision of ATMs), thereby diminishing access to cash and further depressing cash demand. Finally, such restrictions distort consumers' freedom to choose the method of payment and risk a possible loss of public confidence in its currency.

5. Implications for central banks, policy and cash cycle participants: The Playbook

After examining the costs of cash along the cash cycle and finally for the consumer, the following chapter presents policy recommendations for all participants in the cash cycle, but especially for central banks and regulators: the Playbook to increase attractiveness and competitiveness of cash.

Printing and minting firms, for instance, should focus on minimizing the lifetime costs of banknotes. The industry is already addressing this challenge by improving the quality of banknotes and engaging in cross-border cooperation to achieve economies of scale. Therefore, additional government regulation in this sector does not seem necessary.

Central banks should not focus exclusively on the cost side of cash but must take their responsibility for maintaining a robust and resilient cash cycle seriously, particularly in light of the societal benefits of cash. In particular, they should avoid transferring too much responsibility for cash logistics to commercial banks, as was done in Sweden in 2005 (Sveriges Riksbank, 2005). Following this shift, access to and acceptance of cash declined markedly, as banks reduced cash-related services. This development effectively crowded out cash payments and led to a substantial erosion of the cash infrastructure. Indeed, Sweden may

already have reached a point of no return, with potentially severe implications for the resilience of its national payment system (Claussen et al., 2026).

Given the public good characteristics of cash (see chapter 2) central banks should reconsider their traditional stance of neutrality regarding banknotes and coins in the payments market. If they do not have the mandate to actively support cash, lawmakers should change the legislation in this respect. The OeNB provides a prominent example of a proactive approach. To avoid the "Swedish problem" from the outset, it moved away from a passive stance and adopted a strategy of "active neutrality".[20] This strategy seeks to ensure cash acceptance at the point of sale through public awareness campaigns and to encourage consumers to maintain emergency cash reserves. Additionally, the OeNB partially funds ATM infrastructure in remote areas to guarantee cash access and to stabilize the local cash cycle—a measure consistent with the public good role of cash. Public support for this approach appears strong: the ECB's SPACE study on payment behavior in euro area countries reports that cash remains the most preferred means of payment at the point of sale in Austria (ECB, 2024b, 43). Beyond these operational measures, discussions are even underway about enshrining the right to cash in the national constitution (derStandard.at, 2025).[21] Such an active neutrality approach not only safeguards the cash infrastructure, it also ensures a high level of competition in the payments market by limiting the market power of cashless payment service providers (Hung et al., 2025). A radical way of changing the whole landscape in the payment markets would be if the central banks were willing to cover all the logistics costs associated with public money, i.e. cash. In assessing such a policy, central banks would need to balance cost considerations against the risk of moral hazard in order to design incentive-compatible solutions.

In countries with low cash payment shares, regulatory measures such as memoranda of understanding and legislation targeting banks with limited or no cash services are increasingly used to safeguard national cash cycles (Rösl & Seitz, 2025). Sweden, Norway, the Netherlands, Finland, and Lithuania have implemented such measures, including mandatory cash

[20]Matthias Schroth, Director of the OeNB's Cash Management, at the 6th. Bundesbank Cash Symposium in Berlin 5 February 2025.

[21] This is already the case in Slovenia where the National Assembly officially passed a constitutional amendment on 1 December 2025 guaranteeing the right for all citizens to pay with cash (The Slovenia Times, 2025), Hungary (since 14 April 2025), Slovakia (since 2025) and Switzerland where in a referendum on March 8, 2026 the population overwhelmingly approved a legal amendment to constitutionalize the right to use cash (Smith-Meyer, 2026). Several US states have enacted laws prohibiting retail businesses from refusing cash payments (Maroević, 2025). In China, the People's Bank of China enforces mandatory cash acceptance, including issuing of fines for those firms who do not comply (Maroević, 2024).

