

# Governor Signe Krogstrup's speech at the Frankfurt School of Finance and Management about Money and Payments: The Five C's

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19 February, 2024

## CHECK AGAINST DELIVERY

### Introduction

It is a pleasure and an honour to be here and to speak at the new Centre for Central Banking at the Frankfurt School of Finance and Management. I want to thank Prof. Jens Weidmann for inviting me. And I would like to congratulate all of you on the establishment of this new centre. I am confident that we can expect many valuable insights on topics that are high on the central banking agenda in the coming years.

One topic high on this agenda is also my topic for today: digital and technological developments in money and payments, and implications for the fundamental questions of trust in money, financial stability and robustness of our payments infrastructure.

The landscape of money and payments is constantly evolving. In the past decades, money and payments have increasingly moved from banknotes and coin to digital bank deposits with associated card and app payments in many countries. We have been particularly early movers in Denmark. In the past five years alone, I stopped carrying cash, got rid of my physical wallet, and largely stopped visiting my bank except online. I have instead added several new types of digital means of payment to my accounts and phone. I am far from being a unique case. Large parts of the Danish population are following this trend, starting with the young, but the older segments of the population are catching up. In this way, we are not unlike other Scandinavian countries. And many other countries are currently heading in a similar direction.

There are important advantages to the increasing use of cards and other forms of digital payments. However, developments also bring up concerns, notably about the declining use of cash, the trust in money and the robustness of the payments infrastructure. Moreover, cyber security has



become increasingly important. Meanwhile, crypto-based technology is giving rise to new types of assets that may or may not become more broadly adopted. And finally some central banks are considering introducing central bank digital currencies (CBDC).

The keen listener may have noticed the five C's of these developments: Cards, Cash, Cyber, Crypto and CBDC (**Slide 1**). All of these have implications for central banks, in different ways. I will organise my talk today to around these five C's.

I am delighted to address this topic here in Germany. There are similarities between Germany and Denmark in both practice and approach when it comes to the five C's. But there are also profound differences, that can be a source of learning and inspiration. So, it is my hope, that I can offer some food for thought and issues for discussion today.

### **Money is trust and convenience**

The money we use, and the way we pay, have always evolved. However, the constant throughout history has been that money has three attributes, namely that it serves as a medium of exchange, a store of value and a unit of account. It requires trust for money to have these attributes (**Slide 2**). Trust has fittingly been called *the soul of money*.<sup>1</sup> In earlier times, gold, other precious metals or gems typically performed the role of money. Value and trust were ensured by the scarcity and use-value of the commodity, for example its use in jewellery. Money later evolved into more convenient and divisible notes and coins, and were in many countries linked directly to the value of gold – the Gold Standard.

However, gold was not always sufficiently stable in value. The link to gold was eventually replaced with fiat money as legal tender issued by central banks. The trust in fiat money is ensured through the credibility of the issuing central bank's commitment to uphold its store of value and means of payment functions.

### **Cards and other digital means of payment are on the rise**

This brings me to the first C, cards in short, or more broadly, new digital means of payment. Since the second half of the 20<sup>th</sup> century, new and more convenient versions of fiat money, and particularly the means of payment attributes associated with it - have evolved. Checking accounts

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<sup>1</sup> See Agustín Carstens, Digital currencies and the soul of money, Speech at Goethe University's Institute for Law and Finance conference on "Data, Digitalization, the New Finance and Central Bank Digital Currencies: The Future of Banking and Money", 18 January 2022.



issued by commercial banks are now accessed via the Internet for instant digital transfers to other accounts. Associated payments solutions such as debit cards or instant payments apps are gaining ground. In short, technological development is constantly enabling new methods for making payments faster and more convenient.

The chart on **slide 3** shows that the use of payment cards and mobile payment apps in Denmark has grown from below 20 per cent of payments in physical retail trade in 1990 to over 90 per cent today.

