

# **THE IMPACT OF DIGITAL CURRENCIES AND FINANCIAL INNOVATIONS ON THE CASHLESS INITIATIVE STRATEGY IN SERBIA**

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The author is solely responsible for the content presented in this study.



# EXECUTIVE SUMMARY

This study analyzes the potential impact of introducing digital currencies on the cashless initiative in Serbia. It entails opportunities and threats associated with the proliferation of digital currencies globally. It discusses the economic and institutional conditions required for using digital currencies in daily transactions.

A cashless society is a state in which digital forms of payment replace or significantly reduce the use of physical cash in everyday transactions. Digital payment platforms, fintech innovations and emerging technologies such as blockchain have spurred this transformation.

We use the World Bank's Global Findex Database 2021 to construct the cashlessness score. The score is calibrated as a number between 0 and 100, quantifying the extent of cashless adoption in an economy in a given year. The score differs across the World Bank income groups, with upper-income European, North American and East Asian countries being in front of the rest of the world in the cashless initiative. With a score of 52 in 2021, Serbia is around the global average, indicating significant room for improvement should cashless adoption come on the agenda. The mediocre score is primarily influenced by substantial cash remittances and the population's reluctance to use digital payment tools like mobile apps.

Digital currencies go hand in hand with cashless adoption. We present a panel-data analysis that shows a positive association between research and development of central bank digital currencies and cashlessness scores. We control for natural, economic or institutional circumstances that can affect a country's decision to become cashless, such as population, output and financial development, and for country-fixed effects and outliers.

Serbia shows much potential in future cashless adoption as the number of cash transactions decreases. Cash withdrawals have shown a decreasing pattern since 2016, while an increasing trend is evident in the number and value of payment transactions by cards and e-money. This latter trend is even more pronounced for card and e-money payments made to accounts abroad. The number of paper- and electronically-initiated transactions in 2021 became approximately equal, while in 2023, electronic payments already exceeded cash.

The benefits of transitioning to a cashless society for individuals, businesses, governments and economies include convenience and accessibility of digital payment methods, their reduced transaction costs compared to cash, enhanced financial inclusion, improved transparency and accountability, the potential for innovations in financial services, more efficient government services, environmental sustainability by decreasing the need for paper currency production and transportation and various gains from data insights. While these benefits may seem compelling, transitioning to a cashless society presents challenges, such as concerns about privacy, security, cyber threats, unequal access to technology and the potential exclusion of vulnerable populations.

Digital currencies and financial innovations transform traditional financial systems and fundamentally change how economies function and interact. Their significance lies in their potential to reshape various aspects of the financial sector and beyond, such as redefining financial transactions and

strengthening transparency and security, disrupting traditional banking and unlocking new business models, fostering financial inclusion and encouraging technological adaptation and enhancing financial and regulatory efficiency.

Despite these opportunities, adopting central bank digital currencies in Serbia may have several challenges. Crafting a regulatory framework that accommodates innovation while ensuring consumer protection and compliance with regulations is a complex task that requires meticulous attention. The Law on Digital Assets adopted in 2020 is a positive step in this direction. However, the inherent volatility of other digital assets, such as cryptocurrencies, may distort the perception and challenge the adoption of central bank digital currencies in daily transactions. Educating the populace about the mechanics, risks, and appropriate usage of central bank digital currencies is essential to building public trust.

The opportunities and challenges of adopting central bank digital currencies in Serbia require a comprehensive further assessment. While they hold the potential to reshape financial transparency, inclusion and efficiency, the challenges of regulatory adaptation, public acceptance, technical readiness and economic stability must be effectively addressed to harness the potential benefits and mitigate associated risks.



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# INTRODUCTION

Digitalization significantly impacts many aspects of business, including the modus operandi of the modern financial system. Although there are many ways through which digitalization may affect the financial system, two aspects are of particular importance from the point of view of the fight against the shadow economy: the emergence of digital currencies and financial innovations.

Digital currency is a form of money available only in digital or electronic form. As such, it does not have physical attributes. Transactions involving digital currencies are made using computers or digital wallets through designated networks. They stand in contrast to physical currencies, such as banknotes and minted coins, which are tangible. On the other hand, digital currencies are similar to physical currencies in representing means of purchase of everyday goods and services. In addition, they can find restricted use among specific online communities, such as gaming sites, gambling portals or social networks. Digital currencies also enable instant cross-border transactions that can be seamlessly executed.

The rise of digital currencies and their potential use as a means of payment in daily transactions may create new opportunities to scale down the shadow economy and boost tax revenue mobilization. In addition to market-based digital currencies, the concept of government-backed digital currency is gaining attention, not only from the theoretical point of view but also from the policy perspective (World Bank, 2021). However, available studies show that countries with a large share of informal sectors, such as Serbia, may face significant difficulties promoting such forms of payment.

This study comprehensively analyzes the potential impact of introducing central bank digital currencies on the cashless initiative in general and discusses some specific aspects of this question related to Serbia. The analysis will entail opportunities and threats associated with the proliferation of central bank digital currencies.

Financial innovations, often driven by fintech companies, have changed the financial operations paradigm in developed economies. However, in many European countries, including Serbia, the institutional design is still tailored to the traditional financial system design. Such a pattern creates barriers to faster dissemination of financial innovations that may create new opportunities to promote the cashless initiative. With that in mind, this study will address this issue by reflecting on the (global) financial innovations that may foster the cashless initiative.

The remainder of this study is organized as follows. Section 2 provides a general overview of digital transformation in finance. We introduce the cashless society concept and discuss its benefits and challenges. We devise a single metric that captures the level of cashlessness in an economy and compare the countries along this dimension. Section 3 provides an econometric analysis of how digital currencies can facilitate cashless adoption. Section 4 provides a

detailed breakdown of the current state of Serbia's cashless initiative. Section 5 concludes the study with policy implications of digital currency integration, overcoming institutional barriers and strategies for public awareness and acceptance of financial innovations. It identifies potential challenges and opportunities of digital currency adoption specific to the Serbian context.



# DIGITAL TRANSFORMATION IN FINANCE

## THE CONCEPT OF A CASHLESS SOCIETY

The global financial landscape has rapidly evolved in recent years, driven by technological advancements, changing consumer behavior and innovative financial solutions. A cashless society refers to a state in which digital forms of payment, such as electronic transfers, mobile wallets and digital currencies, replace or significantly reduce the use of physical cash in everyday transactions. This transformation has been spurred by the growing prevalence of digital payment platforms, the rise of fintech innovations and the potential of emerging technologies like blockchain.

Physical cash already represents only a small fraction of the money supply in the existing monetary system. The vast majority of the money supply in circulation — around 87% of the Euro area money supply, according to the Statistical Data Warehouse of the European Central Bank (ECB) — is commercial bank money, which is used for payments, e.g., via debit or credit cards.

Naturally, the economies differ in how much people use cash for transactions. Many socioeconomic determinants influence this. We explore them more formally in Section 3. Here, we devise a single metric that captures the degree of cashlessness in a country to facilitate the analysis. To do so, we consider using payment alternatives to cash, such as credit or debit cards, mobile or online apps, mobile money accounts and digital wallets. We also consider the opposing tendencies that perpetuate the use of cash, e.g., wages, remittances, pensions or government transfers received in banknotes. Using all these positive and negative factors from the World Bank's Global Findex Database 2021 for most countries globally, we construct the cashlessness score and normalize it to an absolute scale between 0 and 100. The methodology is described in more detail in Box 1.

Table 1 shows the top ten countries ranked by this cashlessness score in 2021. Not surprisingly, the top five consist exclusively of the Nordic countries, which coincides with the anecdotal evidence and recent publicly discussed tendencies in these economies to abandon the use of cash entirely. Closely behind this group are Canada, New Zealand, Australia, South Korea and Belgium – all markedly above the global score of 54.3.

A deeper look into the data allows us to understand what is behind the high score for the countries that lead in cashless adoption. For instance, the fraction of the population with a debit card is 97.8% in Norway and 99.0% in Denmark, compared to the world average of 52.8%. The mobile bank account was used by 98.1% and 95.5% of the Norwegian and Danish adult population in 2021, respectively, while the global average is only 40.5%. Moreover, 99.4% of adults in Norway and 100.0% of adults in Denmark made or received a digital payment in 2021, compared to 64.1% globally.

