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# **TRENDS AND DETERMINANTS OF CASH USAGE IN NON-EUROZONE EU MEMBER STATES<sup>1</sup>**

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### ***Abstract***

*Technological progress and digital innovations changes consumer payment habits worldwide. Although cash payments are still predominant payment method in European countries, a decreasing trend is observed. Simplicity and accessibility of non-cash ways of payments, along with decreasing availability and restrictions on the use of cash, threaten to push cash from circulation. On the other hand, European Central Bank expressed the importance of cash as a store of value and reliable payment instrument that should be available to all eurozone citizens. The aim of this paper is to analyse the trends and determinants of cash usage in 8 non-euro zone European union countries over the 2013 – 2021 period, based on set of selected indicators. The result show heterogeneity within the group, but with a common downward trend, and the significant influence of technological and sociocultural indicators on cash usage.*

***Keywords: Non-euro zone member states, payment habits, demand for cash, determinants of cash usage***

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## 1. INTRODUCTION

Increasing number of mobile phone users, fast development of electronic ways of payment and innovations in financial services enabled the consumers fast and easy way of purchase at any place and any time, without use of cash. Although it was expected that the digital payment innovations would influence consumer payment behaviour and direct them more to non-cash payments, the data show that the cash payment is still predominant way of consumer attitude in eurozone countries. The data for euro area show that 59 % of point-of-sale (POS) transactions volume in 2022 were carried out using cash, meaning that every 3 of 5 transactions is made with cash. Although it seems that share of cash is very high, compared to 2019 data, cash payments show decline, both in share and value, since earlier share of cash transactions amounted 72 % in volume. In terms of value, according to European central bank data (ECB), cards accounted for a higher share of value of transaction with 46 % of total amount of transactions, compared to 42 % of cash transaction in 2022, while in 2019 this ratio was 47% for cash and 43 % for card payments (ECB, 2022). According to the same data, cash was mostly used for smaller payments, and cards were predominant way of payment for amounts over 50 EUR. Payment methods that replace cash are changing rapidly. Checks, that were very popular substitute for cash payment in 1960s of 20 century, today are almost out of use and replaced by debit and credit cards. Recent data show increase in number of credit card holders in eurozone, showing 1,9 payment cards per one eurozone inhabitant (ECB, 2021). It seems that Covid pandemic has had a significant impact on consumer behaviour directing them to cash substitutes such as cards, mobile phone payments and other electronic payment methods, with the purpose of keeping distance and avoiding viral transmission of virus through cash exchange. Internet search of “cash and virus “soared into the sky around the world, particularly in the peak of pandemic and in countries with stricter lockdowns (Auer, Cornelli & Frost, 2023, p.2). Some European countries experienced a drastic drop in use of cash in the last few years. Good example is Sweden which is rapidly shifting away from cash. Riksbank data show that more than a half of bank branches in Sweden do not hold cash any more, and cash amounts to 13 % of transactions in stores in Sweden (Ingves, Riksbank, 2018). Norway is even better example with the decline in the use of cash by 43 % in the last decade (Armelius, Cllausen & Reslow, 2020, p.33). On the other hand, some other parts of the world record an increase in the usage of cash. Armelius, Cllausen and Reslow (2020) find that Sweden and Norway have been lonely birds so far, and that most of the countries have experienced the growth in cash-usage in the period of 2007-2018, some of them even more than 100 % such as United States, Turkey, Chile, Mexico, South Korea, Israel, but also some European countries like Czech Republic, Poland, Hungary, but also Iceland. Chen et al. (2020) finds that the usage of cash in Canada rise despite the overall decline in consumption during pandemic, and that a majority of Canadians have no plans to go cashless (Chen et al., p.10).