This fast adoption is tied to the joint public-private approach to introducing broad-based digital solutions early on in Denmark. Notable developments include the national debit card introduced already in the 1980s, the development of unique digital verifiable ID's covering the entire population, and a statutory duty as well as right for all Danes to have a bank account with payments features.<sup>2</sup> Underlying this joint approach is a high level of trust in the authorities.

Another important driver is demand for safety and convenience. Digital means of payment are considered safe and – for many – more convenient than cash in Denmark. One example is the highly popular Danish national mobile payments solution, MobilePay, introduced back in 2013, which allows for instant payments directly between private individuals' bank accounts. It is offered by all banks and on a joint platform developed collaboratively by the financial sector and Danmarks Nationalbank. 90 per cent of Denmark's population currently uses this app.

A shift towards digital payments and away from cash takes place in many other countries.

### **Cash is still needed although its use for payments has declined**

This brings me to cash, my second C. The mirror image of the rise in digital payments is a decline in the use of cash in payments. However, as shown on **slide 4**, with important differences across countries. I note that cash is used extensively here in Germany, with about three in five payments in physical retail trade. The use of cash has fallen to particularly low levels in Scandinavian countries, with only about 10 per cent of payments in physical trade in Denmark. This drop is entirely demand driven. Reducing the use of cash is not, and has never been, a goal of the author-

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<sup>2</sup> The requirement for all Danes to hold a bank account ensures that all payments from the authorities to citizens, such as state pensions or tax refunds, are digital. The right for citizens to have a basic account is ensured through EU regulation.



ities. Cash is legal tender and the legal requirement for retailers to accept cash payments remains in Denmark. And cash does remain in use for payments although at a lower level. From surveys, we know that some wish to use cash exactly because it is settled physically and does not require the use of digital devices. Some mention the wish for anonymity. Others find transactions in cash to be easier and simpler to keep account of.

We expect these reasons for using cash to persist and for cash to be in demand for payments for quite some time. To make sure cash remains fit for purpose, we launched a series of new strategic cash initiatives last autumn. We are preparing to issue a new series of banknotes, with state of the art security features in 2028-2029. We are recalling older bank notes. We are also phasing out the largest denomination bank note in Denmark, the 1,000-krone note. Our mandate for issuing bank notes and coin is to ensure its safety and efficiency in payments, and the 1,000-krone note does not contribute to this goal. It is rarely used for payments, as 9 out of 10 cash payments in Denmark are below DKK 500. However, it is more often than other notes subject to counterfeiting, and, according to Danish police, used in various type of financial crime.

The shift from cash to digital payments contributes to efficiency in payments, i.e. the average cost of retail payments has declined, benefitting all citizens.

As payments move from central bank issued bank notes to digital payments provided by private entities, concerns are also raised. One concern regards trust in money, as private digital money is not legal tender. In Denmark, we see no signs of such lack of trust despite the high level of digitalisation. Few Danes seem to distinguish between private and central bank issued money, trusting both. Rather, we see that trust in private digital money and payments is linked to trust in the financial system and the digital infrastructure. Notably, instant payment features seem to enhance trust. Trust is supported by regulation, supervision, deposit insurance, and overall macroeconomic and financial stability.

Another concern raised is that the shift to digital money and payments can also have implications for the robustness and resilience of the payments infrastructure. Digital disruptions can affect access to digital payments. And access to means of payments is critical to the functioning of the economy. So, how to best ensure a robust and resilient payments system? First, note that cash might not be immune to digital disruptions,



and hence is no panacea. This is notably because the circulation and distribution of cash has become highly digitalised.

Instead, key for resilience is redundancy. If one payment solution becomes unavailable, there should be widely used alternatives to switch to. Therefore, it is crucial that there is access to several different broadly accepted payment solutions, including cash, card schemes and mobile payment solutions.