**Table 1:** Top ten countries by cashlessness score in 2021.

Rank	Country	Score
1	Norway	86.1
2	Denmark	84.9
3	Iceland	84.6
4	Finland	84.5
5	Sweden	82.7
6	Canada	82.7
7	New Zealand	82.2
8	Australia	81.0
9	Korea, Rep.	79.7
10	Belgium	79.4
	World	54.3

**Source:** Author's calculations based on the World Bank's Global Findex Database 2021.

Cashless adoption has had a steep increasing trend over the last decade. Table 2 shows the evolution of the cashlessness score by region between 2011 and 2021. The global score rose from 30.7 to 54.3 over that period. The most considerable increase was in North America, Europe and Central Asia, and East Asia and Pacific, which is again expected given the extent of technological advancement and innovation in these regions. The slowest moving are the countries of Sub-Saharan Africa and South Asia. Along with the Middle East and North Africa, they are below the global average. Latin American and Caribbean countries were near the world average in 2021.

When we group the countries by income (Table 3), we notice a clear separation: cashless adoption is the fastest among high-income countries. Upper middle-income countries follow but still lag significantly despite a gradually narrowing gap. The lower middle and low groups are catching up substantially slower.

In Section 4, we will focus on Serbia's cashlessness specifically. We will contrast the evolution of its score with those of comparable European countries, the entire region of Europe and Central Asia and the upper-middle-income group.

**Table 2:** Evolution of cashlessness score by region, 2011–2021.

Region	Score			
	2011	2014	2017	2021
East Asia & Pacific	31.0	38.3	45.8	62.7
Europe & Central Asia	35.1	46.0	53.8	67.3
Latin America & Caribbean	30.9	37.8	38.9	53.0
Middle East & North Africa	29.8	N/A	36.2	42.5
North America	41.4	54.9	65.7	77.9
Sub-Saharan Africa	27.4	30.9	33.2	39.8
South Asia	26.3	23.2	31.6	33.1
World	30.7	37.6	42.5	54.3

**Source:** Author's calculations based on the World Bank's Global Findex Database 2021.

**Table 3:** Evolution of cashlessness score by income group, 2011–2021.

Income group	Score			
	2011	2014	2017	2021
High	38.3	52.9	62.0	74.5
Upper Middle	31.3	33.5	45.7	63.8
Lower Middle	27.0	25.9	32.3	34.4
Low	25.8	22.6	30.5	33.2
World	30.7	37.6	42.5	54.3

**Source:** Author's calculations based on the World Bank's Global Findex Database 2021.

### Box 1: Constructing the cashlessness score

The World Bank data can help us reveal the degree of cashlessness of economies worldwide. We use the Global Findex Database 2021 to construct a specific cashlessness score for each country, region and income group on each observation date.

More specifically, we consider the following nine factors for the adult population (i.e., age 15 or above) in each country:

- fraction of the population with a credit card (*credit*);
- fraction of the population with a debit card (*debit*);
- fraction of the population that used a mobile phone or the internet to check account balance (*balance*);
- fraction of the population that used a mobile phone or the internet to make payments, buy things, or send or receive money (*mobpay*);
- fraction of the population with a mobile money account (*mobaccount*);
- fraction of the population that made or received a digital payment (*digitalpmt*);
- fraction of the population that received wages in cash only (*wages*);
- fraction of the population that received government transfer or pension in cash only (*transfer*);
- fraction of the population sent or received domestic remittances in person and cash only (*remit*).

We expect the first six factors to contribute positively to cashlessness, while the last three should

negatively impact it. Since the Global Findex Database is constructed from surveys, the data is available at a low frequency – for years 2011, 2014, 2017 and 2021. The final dataset consists of a panel with 163 countries across four points in time.

The cashlessness score is constructed from the first principal component of the correlation matrix of the nine observed factors. This component explains 59% of variations in the data. Next, we use the factor loadings of the first principal component and create the raw score for each country  $i$  at time  $t$  as:

$$\begin{aligned} raw_{it} = & 0.3220 \textit{credit}_{it} + 0.3698 \textit{debit}_{it} \\ & + 0.4079 \textit{balance}_{it} + 0.4128 \textit{mobpay}_{it} \\ & + 0.2572 \textit{mobaccount}_{it} \\ & + 0.4164 \textit{digitalpmt}_{it} - 0.2598 \textit{wages}_{it} \\ & - 0.2067 \textit{transfer}_{it} - 0.2701 \textit{remit}_{it} \end{aligned}$$

The signs of the factor loadings confirm our intuition about the contribution of each factor.

The lowest hypothetical raw score is equal to  $raw_{\min} = -0.2598$ . It is obtained by setting all factors with a positive cashlessness impact to zero and all those with a negative impact to one. On the other hand, the highest hypothetical raw score is equal to  $raw_{\max} = 2.1861$ . It is obtained by setting all factors with a positive cashlessness impact to one and all those with a negative impact to zero. Using these theoretical bounds, we finally gauge the total score by recalibrating the scale to take values between 0 and 100, i.e.:

$$score_{it} = 100 (raw_{it} - raw_{\min}) / (raw_{\max} - raw_{\min}).$$

## THE RISE OF CENTRAL BANK DIGITAL CURRENCIES

The development of cryptocurrencies put many central banks under pressure to improve the efficiency of payment systems. As an outcome, central bank digital currencies (CBDCs) emerged as digital versions of cash issued and regulated by central banks. CBDCs should be an alternative to fiat money, more secure and less volatile than unbacked crypto assets (Ward & Rochemont, 2019).

CBDCs may seem like a new concept, but they have existed for three decades. In 1993, the Bank of Finland launched the Avant smart card, an electronic form of cash. The system was eventually abandoned in the early 2000s. The worldwide research into CBDCs has proliferated globally relatively recently (see Figure 1). Central banks are now exploring the potential benefits of digital currencies, including how they improve the efficiency and safety of payment systems.

According to the CBDC Tracker portal ([cbdctracker.org](http://cbdctracker.org)), as of September 1, 2023, there were 136 CBDCs in various research stages and three fully launched: the Sand Dollar of the Central Bank of Bahamas in October 2020, the eNaira of the Central Bank of Nigeria in October 2021, and JAM-DEX of the Bank of Jamaica in December 2021. Countries have different rationales for researching and issuing CBDCs. However, the primary driving forces for these three were the necessity to help the underbanked and attempts to reduce the role of cash in the informal economy.<sup>1</sup>

An array of models is under consideration by central banks across the globe. Some undergo joint research projects: Icebreaker, in the case of Bank of Israel, Norges Bank and Sveriges Riksbank; Project Sela, conducted by the BIS Innovation Hub, the Bank of Israel and the Hong Kong Monetary Authority; France & Singapore CBDC, ran by Banque de France and the Monetary Authority of Singapore; Jura, supervised by Swiss National Bank, Banque de France and BIS. In Box 2, we show some examples of CBDC projects in different statuses.

However, the effects of a CBDC on interest rates and financial stability demand a thorough re-evaluation. The associated transformations in financial intermediation would affect bank funding and liquidity.

A switch from public fiat to private electronic money challenges the role of central banks, financial intermediation and the traditional transmission channels of monetary policy and the definition of money and access to legal tender. On the other hand, blockchain enables transactions without a central monetary authority, which may bring essential advantages to future international trade growth. Bitcoin and other algorithmic digital currencies are attainable contenders to central bank fiat currency, and their existence may force central banks to follow tighter monetary policy (Raskin & Yermack, 2016). The underlying blockchain technology can enhance central banks' payment and clearing operations and represents a natural platform for the launch of CBDCs. Sovereign digital currencies could profoundly impact banking systems, narrowing the gap between citizens and central banks and reducing the need to maintain the fractional reserve system through commercial bank deposits.

<sup>1</sup> Currently, the only regional central bank conducting a CBDC research project is the Central Bank of Montenegro. Since April 2023, they have been exploring the introduction of Montenegro Stablecoin.

## Box 2: Examples of CBDC projects

### Hungary CBDC

Issuer: Central Bank of Hungary (MNB)

Announcement year: 2020

Status: Proof of concept

Type: Retail

Description: The MNB announced the creation of their CBDC to join the leading central banks in the field of central bank digital currency research. As a first step, they published a comprehensive study entitled *At the Dawn of a New Age – Money in the 21st Century*, in which they summarize the theoretical considerations, the most important practical issues, the motives behind the potential creation of this new instrument and the opportunities offered by this new form of money. In addition to the conceptual and design considerations of the possible forms of central bank digital currency, it also covers monetary policy, financial stability and cash flow effects, as well as the issues of infrastructural implementation.

Governance structure: MNB's new blockchain technology-based platform is accessible via a mobile application, which provides fun and professional content on the Money Museum and also offers a function as a digital coin register. It provides a dedicated, private blockchain-based NFT (Non-Fungible Token) issuance platform for further technology experimentation.