Despite this data, it seems that convenience and fast development of payment apps on one hand, and simultaneous aging of the population, especially in

Europe, on the other hand, associated with changed payment habits acquired during pandemic, seriously displaces the usage of cash. Decline in the usage of cash brings some benefits to cash providers. Maintaining cash infrastructure is expensive and risky, so it can be expected that the financial institutions, as the biggest intermediaries in money trade, will be satisfied with new trend in cash usage. It allows them to reduce places for cash distribution, such in Sweden, or replace them with automated teller machines (ATMs). Credit card issuers and other non-cash payment innovation developers also find their interest in elimination of cash from circulation. State regulators find their interest in reducing “informal” or “shadow” economy, setting the limits on cash payments through anti-money laundering legislation (AML). On the other hand, the main goal of the financial system is to be available and accessible to all citizens, regardless of age, material position, educational level or place of residence. Except as a way of payment and savings, cash is used in times of insecurity or crisis, when people usually try to keep some reserves for unforeseen situations. It is not surprising that a high share of people in Europe still show a high preference toward the use of cash as the fastest and the cheapest way of payment compared to non-cash methods. Another additional value of cash that should be highlighted is anonymity. The usage of cash ensures privacy, which is rare in the world where mass surveillance is becoming an increasingly widespread practice (Harasim, 2016, p.65).

The importance of availability and acceptance of cash for eurozone Member States (MS) is expressed in the European Central Bank (ECB) recent Eurosystem’s Cash 2030 strategy (ECB, 2020). As an answer to a digital transformation payment trend, recent decline in cash usage, and with the aim to preserve the use of cash in eurozone, ECB indicates the importance of cash as a store of value, reliable and competitive payment instrument that should be available to all eurozone citizens and business.

The aim of this paper is to analyse the cash usage trends and determinants that influence the cash usage in 8 non-eurozone member states. The sample includes Bulgaria, Czech Republic, Croatia, Denmark, Hungary, Poland, Romania and Sweden. Although it joined euro-area from January 1, 2023, Croatia is also part of this sample because the data used referred to a period of 2013 to 2021, before this accession. As most of the countries from this sample, except Denmark and Sweden, assumed the obligation to join the euro area in some time in the future, this topic is relevant for the central banks of these countries, and also for the ECB as well, as money suppliers.

The paper is organized as follows. After this introduction, in the second part, the literature overview is presented. The third part explains the selected data, and the fourth part presents the econometric model and the achieved results. The fifth part concludes the paper.

## 2. LITERATURE REVIEW

There are many studies in the literature that focus their analyses on the determinants and analyses of cash usage, consumer preferences in payment choices, role of central banks in future payment system or the future of payment

(Carstens, 2019; Dias, 2018; Humphrey, Kaloudis, & Øwre, 2004). Some of them focus on individual countries (Armelius et al., 2020, Fujiki, 2020, Alonso, 2018, Fung et al., 2015), and some on selected group of countries (Titova et al., 2021; Eselink & Hernandez, 2017; Siekmann, 2016; Williams & Martinez Perez, 2014; Bagnal et al., 2014).

Alonso et al. (2018) explores the factors driving the prevalence in the use of cash in the period from 2000 to 2016 in 28 EU countries, with special analysis focused on Spain. The research factors comprise influence on degree of digitalisation, access to banking products, macroeconomic and cultural factors. The results confirm the trend of replacement of cash with digital forms of payment with the share of senior population, the level of digitalisation and the average size of card transaction as the main drivers of cash usage in the sample in the observed period from 2000 to 2016 (Alonso et al., 2018). Fujiki (2020) investigated the relationship between cash usage and financial literacy in Japan for 2010 and 2016, in light of the efforts of Japanese government to reduce the household demand of cash for day-to-day transactions and hoarding. The results show that a consumer with a higher level of financial literacy tends to hold a relatively smaller amount of cash for every day purposes, but large amount of cash hoarding, as a rational response to long-lasting period of low interest rates. Research concluded that the promotion of financial literacy and cashless payments for day-to-day transactions would reduce the relatively small demands for cash for day-to-day transactions, but it would not necessarily reduce the amount of cash demands for hoarding (Fujiki, 2020, p.10). Evans et al. (2013) developed and implemented the methodology for estimating cash use for 8 European union countries, Great Britain and the USA for the period from 2012 to 2022, based on historical cash demand measures, distinguishing value of consumer payments made with cash and share of cash payments in total payments. They found that, although it varied across countries, the total share of cash spending in this sample of countries will decline, but the value of consumer payments made with cash will increase. The decline in share of cash spending will very likely be overwhelmed by overall growth in spending, so the total use of cash in these countries may rise (Evans, 2013). Titova, Cornea & Lemeunier (2021) analysed the determinants of cash usage in the selected EU countries over the 2003 to 2016 period, based on the selected technological, socioeconomic and sociocultural indicators and cost components. The results reveal that the cash usage is determined by payment system characteristics for all countries, but for EU advanced countries the level of economic development and income inequalities are also significant, while in Central and Eastern European countries cash usage is negatively related to consumer confidence and technological progress (Titova et al, 2021).