In addition to redundancy, we see offline card payments as the most important payment contingency measure in Denmark. The technology is already available and implemented, and we are working to broaden its application. It enables card payments to function offline on payment terminals, within limits, until a disruption is resolved. We estimate that offline card payments have the potential to cover most Danes' basic spending needs for up to ten days.<sup>3</sup>

### **Cyber security is increasingly important**

A potential disruption could be linked to cyber treats, and this brings me to my third C, namely the emergence of cyber threats alongside digitalisation. The cyber threat has been with us for some time already, but is increasing with society's reliance on digital solutions. Cyber attack capabilities among states and criminals are also increasing, and there is growing uncertainty due to geopolitical tensions.

Successful cyber attacks have the potential to threaten financial stability, if for example payment systems are disrupted. For this reason, central banks are engaged in enhancing cyber robustness, jointly with other authorities and the financial sector.

This requires another toolbox because – from a macroprudential point of view – cyber risks are very different from financial risks such as credit and liquidity risks. Cyber attacks affect operability. Operational tools are hence required.

Due to the high degree of interconnectedness in the financial system, no private entity or institution can deal with the threat from cyber alone. Therefore we need to collaborate and share information, and this requires trust amongst the different stakeholders.

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<sup>3</sup> See Frederik Ræbild Kjemtrup, Offline card payments as a payment contingency measure, *Danmarks Nationalbank Analysis*, No. 17, November 2023.



In 2016, Danmarks Nationalbank took the initiative to establish a public-private collaboration forum called Financial Sector forum for Operational Resilience, FSOR (**Slide 5**). Its objective is to enhance operational resilience across the financial sector, including resilience against cyber attacks.

The work is based on a sector-wide risk analysis as foundation for prioritising joint mitigating actions.

The Danish cyber test programme, TIBER-DK, is a highly appreciated cyber-specific tool for increasing cyber resilience. TIBER is short for Threat Intelligence-Based Ethical Red-Teaming. Our programme was one of the first of its kind in Europe when we launched it in 2018. The framework is based on TIBER-EU, developed by the European Central Bank. Our experience is that TIBER is uniquely helpful in generating insight on how to protect against, detect and respond to advanced cyber attacks. The TIBER testing approach is spreading to the entire EU via the Digital Operational Resilience Act, DORA, applicable from 2025. Broader use of TIBER will be a significant contribution to increasing the cyber resilience of the European financial sector.

Beyond prevention it is also vital to have a crisis management response plan that can be activated if a system wide incident occurs. This is also something we address within FSOR.

Prevention and crisis management planning are crucial, but can only take us so far. Each individual institution has the important responsibility to prepare and increase its own robustness.

### **Crypto-based technology gives rise to new types of money and financial products, and potentially new risks**

The fourth C stands for crypto, a shorthand reference to the financial products and services based on distributed ledger technology (DLT), such as Blockchain. Some have voiced concern that unregulated crypto-assets may substitute and perhaps crowd out national currencies, or that the financial system may become subject to new severe risks, which may, in turn, challenge trust in money.

When discussing crypto, we should distinguish between the technology on the one hand, and the products and services currently based on this technology on the other.

In essence, the technology itself is a way of hard-coding the supply or issuance of the assets and allowing for transparency of transactions. It is



possible that this technology may help address some shortcomings and problems in the current plumbing of the global financial system. How this pans out is unpredictable, however, and the value added not yet clear.<sup>4</sup>

But so-called crypto-assets have already entered the global financial system. Some of these have seen a significant increase in interest as well as market capitalisation in recent years.

Let me start with the crypto-assets that are unbacked such as Bitcoin and Ether. These are sometimes referred to as crypto currencies, but that is a misnomer. They do not feature any of the three attributes of well-functioning money. And are thus unlikely to be adopted as substitutes for money in countries where existing money is stable and well-functioning. They are at best speculative and risky assets. The lack of an issuer that can be regulated and subjected to oversight also makes crypto-asset markets vulnerable to market manipulation and fraud.<sup>5</sup>

Despite the risks associated with these assets, there are no signs that unbacked crypto-assets currently threaten financial stability. As illustrated on **slide 6**, vulnerabilities related to crypto-assets can affect the financial sector through direct investor exposures and interconnections with the traditional financial sector. Despite the increase in market capitalisation, adoption remains low on both fronts. We recently estimated that less than 4 per cent of Danish households own crypto-assets.<sup>6</sup> And most investors have invested modest amounts, for now. Financial institutions in Denmark, such as banks and pension funds, also have low exposures. Similar assessments of exposures appear from surveys in other countries. We follow closely new developments in these exposures.