Main goals: While the MNB sees no urgent need to launch a retail CBDC, it plans to explore further possible use cases. One key incentive would be to foster financial inclusion since 13% of Hungarian adults do not have bank accounts.

### Retail Digital Euro

Issuer: European Central Bank (ECB)

Announcement year: 2021

Status: Research

Type: Retail

Description: A digital euro would create synergies with private payment solutions and contribute to a more innovative, competitive and resilient European payment system. By serving as a unifying force in Europe's digital economies, a digital euro would also be an emblem of the ongoing European integration process.

Main goals: A digital euro could support the Eurosystem's objectives by providing people access to safe money in the fast-changing digital world.

### E-kroner

Issuer: The Danish Central Bank (Nationalbanken)

Announcement year: 2017

Status: Cancelled

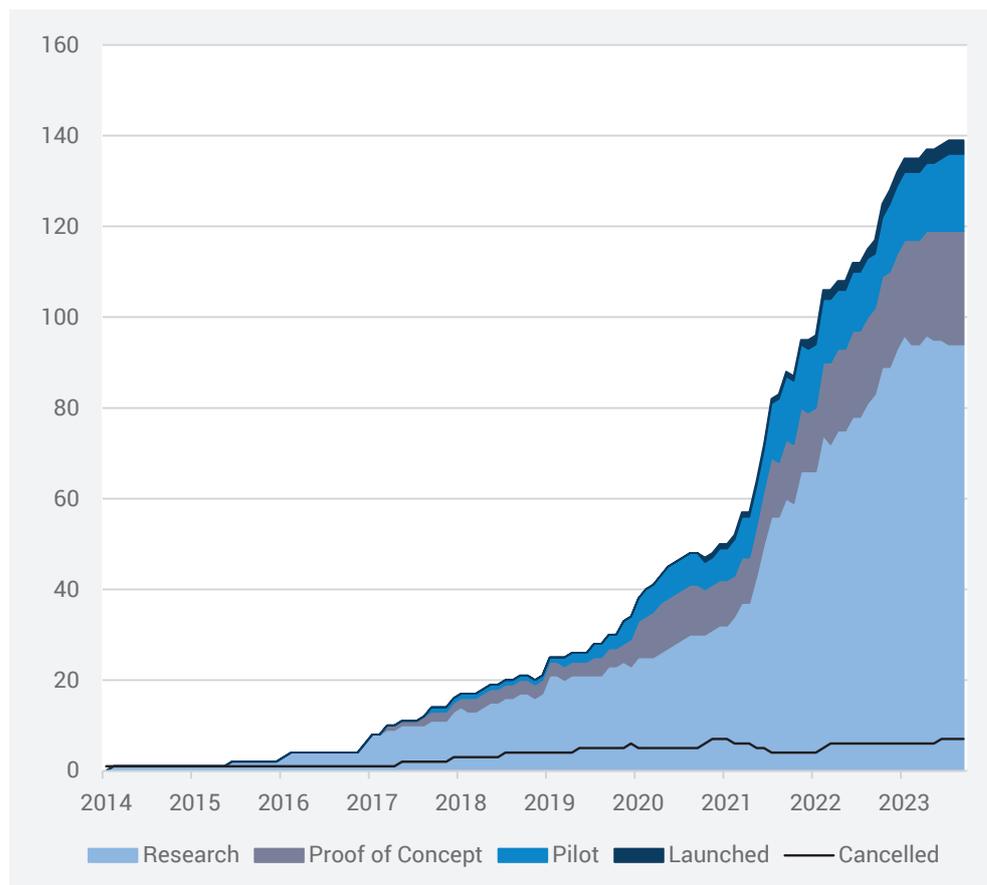
Type: Retail

Description: The Central Bank of Denmark explored the viability of a national digital currency (E-kroner) in 2016 and 2017. The critical question was whether the CBDC should be anonymous or not. In its December 2017 report, the Danish Central Bank concluded that "the potential benefits of introducing central bank digital currency for households and businesses in Denmark would not match the considerable challenges this introduction would present." Citing Denmark's existing secure and effective payment infrastructure, the report noted that the efficiency gains from a CBDC do not outweigh the risks of financial instability that a CBDC can lead to the risk of systemic bank runs.

Main goals: The Nationalbanken confirmed that there is no need for a retail CBDC in Denmark as commercial banks continue to offer their services. The decline in cash usage does not lead to a substantial risk of financial stability.

**Source:** CBDC Tracker

**Figure 1:** CBDC status worldwide by month (January 2014 to September 2023).



**Source:** CBDC Tracker ([cbdctracker.org](https://cbdctracker.org)).

**Research:** first exploratory CBDC research.

**Proof of Concept:** CBDC in advanced research stage.

**Pilot:** CBDC tested in a real environment.

**Launched:** CBDC fully launched.

**Canceled:** CBDC canceled or decommissioned.

Technical concerns associated with performance, scalability, security and compatibility leave central banks skeptical that CBDCs are safe enough to substitute current payment systems. The benefits of CBDCs divided the international community, and different monetary authorities take opposing stances. Ward & Rochemont (2019) discuss these issues thoroughly.

From the implementation perspective, the CBDC business models explored fall into retail and interbank CBDCs. The division mainly reflects the type of issuance and users. Retail CBDCs are predominantly used for daily transactions by consumers, which can reduce operating costs and complex oversight of paper money, help track the money supply and provide more inclusive financing. It is generally fitting for countries with inadequately managed paper money and imperfect circulation. However, the European Central Bank is considering the issuance of its Digital Euro using the retail model (ECB, 2020; see also Box 2).

Interbank CBDCs are adequate for high-valued transactions involving financial institutions or corporate entities. In an interbank digital currency, the central bank is an “information carrier.” It can attach the necessary transaction data to the digital currency, thereby improving informational efficiency and enabling the settlement of extensive bank transactions. It is appropriate for large economies with frequent cross-border trading. The main applications for interbank CBDCs are interbank and security settlements and international trade.

CBDCs warrant many benefits but could have undesired consequences if not well designed. Issuing a CBDC should not change monetary policy objectives or its operational framework. However, Lukonga (2023) finds that CBDCs can generate payment system modifications with adverse spillover effects on monetary policy, impacting money velocity, currency substitution, capital flows, volatility of bank reserves and bank deposit disintermediation. The most vulnerable are those countries with banking systems dominated by small retail and demand deposits, low levels of digital payments and weak macro fundamentals. Caps on CBDC holdings and similar design characteristics of digital currencies can mitigate disintermediation risks. Central banks must ensure that undesired macroeconomic risks are exhaustively identified and adequately managed.





# BENEFITS OF DIGITAL CURRENCIES AND FINANCIAL INNOVATIONS FOR CASHLESS STRATEGIES

## DIGITAL CURRENCIES AND CASHLESSNESS

Digital currencies allow individuals without access to traditional banking systems to participate in the cashless economy. Mobile phones or internet access are often enough to engage in digital currency transactions, breaking down geographical and infrastructural barriers. This accessibility promotes financial inclusion by offering previously underserved populations a secure and convenient way to manage their finances.

Traditional cashless transactions often involve intermediaries such as banks or payment processors, leading to transaction fees and delays. Digital currencies, especially cryptocurrencies, enable direct peer-to-peer transactions. This intermediary reduction leads to quicker and more cost-effective transactions, which is particularly important for international payments and remittances (Putrevu & Mertzanis, 2023). Digital currencies represent a leverage for blockchain technology, which provides secure and transparent transaction records. This technology minimizes fraud and ensures the integrity of transactions. Security concerns are essential in cashless adoption, so the tamper-resistant nature of digital currency transactions may alleviate these matters.

Digital currencies offer a unified payment vehicle for transactions that transcend geographical boundaries. This aspect is particularly advantageous for countries like Serbia involved in international trade and remittances. They can simplify cross-border transactions by removing currency conversion complexities and reducing delays associated with traditional banking systems (Bindseil & Pantelopoulos, 2022). They also allow for microtransactions, enabling the exchange of tiny amounts of value. This trait is beneficial in economies where small transactions are prevalent, such as digital content purchases or daily necessities. Additionally, digital currencies can be divided into fractional units, accommodating transactions of any size.

Digital currencies foster an environment of innovation. They serve as a platform for developing new financial products, services and business models. This ecosystem encourages the creation of user-friendly wallets, payment apps and integrated financial platforms that cater to various population segments. In contrast to unbacked crypto-assets, CBDCs can provide a supervised digital currency option, which can instill confidence in digital transactions and encourage individuals and businesses to adopt digital currencies with the assurance of regulatory oversight.