withdrawal and deposit services, agreements to maintain ATM networks, and legislative initiatives to ensure broad access (van Anholt, 2025, 2026; Sveriges Riksbank, 2024; Norges Bank, 2022; De Nederlandsche Bank, 2020; Bank of Finland, 2023; Bank of Lithuania, 2022). A more radical approach involves mandatory acceptance of cash, a step addressed by the ECB's Eurosystem Cash Strategy (ECB, 2024a) and the EU Commission's Legal Tender Initiative (2023). Such cash protection bills are also considered by the Australian government (2025) and political groups in New Zeeland (New Zeeland First, 2025). In the USA, a bi-partisan initiative of US Senate members introduced in 2025 the "Payment Choice Act" to ensure that consumers can use cash for in-person purchases and that retailers cannot charge cash-paying customers more (U.S. Senate, 2025). A similar regulation is in effect in China since February 2026, aimed at "upholding the legal tender status of the renminbi, preventing and regulating entities' refusal to accept cash, and meeting the public's diverse payment services needs" (Mothership, 2025). However, no similar regulations currently appear to be in place in cash-intensive countries across South America and Africa.

One important issue of ATM interchange setting is its lack of transparency. This makes it difficult for central banks and regulators to understand how the interchange model works. As evidence has shown, transparency together with independent ATM cost studies may substantiate a raise of ATM interchange (by regulators or schemes), see the Dutch and Polish examples discussed in chapter 4.1.4. To guarantee country-wide access to cash against the background of fees not covering the costs, public-private partnerships (see e.g. the case of the OeNB) would be helpful to avoid cash deserts. Efficiency gains through ATM pooling and enhanced ATM services might also support a viable ATM business model.[22] India's ATM approach might be a blueprint in this respect (Lepecq, 2026). Its unique combination of government intervention, central bank support, strategic partnerships between fintech companies and ATM manufacturers as well as technological innovation (such as cash recycling machines, biometric ATMs or IoT-enabled ATMs) led to more efficiency, more white-label ATM operators and an increase in the number of ATMs of 25% between 2019 and 2024.

With regard to cash-related costs incurred by CIT companies, there are—at least for some European countries—strong indications of a low level of competition in national cash logistics markets, as shown in Chapter 4.1.2. This finding is hardly surprising given the almost complete

[22] This is the intention of SARB's initiative to review ATM interchange (SARB, 2025, 75).

segmentation of the cash transportation industry along national borders. A key explanatory factor appears to be the lack of harmonization in government regulations governing cash transport. In the European context, addressing this regulatory fragmentation should be a policy priority. More generally, increasing competition in the wholesale cash market might help to enhance innovation and efficiency, i.e. reduce costs (SARB, 2025). In this vein, in February 2026, the Dutch House of Representatives adopted the Cash Payments Act which, inter alia, ensures that especially larger CIT companies will be subject to reporting obligations, supporting the continuity of CIT services in the Netherlands (van Anholt, 2026).[23]

Policymakers could consider putting in place an appropriate regulatory framework that defines accounting treatment, risk allocation, and compliance standards for Notes Held to Order or similar cash deposit schemes (Rösl, 2012). Once such a framework is established, banks (especially in countries with high criminality) may be encouraged to adopt these arrangements to reduce cash transportation costs.

Regarding retailers, cash back and cash-in-shop services can indeed help to reduce overall cash handling expenses. By allowing customers to withdraw cash directly at the point of sale, the net balance of cash delivered by CIT companies and paid out through change or withdrawals may be lowered, easing the operational burden for merchants. From a macroeconomic perspective, these services also enhance the robustness of the cash cycle by increasing access to cash. Bech et al. (2018, 72) note that in the Netherlands, the reduced density of ATMs was at least partly offset by cash back services provided by stores, helping to stabilize the national cash cycle. In line with this, the ECB promotes merchant-provided cash services (ECB, 2024a), highlighting their role in maintaining broad access to cash. In practice, however, significant limitations remain, as, for example, participating merchants typically do not accept all payment cards, they are not open 24/7, the amounts are limited and are in most cases combined with a purchase. As a result, cashback and cash-in-store services can only complement existing cash provision and cannot be regarded as full-fledged substitutes for ATMs, which remain undoubtedly the primary workhorse for supplying the public with cash. As mentioned in section 4.1.4, the number of bank-operated ATMs is falling for years and independent ATM deployers are stepping in to maintain coverage in many countries.