So-called stablecoins, also based on DLT, are a different matter. These are issued by an institution with a balance sheet, allowing for stable value, as well as potential regulation and supervision. The value of a stablecoin is ensured by backing it with assets that are stable in value – hence its name. Stablecoins are often issued to provide a means of payment

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<sup>4</sup> One example is the work currently conducted in the central banks and BIS Innovation Hubs on how crypto technology may help reduce inefficiencies of cross-border payments. See for example “[Project mBridge: experimenting with a multi-CBDC platform for cross-border payments](#)” that investigates how a multiple-central bank digital currency common platform for wholesale cross-border payments might reduce high costs and operational complexities and “[Project Dunbar: international settlements using multi-CBDCs](#)” that looks into how a common platform could enable cheaper, faster and safer cross-border payments.

<sup>5</sup> See, for example, United Nations Office on Drugs and Crime, Casinos, Money Laundering, Underground Banking, and Transnational Organized Crime in East and Southeast Asia: A Hidden and Accelerating Threat, January 2024.

<sup>6</sup> See Benjamin Christiansen and Rasmus Bobek Søndergaard, Crypto-assets: Risks, regulation and usage in Denmark, *Danmarks Nationalbank Analysis*, No. 16, November 2023.



that can be used on a platform based on DLT, typically with a stable value against a major national currency. A stablecoin thus borrows the stability of the underlying currency, and hence the trust and credibility of the issuer of that currency, i.e. the central bank. This is not unlike bank deposits, with similar potential risks and advantages. One risk is bank run risk, which is more prevalent in stablecoins as long as they are not regulated. An alternative to stablecoins is tokenised bank deposits, DLT-representations of traditional bank deposits, with the current advantage over stablecoins that they are already regulated and may therefore be safer.

With proper regulation, risks associated with stablecoins can be mitigated, and a level playing field created with other assets and means of payment. With proper regulation, they can have the potential to play a role in the payments and settlement of digital asset trading on DLT, if this becomes prevalent.

The first steps are taken toward regulating crypto-assets in Europe, with the new EU Markets in Crypto-Assets (MiCA) regulation.<sup>7</sup> However, more will be needed to close the regulatory gap between traditional and crypto-based finance.

### **Central banks are looking onto issuing so-called CBDCs**

CBDC is the final C for my talk today.

Central banks are keeping a watchful eye on recent changes in money and payments. Some central banks are considering whether to issue their own digital currencies – so-called CBDCs.

The term CBDC is usually taken to mean one of two things. First, it can refer to so-called wholesale CBDC, describing central bank digital money available only to financial institutions. Central banks already issue wholesale digital money, and the concept of a wholesale CBDC refers to making such wholesale money DLT-based. As such, it is a question of technology, which could become useful if DLT were to become more prominently used in the financial system.

Second, CBDC can refer to retail CBDCs: Digital central bank money issued directly to households and businesses, irrespective of technology. Households and businesses currently do not have access to digital de-

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<sup>7</sup> MiCA entered into force on 30 June 2023 with some provisions becoming applicable after an implementation period of 12 and 18 months.



posits at the central bank. Retail CBDC could – depending on how it is designed – change the structure of the financial system and the issuance and distribution of money.