Bijlsma et al. (2021) find that potential early adopters of a CBDC are younger, educated people with higher incomes. Younger generations are generally more tech-savvy, and growing up in a digital world, they will likely embrace digital financial solutions more readily, contributing to the organic adoption of digital currencies. This demographic dimension may also contribute to the declining use of cash in the future (Sveriges Riksbank, 2018).

Financial innovations, driven by fintech advancements, have had varying impacts on economies of different levels of financial development (Johnson & Kwak, 2012). Integrating these innovations into the financial landscape has brought about transformative changes, influencing efficiency, inclusion and overall economic dynamics (Nejad, 2022).

In advanced economies, fintech-driven financial innovations have led to substantial changes. Mobile payment platforms, digital wallets and blockchain technologies have streamlined payment processes, enhanced consumer convenience and provided new investment avenues (Moro-Visconti & Cesaretti, 2023). Advanced economies have robust technological infrastructure and regulatory frameworks that facilitate the adoption of financial innovations. However, institutional barriers exist even in financially developed countries and regulatory adjustments are required to acclimate new technological standards (Kouhizadeh et al., 2020). Additionally, while public endorsement in such economies may be high, concerns about data privacy, security and conceivable employment losses due to automation must be addressed.

Fintech innovations offer considerable prospects in emerging economies. Putrevu & Mertzanis (2023) discuss these prospects thoroughly. Mobile-based financial services have extended banking access to previously underserved inhabitants (World Bank, 2020). Digital payment systems have reduced the reliance on cash and frictions associated with international trade (Kuehnlenz et al., 2022). However, the adoption of financial innovations in these economies is often constrained by institutional barriers (Udo, 2019). Regulatory frameworks need to be more agile to accommodate the pace of technological change. Moreover, lacking financial literacy and trust in new technologies can hinder adoption, requiring targeted awareness campaigns and educational initiatives.

Fintech-driven innovations have begun percolating even in low-income countries: mobile money services, for instance, have revolutionized financial transactions and enabled essential financial services for unbanked populations, improving financial inclusion (Lashitew et al., 2019; Thomas & Hedrick-Wong, 2019). Institutional barriers in low-income countries can be particularly challenging. Weak regulatory environments, lack of reliable infrastructure and limited access to information and technology hinder the adoption of financial innovations (Ozili, 2020; Nejad, 2022). Addressing these barriers requires a multi-faceted approach involving policy reforms, infrastructure development and capacity building.

In this regard, one might ask whether central banks should start issuing digital currency to the public. This issue is complex, and central banks worldwide will likely face it soon. Schabel & Shin (2018) look to history lessons on the nature of money and the role central banks play in building trust in using money in a society. The economic crisis in Europe during the Thirty Years War (1618-48) was caused by uncontrolled currency debasement, but the establishment of deposit banks rebuilt trust in monetary exchange. Deposit banks were payment banks with deposits fully backed by coins. Howev-

er, they provided a notional currency – bank money – and a platform to settle financial transactions that rebuilt trust in monetary exchange. In the process, bank money established common knowledge of the value of money, which ultimately brought about greater confidence in transactions and broader participation in economic activity. This historical analogy can be used to analyze the benefits of a fully backed digital asset, such as CBDC, over alternatives like cryptocurrencies and unbacked stablecoins in replacing traditional cash transactions.

To explore how cashless adoption is associated with research and development of CBDCs, we use a panel of 158 countries between 2011 and 2021. For each country  $i$  and year  $t$ , we run the following regression:

$$score_{it} = \alpha_i + \sum_{k=1}^K \beta_k D_{it}^k + \sum_{l=1}^L \gamma_l controls_{it}^l + \varepsilon_{it}. \quad (1)$$

In Equation (1), the dependent variable  $score_{it}$  represents the cashlessness score constructed from nine Global Findex Database 2021 factors (see Box 1 for details). The main set of explanatory variables is  $D_{it}^k$ . This is the set of dummy variables that track the various stages of CBDC development, constructed from the CBDC Tracker database (see Box 2 for examples of different development stages). The set contains three dummies: *Research*, having the value of one if a CBDC is in the research stage and zero otherwise; *PoC*, if a CBDC has reached the proof-of-concept stage and zero otherwise; *Pilot/Launched* if a CBDC is in the pilot stage or launched and zero otherwise. The control variables are introduced to pick up other traits arising from natural, economic or institutional environments that can affect a country's decision to become cashless. Here, we use population size, GDP per capita and IMF Financial Development indicator (FD) for simplicity, but the analysis can also be extended to other factors.

To run the regression given by Equation (1), we keep the observations matching the dependent variable's time and cross-sectional dimension. The descriptive statistics of the dataset are shown in Table 4.

**Table 4:** Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Score	428	42.073	16.480	16.465	86.078
Research	428	0.110	0.313	0	1
PoC	428	0.023	0.151	0	1
Pilot/Launched	428	0.028	0.165	0	1
Population (million)	428	37.589	126.523	0.230	1153.773
GDPpc (000 constant USD)	417	14.179	19.160	0.308	107.142
FD	406	0.360	0.240	0.041	0.957

**Source:** Author's calculations based on the World Bank and IMF data.

The Hausman specification test performed on the model has a highly significant test statistic, suggesting the rejection of the null hypothesis that the preferred model is random effects. Thus, we opt for the fixed effects model. The results are shown in Table 5. We run two versions of this model: one with the original variables and the other where the continuous independent variables (i.e., controls in this case) are winsorized at the top and bottom 5 percent of the most extreme observations. The second version of the model was intro-

duced as a simple robustness check to ensure the outliers in controls do not drive the results.

The results indicate a robust positive association between the development of digital currencies and the degree of cashlessness: all dummies are highly significant in both models. The interpretation of this finding is straightforward: countries that push for the development of CBDCs tend to be the same ones that are prone to reducing the use of cash in their economies. The most substantial effect on the cashlessness score is when a CBDC is in the proof-of-concept stage, followed by the pilot or launch stages. The PoC is around twice as impactful as the research stage for the untransformed and the winsorized controls. Advancing the project from the research stage to PoC is associated with an average increase in the cashlessness score by 8.5 and 6.3, respectively. To understand this impact, we can recall that the scores between upper middle-income countries and the global average differed by about 8.5 in 2021 (Table 3).

**Table 5:** Coefficient estimates in the fixed-effects model, which explores how cashlessness is associated with research and development of digital currencies.

Dependent variable: Score	Untransformed controls	Winsorised controls
Constant	10.96*** (8.19)	-42.69*** (10.37)
Research	7.45*** (1.59)	6.52*** (1.43)
PoC	15.96*** (3.16)	12.85*** (2.87)
Pilot/Launched	9.92*** (2.92)	7.19*** (2.69)
Population	0.14 (0.09)	0.75*** (0.26)
GDPpc	1.66*** (0.24)	4.79*** (0.45)
FD	0.83 (19.38)	1.32 (17.41)
Country fixed effects	Yes	Yes
Observations	398	398
Within- $R^2$	0.37	0.48
Between- $R^2$	0.53	0.69
Overall/average $R^2$	0.45	0.58
$F$ statistic	23.58***	38.53***

**Source:** Author's calculations based on the World Bank and IMF data.

Standard errors are given in parentheses. The asterisks denote the usual significance levels:

\* for  $p$ -value < 0.10, \*\* for  $p$ -value < 0.05 and \*\*\* for  $p$ -value < 0.01.

The results hold in the presence of controls. GDP per capita is highly significant, showing that cashlessness is strongly associated with high output. The effect is substantial in the winsorized case, where an additional thousand dollars of output per capita increases the cashlessness score by around 4.8. Population only becomes significant when we remove the outliers, implying that larger countries are more prone to cashless initiatives on average. The winsorized model has slightly better explanatory power than the untransformed one, having an overall  $R^2$  of 0.58. The between  $R^2$  of the winsorized model indicates that the model can explain around 69 percent of the variance between countries. Both models also exhibit high joint significance, indicated by the double-digit values of the  $F$  statistic.

## FINANCIAL INNOVATIONS AND CASHLESS ADOPTION: THE SERBIAN CONTEXT

As a transitioning economy, Serbia faces unique challenges and opportunities. Adopting fintech innovations in Serbia could drive financial inclusion, enhance efficiency and offer new economic possibilities (Randelović & Tanasković, 2023a). Mobile payment platforms and digital wallets can empower the unbanked, while blockchain applications could improve transparency and reduce fraud (World Bank, 2020).