[23] The Act directly addresses affordability for consumers in that it stipulates that consumers will not pay transaction fees for banknote withdrawals and deposits and fees for businesses will be capped.

However, their business model is completely different, as they rely heavily on surcharge or interchange.

As shown in Chapter 4.2, regulations limiting cash usage make banknotes and coins artificially costly and discourage their use at the point of sale. Such restrictions should be removed, and reporting requirements aligned with credit transfers and digital payments to ensure compliance with AML and CTF regulations. Moreover, central banks should consider to (re-)issue larger banknote denominations to serve the demand for high-value notes especially in times of crisis.

6. Summary and conclusions

The paper reviewed cash affordability: the status quo, cash cycle repercussions and policy implications. From the cost side, an extended literature review has shown enormous heterogeneity amongst different payment instruments and amongst countries. Hence, one cannot conclude that one specific payment instrument is in general more or less costly than one of its competitors. The main explanations for this are differences in the level of competition and market power in the national payments market as well as government regulations. At any rate, cash should remain a critical part of an efficient and resilient payment mix, providing universal accessibility, financial and payments inclusion, privacy, transparency, and simplicity in daily transactions. These substantiate and underline the use cases for cash. Beyond these advantages and convenience, cash plays a unique stabilizing role during crises, functioning as a liquid store of value and a reliable transactional medium when digital systems fail—effectively serving as a non-excludable, non-rival public good that enhances overall economic resilience.

Costs associated with cash—from printers, minters, central banks, CITs, and commercial banks to ATM operators and merchants—are ultimately borne by consumers. However, the cash-related costs are not concentrated in a single segment of the cash cycle but arise along multiple stages, reflecting the complex infrastructure required to ensure the availability of cash. The playbook on how to secure a cost-effective and robust cash cycle leads to a variety of recommendations:

Central banks should avoid over-reliance on commercial banks for cash logistics, supporting ATM networks in underserved areas, and ensure the supply of sufficient denominations to

meet both everyday and crisis-related demand. In essence, central banks should overcome their traditional passive stance on cash in the payments market and adopt the more proactive approach of “active neutrality” developed by the OeNB. Regulatory frameworks should be designed to remove restrictive cash usage limits, align reporting obligations with those for credit transfers and electronic payments, and harmonize national cash logistics regulations to enhance efficiency and competition. Commercial banks need to manage cash handling effectively while avoiding incentives that discourage cash provision. At the same time, merchants can support the cash cycle by offering services such as cash back and cash-in-shop, which reduce operational burdens and enhance public access to cash. However, this can only support the decisive role of ATMs whose efficient functioning necessitates viable ATM business models. Together, these measures safeguard the societal and economic value of cash, preserve its role as a public good, and ensure that cash remains a well-functioning, affordable, and widely accessible payment instrument alongside emerging digital alternatives.

Consumers react to price signals and changes in cost-benefit ratios. However, a clear and convincing signal must be given for a decision against the actual payment preferences. Overall, there should be cost transparency for consumers when it comes to payment methods. This implies guaranteeing freedom of choice for all basic means of payment.

While costs certainly matter, what ultimately counts is a comprehensive cost-benefit assessment from society’s perspective. In light of the advantages that cash provides, its overall affordability becomes the decisive factor. As A. Newbury (2026) aptly notes, “I think a lot of it comes down to probably affordability…”. In a market economy, consumers should remain at the center—provided they retain full freedom of choice. Ensuring a well-functioning payment infrastructure is therefore essential. This responsibility also lies with central banks and governments, since a reliable payment system constitutes a fundamental public infrastructure, comparable to water or electricity supply. As demonstrated above, cash is an integral part of this infrastructure and determines the huge variety of its use cases. These can only materialize due to the USPs of cash. A closer analysis of these use cases is beyond the scope of the present paper and is left to future research.

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