The reasons given for the interest in issuing CBDC vary from country to country. Examples are shown on **slide 7**. Some see CBDC as an anchor to ensure trust in money as cash declines. Others see it as a potential bulwark against foreign currency substitution, or as a way to increase competition in markets for digital payments. We acknowledge the concerns underlying these and other reasons. However, in Denmark we currently do not see the possibilities for a CBDC to address them given the specific circumstances we have in Denmark. I already mentioned how trust in money and payments do not seem to be affected by the declining use of cash in Denmark. More fundamentally perhaps, with the well-functioning digital payments infrastructure already in place in Denmark, it is not clear how a CBDC would offer added value and compete on trust and convenience, and hence be adopted in Denmark.

The case for issuing CBDC may look very different in other countries, with different institutional setups, culture and preferences, and payments systems.

And countries in our close vicinity are considering introducing CBDCs. Therefore, we follow the development closely and reassess the arguments for and against our own CBDC on an ongoing basis.

## **Conclusion**

Let me conclude by noting that we are in the midst of an ongoing digital transformation of money and payments, characterised by my five C's. While technology has changed the nature of money throughout history, one constant has remained, namely that money has three attributes – safe store of value, medium of exchange and unit of account. It is the responsibility of central banks, and directly in the mandates of many, to ensure these attributes, so that money and payments can function as the backbone of a well-functioning economy.

I hope that this has given you food for thought. It has been a pleasure speaking here today. Thank you.



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## Money and Payments: The Five C's

Governor Signe Krogstrup, Danmarks Nationalbank  
Frankfurt School of Finance and Management, Centre for Central Banking, 19 February 2024



# Money and Payments: The Five C's

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CARDS



CASH



CYBER



CRYPTO



CBDC



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**Means of  
payment**



**Unit of  
account**



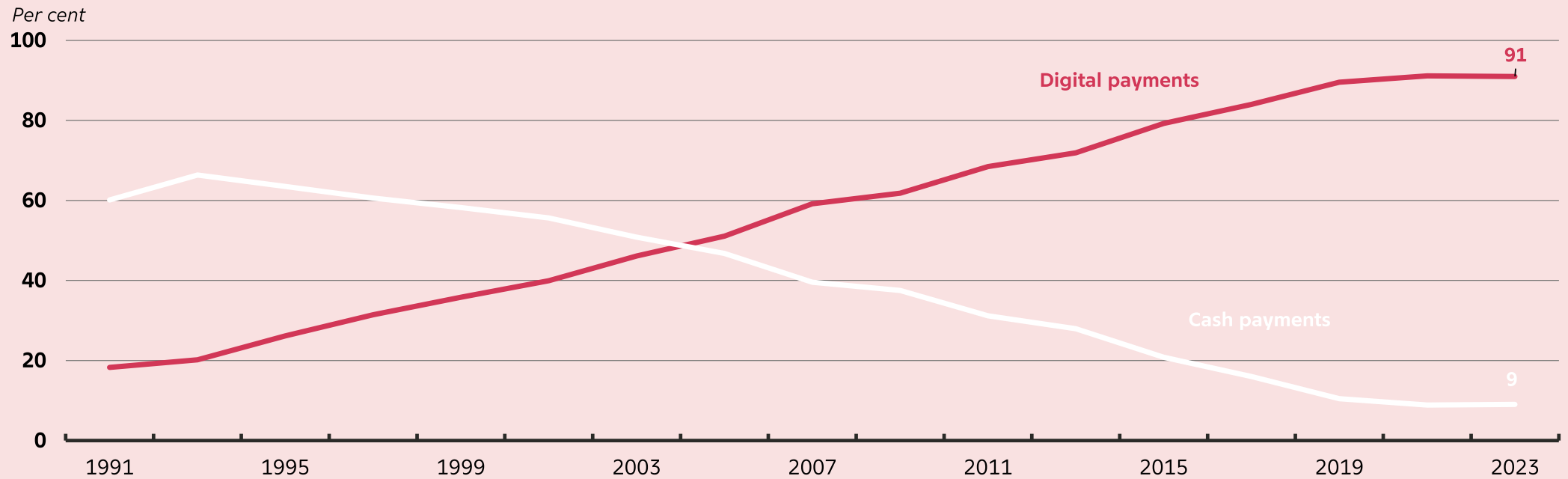
**Store of  
value**

**TRUST**



# New technologies and a shift in consumer preferences have led to an increase in digital payments

Digital payments are on the rise in Denmark



Source: Danmarks Nationalbank, Payment statistics and own calculations.