Serbia's regulatory framework might need some adaptation to accommodate all fintech innovations. Ensuring data security and privacy in a digital context is crucial. Furthermore, building trust in these new systems requires transparent communication and effective enforcement of consumer protection measures.

Serbia falls between emerging and advanced economies in terms of financial development. This position facilitates leveraging the experiences of advanced economies in fintech adoption and the lessons learned from emerging markets' efforts to overcome infrastructure and regulatory challenges (see, for instance, Putrevu & Mertzanis, 2023).

The impact of financial innovations and cashless adoption varies across economies based on financial development stages. Understanding the contextual nuances, such as technological infrastructure, regulatory environment and institutional barriers, is crucial for Serbia's successful integration of financial innovations. By carefully navigating these factors, Serbia can harness the potential of fintech-driven innovations to enhance financial inclusion, efficiency and economic growth.

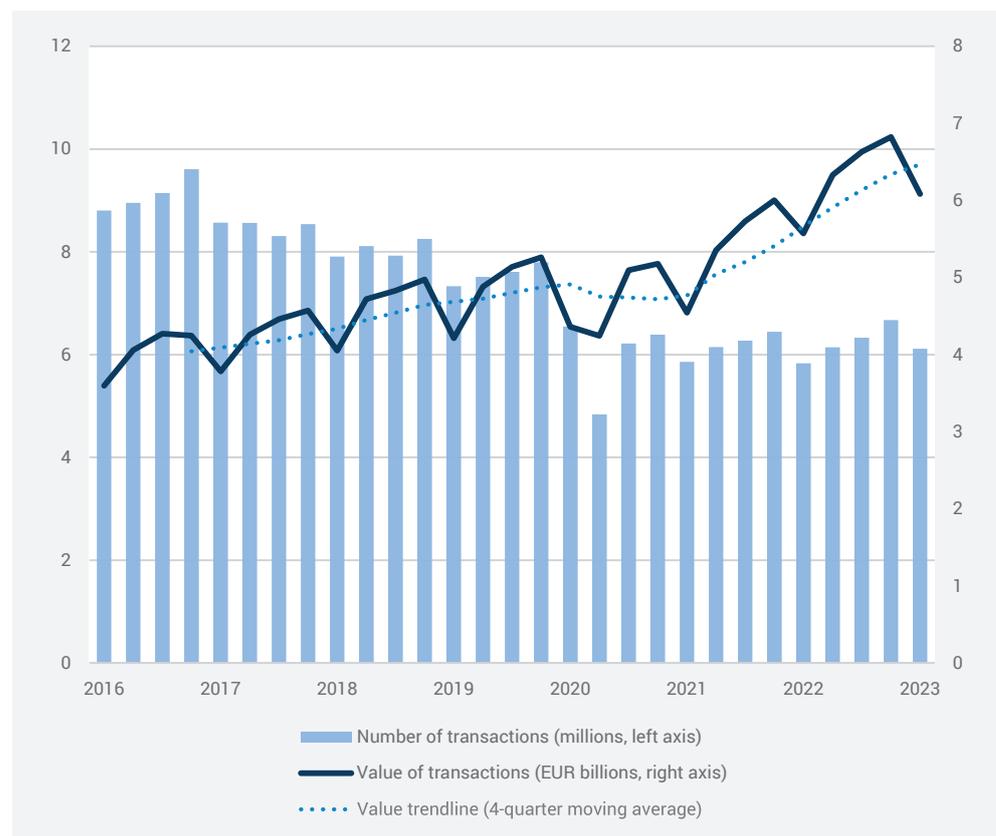


# IMPACT ASSESSMENT ON SERBIA'S CASHLESS INITIATIVE

Implementation of cashless payment systems is demanding, and each country faces its idiosyncrasies. Ng et al. (2021) discuss various challenges of cashless payment implementations. They find that developing countries can overcome legacy infrastructures through mobile payment solutions. In contrast, developed countries may face settlement delays and transaction costs.

This Section addresses the potential for digital transformation from the Serbian perspective. The Serbian society has already made some necessary steps in that direction, as the number of cash transactions shows a decreasing tendency. At the same time, the use of cards and electronic money has gained significant momentum over the last decade.

**Figure 2:** Payment account placements in Serbia between 2016 Q1 and 2023 Q1



**Source:** Author's calculations based on the data from the National Bank of Serbia.

Figure 2 illustrates the payment account placements in Serbia between the first quarter of 2016 and the first quarter of 2023. The total number of cash transactions related to payment account placements decreased by around 30% during the observation period. However, the monetary value of these transactions shows an increasing trend. Despite a strong seasonal pattern, the transaction value has increased by almost 70% since 2016. Therefore, cash placements are becoming more scarce but bulkier, progressively dominated by fewer transactions in more substantial amounts.

**Figure 3:** Payment account withdrawals in Serbia between 2016 Q1 and 2023 Q1



**Source:** Author's calculations based on the data from the National Bank of Serbia.

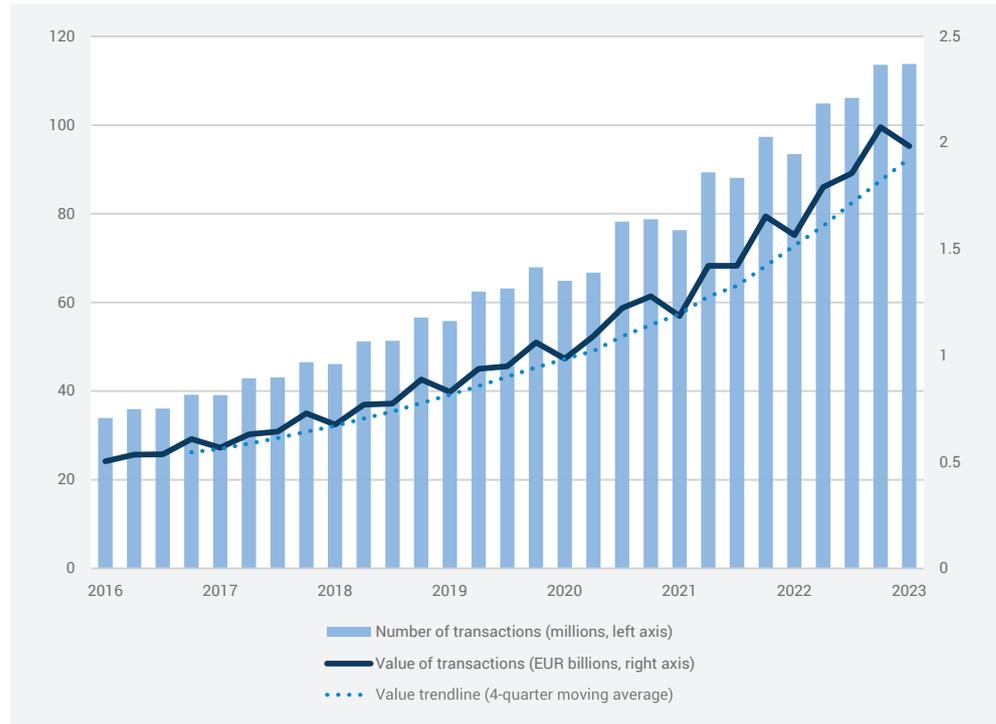
Cash withdrawals, shown in Figure 3, exhibit a similar gradually decreasing pattern. Parallel to the placements, the monetary value of withdrawal transactions has also increased since 2016, albeit at a steadier pace of around 27%.

The decline in the use of cash is leaving space for electronic means of payment, such as bank cards and mobile payment platforms. Anecdotally, digital payments via card, mobile banking apps or even digital wallets become increasingly common, to the extent that many people no longer carry cash. However, debit cards are still dominant among electronic means of spending.

Figure 4 illustrates the payment transactions by locally issued cards and e-money in Serbia between 2016 Q1 and 2023 Q1. The increasing trend is evident both in the number and value of transactions. The number of transactions spiked from 34 to 114 million over the last seven years, while their value quadrupled in the same period, from 0.5 to almost 2 billion euros. The trend is even more pronounced for card and e-money payments made to accounts abroad (Figure 5). The number increased by a factor of five, from 2 to 10 million, and the transaction value increased from 88 to 352 million euros. Still, cashless payments might not be the option for everyone, leaving cash as an essential means of payment for part of the population, including those who do not wish to or cannot manage their expenditures electronically. We will address this important issue later.

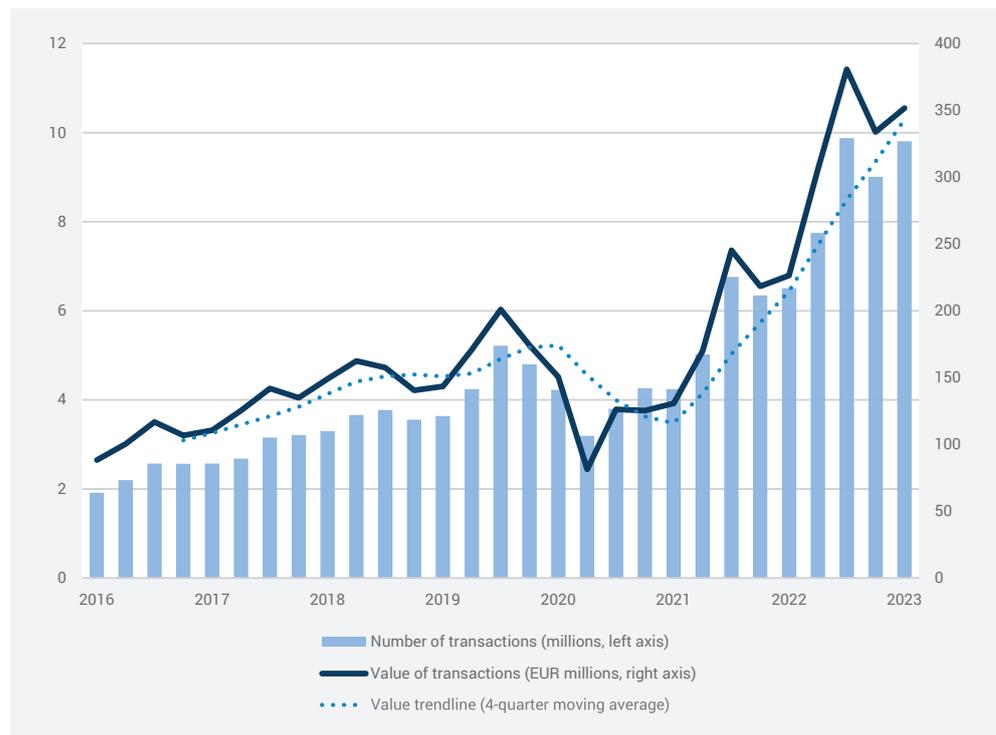
There is a strong trend that payment transactions become progressively more initiated electronically. Figure 6 shows that at the beginning of 2016, the number of transactions initiated in paper form represented as high as 70% of the total transactions with a payment order. In 2021, the number of paper- and electronically-initiated transactions were approximately the same. During the first quarter of 2023, there were almost 4 million more electronically initiated transactions than the paper-based ones.

**Figure 4:** Payment transactions of funds transfer performed in Serbia by locally issued cards and e-money between 2016 Q1 and 2023 Q1



**Source:** Author's calculations based on the data from the National Bank of Serbia.

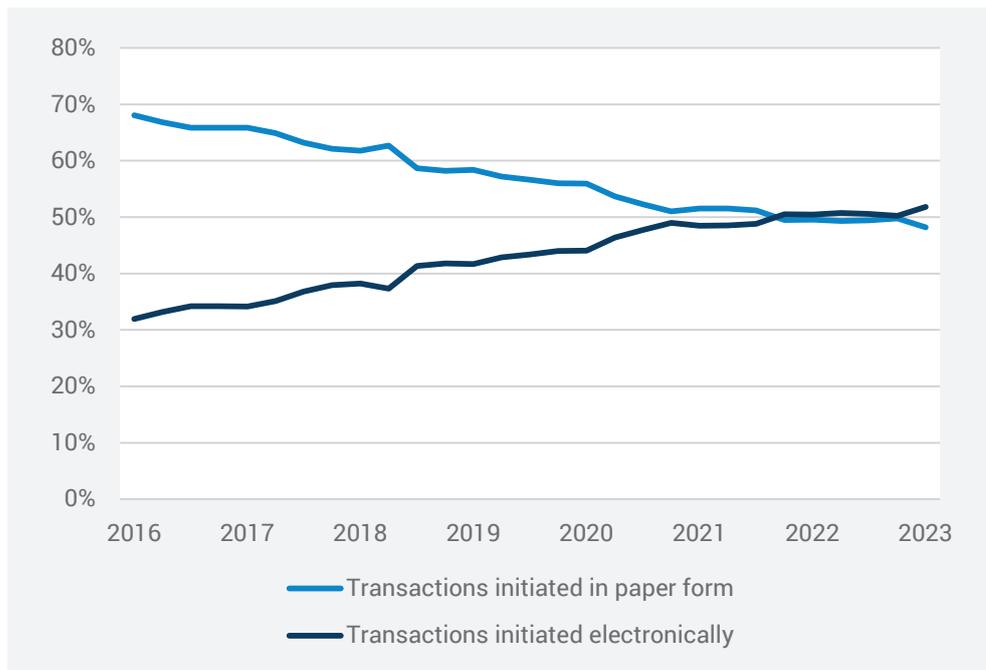
**Figure 5:** Payment transactions of funds transfer performed outside of Serbia by locally issued cards and e-money between 2016 Q1 and 2023 Q1



**Source:** Author's calculations based on the data from the National Bank of Serbia.

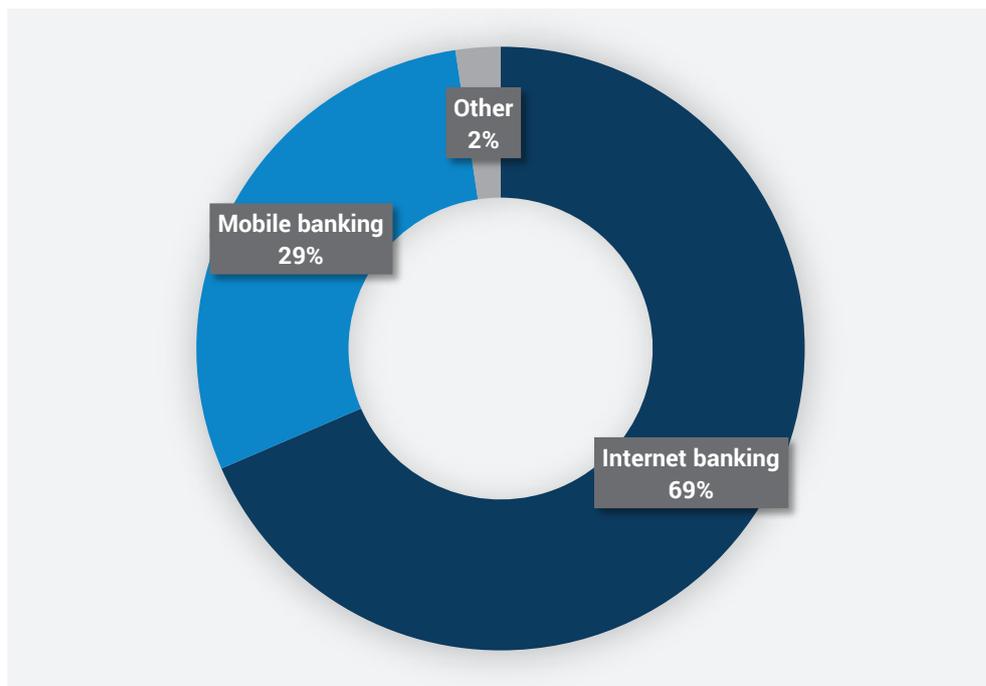
Figure 7 shows the structure of electronic payment transactions in Serbia between 2016 Q1 and 2023 Q1. Most electronic transactions were initiated through online banking platforms (69%), followed by mobile apps (29%). The remaining electronic payment transactions mostly came as standing orders and transfers conducted via an ATM.

**Figure 6:** Payment transactions in Serbia between 2016 Q1 and 2023 Q1. The graph shows the number of transactions initiated in paper form and electronically as a percentage of the total number of transactions with a payment order.



**Source:** Author's calculations based on the data from the National Bank of Serbia.

**Figure 7:** The structure of electronic payment transactions in Serbia between 2016 Q1 and 2023 Q1.



**Source:** Author's calculations based on the data from the National Bank of Serbia.

Table 6 shows the evolution of the cashlessness score in Serbia between 2011 and 2021. We can notice that Serbia tracks close to the global average, showing an increasing tendency towards cashless payments but still lagging behind its peers from the upper-middle-income group, as well as Europe and Central Asia. The gap with the Euro area is even more pronounced. Serbia falls in between compared to the Central, Eastern and Southeastern European countries. On the one hand, its cashlessness score is still substantially behind those of the stronger regional economies that are EU members, such as Slovenia, Czech Republic, Slovakia or Poland, but also behind Greece, Hungary and Croatia. This tendency holds both for the levels and the speed of cash-

less adoption. On the other hand, the score evolves more rapidly than in four neighboring countries (Albania, Bosnia and Herzegovina, Montenegro and Romania). Roughly, it goes on par with Bulgaria and North Macedonia.