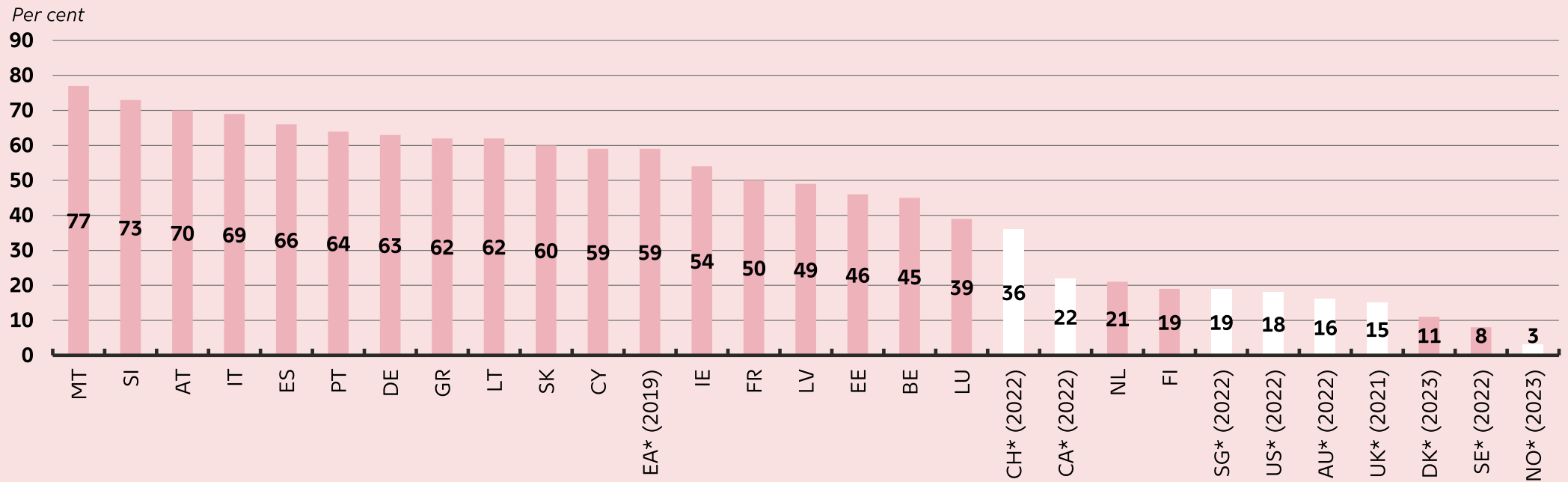


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# Cash is still needed, although its use for payments has declined

## Cash payments at point of sale as proportion of all payments



Note: EA\* includes the 19 countries which had adopted the euro in 2021 and is based on the 2022 SPACE report. Countries marked with \* are based on other studies including national surveys. Note that a direct comparison between the countries is subject to some uncertainty due to differences in the applied methods and years for measuring the use of cash.

Source: Study on the payment attitudes of consumers in the euro area 2021 (SPACE), Danmarks Nationalbank, Sveriges Riksbank, Norges Bank, Schweizerische Nationalbank, Bank of Canada, Federal Reserve, UK Finance, Reserve Bank of Australia, FIS Global Payments Report 2023.



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# The Danish approach – public-private collaboration





# Risks associated with crypto-assets can be transmitted to financial stability through two channels



Increased usage  
among households  
and businesses



Greater interconnectedness  
with the traditional financial  
sector



More loans and investments  
for real economic activities  
are made using crypto-assets