The origin of this result becomes clear once we dig deeper into the factors. In 2021, only 16.2% of adults in Serbia owned a credit card, compared to 24.5% globally. The population relies more on debit cards (61.5%, above the global average of 52.8%). Even though 40.8% of people in Serbia above the age of 15 use their mobile or online apps to check their account balances, only 28.3% use these apps to make payments or pay for goods and services from their bank accounts. This fraction is surprisingly low and coincides with anecdotal evidence that the bank and post offices in major cities are always full and busy. Wages, pensions and similar transfers made in cash are less prevalent in Serbia than most countries in the rest of the world. With 5.5% and 6.6%, respectively, they still have a reduction potential. However, among the most significant impediments to wider cashless adoption in Serbia are remittances, where 42.5% of adults who sent or received such transfers did so in cash.

**Table 6:** Evolution of cashlessness score in Serbia and comparable countries, 2011–2021.

Country/Region	Score			
	2011	2014	2017	2021
Serbia	33.1	36.8	44.7	52.0
Albania	29.0	24.1	29.7	26.9
Bosnia & Herzegovina	30.8	28.8	37.9	45.0
Bulgaria	32.1	33.4	43.2	53.3
Croatia	38.5	45.7	54.4	60.7
Czech Republic	35.8	41.6	54.4	73.1
Greece	31.4	35.7	47.3	67.7
Hungary	34.8	37.0	47.5	63.8
Montenegro	29.5	30.0	39.2	N/A
North Macedonia	31.6	41.5	45.2	50.2
Poland	31.9	38.6	56.0	70.4
Romania	30.0	33.5	36.2	46.8
Slovak Republic	36.1	40.0	53.6	71.8
Slovenia	41.1	53.0	62.0	73.8
Upper Middle-Income Countries	31.3	33.5	45.7	63.8
Europe & Central Asia	35.1	46.0	53.8	67.3
Euro area	37.9	52.4	61.7	74.1
World	30.7	37.6	42.5	54.3

**Source:** Author's calculations based on the World Bank's Global Findex Database 2021.

Although our findings indicate a promising trend toward digital transformation in Serbia and a strong potential for further financial innovations, adopting digital currencies presents various opportunities and challenges that merit careful consideration within the country's economic and financial ecosystem. Central to the potential benefits of digital currencies is their capacity to address issues related to the shadow economy (cf. Arsić, Randelović & Tanasković, 2023). Particularly, CBDCs have the potential to enhance transparency and traceability in financial transactions. Such enhancement could

reduce instances of tax evasion, money laundering and illicit economic activities, leading to improved tax revenue generation and the expansion of the formal economy.

Cross-border transactions stand to be streamlined through digital currencies, particularly pertinent for Serbia due to its active involvement in international trade and reliance on remittances. Reducing intermediaries and associated transaction costs could enhance economic efficiency in cross-border financial interactions (Bindseil & Pantelopoulos, 2022).

Embracing digital currencies promises to promote financial inclusion with mobile-based payment platforms (Figure 7). By offering accessible and affordable transaction methods, Serbia can potentially bring segments of its population previously excluded from formal financial services into financial activity (Randelović & Tanasković, 2023a; Tan, 2023).

Public sector operations could also experience a notable boost in efficiency through CBDCs. Transactional processes within government entities could be streamlined, reducing administrative overhead and improving resource allocation and public service transparency.

# POLICY IMPLICATIONS AND FUTURE PATH

**The benefits of transitioning to a cashless society** are multi-faceted and have implications for individuals, businesses, governments and economies. Some key benefits to highlight include:

*Convenience and Accessibility* – Digital payment methods offer unparalleled convenience. People can make transactions anytime, anywhere, without needing physical cash. This accessibility is particularly advantageous for the unbanked or underbanked, as they gain access to financial services through mobile phones and other digital channels.

*Reduced Transaction Costs* – Cash handling involves various costs, including printing, distribution, storage and security. These costs are significantly diminished in a cashless society, potentially reducing costs for governments and financial institutions.

*Enhanced Financial Inclusion* – Digital payment platforms can help bridge the financial inclusion gap by providing services to previously underserved populations. The ease of setting up digital accounts and making transactions fosters participation in formal financial systems, enabling individuals to save, borrow and invest more effectively.

*Transparency and Accountability* – Digital transactions are inherently traceable, enhancing transparency and reducing the scope for illicit financial activities. They can help combat corruption, tax evasion and money laundering.

*Innovative Financial Services* – The shift to digital payments has paved the way for financial innovations, including peer-to-peer payments, robo-advisors and micro-investment platforms. These innovations democratize access to financial tools and services traditionally available only to a limited population segment.

*Efficiency in Government Services* – Governments can leverage digital payment systems to streamline public services and benefit delivery. This leverage can lead to a more efficient and accurate distribution of resources to citizens.

*Environmental Considerations* – The reduced reliance on physical cash can contribute to environmental sustainability by decreasing the need for paper currency production and transportation.

*Data Insights* – Digital transactions generate valuable data that can be analyzed to gain insights into consumer spending patterns, economic trends and preferences. This information can be used for better policy formulation and targeted marketing strategies.

While the benefits are compelling, **transitioning to a cashless society carries significant challenges**. These challenges include concerns about privacy, security, cyber threats, unequal access to technology and the potential exclu-

sion of vulnerable populations. As a country embarks on its cashless initiative, evaluating these benefits and challenges in the context of the local economy, regulatory framework, and societal norms will be crucial for effective implementation. The complexity of the transition to a cashless economy and relevant international experience was previously discussed by Randelović & Tanasković (2023b), who also provide specific policy implications for Serbia.

**Digital currencies and financial innovations drive profound shifts in the global economic landscape.** These advancements transform traditional financial systems and fundamentally change how economies function and interact. Their significance lies in their potential to reshape various aspects of the financial sector and beyond. These aspects include redefining financial transactions and strengthening transparency and security, disrupting traditional banking and unlocking new business models, fostering financial inclusion and encouraging technological adaptation and enhancing financial and regulatory efficiency.

## FINANCIAL TRANSACTIONS

Digital currencies, particularly cryptocurrencies and CBDCs, are revolutionizing transactions. By enabling secure, decentralized and instantaneous peer-to-peer transactions, these currencies redefine the very nature of money and value transfer.

Digital currencies facilitate cross-border transactions, removing intermediaries and reducing transaction fees and processing times. This aspect significantly affects international trade, remittances and global economic interactions. Blockchain technology, a core innovation behind many digital currencies, enhances transparency, security and accountability in financial transactions. It has the potential to combat fraud, money laundering and corruption by providing an immutable record of transactions.

## NEW BUSINESS MODELS

Financial innovations driven by fintech companies are challenging traditional banking models. Mobile banking, robo-advisors and blockchain-based financial services provide alternatives to traditional banking, making financial products and services more accessible and convenient. Financial innovations are opening doors to innovative business models and economic opportunities. Peer-to-peer lending, crowdfunding and decentralized finance (DeFi) platforms are changing how capital is raised, allocated and utilized.

## FINANCIAL INCLUSION AND TECHNOLOGICAL ADAPTATION

Digital currencies and financial innovations are bridging gaps in financial access. Mobile payment platforms and digital wallets empower individuals previously excluded from formal financial systems, promoting financial inclusion and reducing inequalities. The advent of digital currencies and financial innovations also encourages societies to adapt to technological changes. People are becoming accustomed to digital payment methods and exploring new ways of managing their finances.

## EFFICIENCY AND FAIRNESS

The digitization of payments and financial processes improves efficiency, reduces administrative overhead and minimizes operational costs for businesses and financial institutions. The emergence of these innovations necessitates regulatory adjustments to ensure consumer protection, prevent misuse and foster a fair financial ecosystem. Striking the right balance between innovation and regulation is a critical consideration.

Despite these opportunities, **adopting digital currencies in Serbia might need to overcome several challenges.** Crafting a legislative and regulatory framework that accommodates innovation while ensuring consumer protection and compliance with anti-money laundering (AML) and know-your-customer (KYC) regulations is a complex task that requires meticulous attention. A positive step toward a comprehensive legal framework is adopting the Law on Digital Assets by the National Assembly of the Republic of Serbia, which entered into force in December 2020 and has been applied since June 2021.<sup>2</sup> Driving public awareness and fostering acceptance of digital currencies within society is also crucial. Educating the populace about the mechanics, risks, and appropriate usage of digital currencies is essential to building public trust and encouraging widespread adoption.

The technological infrastructure of the Serbian financial system requires thorough evaluation and potential enhancement to accommodate secure and efficient digital currency transactions. This issue necessitates addressing cybersecurity concerns and establishing a reliable ecosystem for digital payments. Equity in access to digital currencies is another pivotal matter. Ensuring that all segments of the population can participate without exclusion is vital. Special consideration should be devoted to the older population and those without access to modern technology, preventing a digital divide from arising.

The inherent volatility of digital currencies poses challenges for their adoption in daily transactions.<sup>3</sup> Establishing mechanisms to stabilize these values and prevent drastic fluctuations is essential for fostering a stable economic environment. Furthermore, the interplay between digital currency adoption and monetary policy requires careful calibration. Balancing the benefits of innovation with preserving macroeconomic stability is an intricate endeavor. In a global context, coordination among nations is necessary for seamless transactions and regulatory harmonization. Ensuring that digital currencies can effectively transcend geographical boundaries without regulatory complexities is crucial.

The opportunities and challenges posed by the potential adoption of CBDCs in Serbia require a comprehensive assessment. While digital currencies can potentially reshape financial transparency, inclusion and efficiency, the challenges of regulatory adaptation, public acceptance, technical readiness and economic stability must be effectively addressed to harness the potential benefits and mitigate associated risks.

<sup>2</sup> Official Gazette of the Republic of Serbia, No. 153/2020.

<sup>3</sup> The exceptions are stablecoins, cryptocurrencies pegged to another fiat currency, commodity or financial instrument.

## REFERENCES

- Arsić, M., Randelović, S. and Tanasković, S. (2023), “The impact of an increase in cashless payments on the shadow economy and public finance in Serbia”, Foundation for the Advancement of Economics (November 2023). Available at: <https://fren.org.rs/wp-content/uploads/2022/12/THE-IMPACT-OF-AN-INCREASE-IN-CASHLESS-PAYMENTS-ON-THE-SHADOW-ECONOMY-AND-PUBLIC-FINANCE-IN-SERBIA.pdf>
- Bijlsma, M., van der Cruijssen, C., Jonker, N. and Reijerink, J. (2021), “What triggers consumer adoption of CBDC?” De Nederlandsche Bank Working Paper No. 709, Available at SSRN: <https://ssrn.com/abstract=3836440>
- Bindseil, U. and Pantelopoulos, G. (2022). “Towards the Holy Grail of Cross-Border Payments”. ECB Working Paper No. 2022/2693, Available at SSRN: <https://ssrn.com/abstract=4178863>
- ECB (2020), “Report on a digital euro”, European Central Bank (October 2020). Available at: [https://www.ecb.europa.eu/pub/pdf/other/Report\\_on\\_a\\_digital\\_euro~4d7268b458.en.pdf](https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf)
- Johnson, S. and Kwak, J. (2012), “Is Financial Innovation Good for the Economy?“, *Innovation Policy and the Economy* 12(1), 1-110. DOI: 10.1086/663153
- Kouhizadeh, M., Saberi, S. and Sarkis, J. (2020), “Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers,” *International Journal of Production Economics* 231, 107831. DOI: 10.1016/j.ijpe.2020.107831
- Kuehnlentz, S., Orsi, B. and Kaltenbrunner, A. (2022), „Central bank digital currencies and the international payment system: The demise of the US dollar?“ *Research in International Business and Finance* 64, 101834. DOI: 10.1016/j.ribaf.2022.101834
- Lashitew, A. A., Van Tulder, R. and Liasse, Y. (2019), “Mobile phones for financial inclusion: What explains the diffusion of mobile money innovations?“ *Research Policy*, 48(5), 1201-1215. DOI: 10.1016/j.respol.2018.12.010
- Lukonga, I. (2023), “Monetary policy implications of central bank digital currencies: perspectives on jurisdictions with conventional and Islamic banking systems”, IMF Working Paper No. 23/60, International Monetary Fund, Washington DC. Available at: <https://www.imf.org/-/media/Files/Publications/WP/2023/English/wpiea2023060-print-pdf.ashx>
- Moro-Visconti, R. and Cesaretti, A. (2023), “FinTech and Digital Payment Systems Valuation”. In: *Digital Token Valuation*. Palgrave Macmillan, Cham. DOI: 10.1007/978-3-031-42971-2\_13
- Nejad, M. G. (2022), “Research on financial innovations: an interdisciplinary review“, *International Journal of Bank Marketing* 40(3), 578-612. DOI: 10.1108/IJBM-07-2021-0305
- Ng, D., Kauffman, R. J., Griffin, P. and Hedman, J. (2021), “Can we classify cashless payment solution implementations at the country level?“, *Electronic Commerce Research and Applications* 46, 101018. DOI: 10.1016/j.elerap.2020.101018
- Ozili, P. K. (2020), “Contesting digital finance for the poor”, *Digital Policy, Regulation and Governance* 22(2), 135-151. DOI: 10.1108/DPRG-12-2019-0104
- Putrevu, J. and Mertzanis, C. (2023). “The adoption of digital payments in emerging economies: challenges and policy responses”, *Digital Policy, Regulation and Governance*, ahead-of-print. DOI: 10.1108/DPRG-06-2023-0077

- Randelović, S. and Tanasković, S. (2023a), “The impact of the transition to a cashless economy on disadvantaged groups in Serbia”, Foundation for the Advancement of Economics (April 2023). Available at: [https://fren.org.rs/wp-content/uploads/2023/05/FREN\\_Impact-of-cashless-economy-on-disadvantaged-groups-1.pdf](https://fren.org.rs/wp-content/uploads/2023/05/FREN_Impact-of-cashless-economy-on-disadvantaged-groups-1.pdf)
- Randelović, S. and Tanasković, S. (2023a), “Promotion of the transition to a cashless economy: International experience and recommendations for public policies in Serbia”, Foundation for the Advancement of Economics (June 2023). Available at: [https://fren.org.rs/wp-content/uploads/2023/06/FREN\\_Promotion-of-the-transition-to-a-cashless-economy-in-Serbia-1.pdf](https://fren.org.rs/wp-content/uploads/2023/06/FREN_Promotion-of-the-transition-to-a-cashless-economy-in-Serbia-1.pdf)
- Raskin, M. and Yermack, D. (2016), “Digital currencies, decentralized ledgers, and the future of central banking”, NBER working paper 22238. Available at: <http://www.nber.org/papers/w22238>
- Schabel, I. and Shin, H. S. (2018). “Money and Trust: Lessons from the 1620s for Money in the Digital Age.” BIS Working Paper 698, Bank for International Settlements, Basel. Available at: <https://www.bis.org/publ/work698.htm>
- Sveriges Riksbank (2018). “The Payment Behaviour of the Swedish Population.” Stockholm. Available at: <https://www.riksbank.se/en-gb/statistics/statistics-on-payments-banknotes-and-coins/payment-patterns/>
- Tan, B. (2023), “Central Bank Digital Currency and Financial Inclusion”, IMF Working Paper No. 23/69, International Monetary Fund, Washington DC. Available at: <https://www.imf.org/-/media/Files/Publications/WP/2023/English/wpiea2023069-print-pdf.ashx>
- Thomas, H. and Hedrick-Wong, Y. (2019), “How Digital Finance and Fintech Can Improve Financial Inclusion”, *Inclusive Growth*, Emerald Publishing Limited, Bingley, pp. 27-41. DOI: 10.1108/978-1-78973-779-020191004
- Udo, M. (2019), “International payments: Current alternatives and their drivers“, *Journal of Payments Strategy & Systems* 13(3), 201-216. Available at: <https://www.ingentaconnect.com/contentone/hsp/jpps/2019/00000013/00000003/art00004>
- Ward, O. and Rochemont, S. (2019), “Understanding Central Bank Digital Currencies (CBDC): An addendum to ‘A Cashless Society- Benefits, Risks and Issues (Interim paper)’”, Institute and Faculty of Actuaries (March 2019). Available at: <https://www.actuaries.org.uk/system/files/field/document/Understanding%20CBDCs%20Final%20-%20disc.pdf>
- World Bank (2020). *Digital Financial Services*. World Bank, Washington, DC. Available at: <https://pubdocs.worldbank.org/en/230281588169110691/Digital-Financial-Services.pdf>
- World Bank (2021). *Central Bank Digital Currency: A Payments Perspective*. World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/36765>