The question of high share of cash in transactions, and cash preferences in consumer payment habits are in focus of many authors. Williams & Martinez Perez (2014, p.13), investigating the reasons for a high share of cash transactions in European countries, find the reason in “cash-in-hand consumer culture “and the participation of European consumers in the „informal economy“. They started from the assumption that consumers are just “rationale economic actors seeking for the

lowest price “. Based on the results of 27-European union consumer survey, they found that saving money is the main reason only in 44 % of cases, and social reasons, failures of the formal economy in terms of availability, speed and quality of desired products are predominant reasons for the participation of European consumers in informal economy. The results vary across different regions, so the consumers in Nordic and East Central European countries cited the market failure to receive a faster availability of product as a main rationale for participating in informal economy, and the consumers in Western Europe cited the social reasons as a main rationale for purchasing informally.

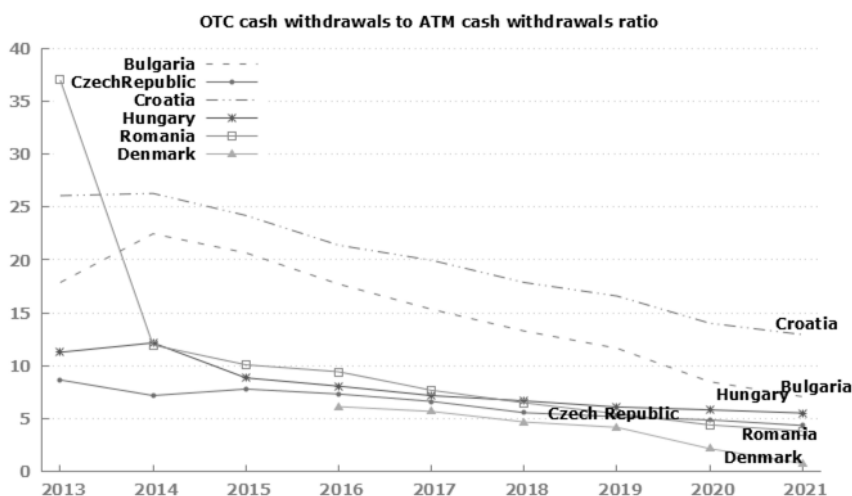
One part of literature in this field is based on the analysis of the surveys and questionnaires among euro area consumers cash preferences which is carried periodically by the European central bank or some national central banks (Alonso et al., 2018; Bagnal et. Al, 2014). Lalouette & Esselink (2018), analysing trends and developments in the use of cash banknotes in euro area over the past ten years, found that the use of cash for transaction purposes is only one driver of cash demand. Most of cash in circulation in the observed period in euro area is kept as a store of value. These results are not only a consequence of a long period of low interest rates, but also of external events that cannot be predicted, such as financial crises, pandemic and political uncertainty, which all caused the increase in cash demand. These results conclude that euro currency is accepted as a reliable method of storing wealth, in and outside the euro area (Lalouette, Esselink, 2018, p.12).

### 3. DATA AND METHODOLOGY

The selected data set consists of 8 non-euro zone countries for a period of 2013 – 2021. As the Republic of Croatia joined the European Union in 2013, most of the data used is available as of this period. The selected period offers a reliable research basis, with quite stable period, except for the very end of the period when the circumstances of pandemic might come to the fore.

The aim of the paper is to investigate the use of cash in the non-euro area member states by developing a model that will try to explain the determinants on consumers demand for cash. Therefore, for cash usage estimation, we rely on the methodology by Takala & Viren (2012), based on withdrawals from automated teller machine (ATMs) and at bank branches, over-the-counter (OTC) sources. Assumption is that consumers in European countries get cash mostly by withdrawing them from ATMs or in financial institutions, as OTC withdrawals. There are some other ways in which consumers can get cash, such as on the point of sale (POS), when receiving the cash back in stores, or in some kind of exchange between natural persons, but this can be part of “informal economy “. ECB statistic offers official data for ATMs and OTC cash withdrawals for economy “selected period, which makes it possible to use this methodology to compute consumers demand for cash. Data on OTC withdrawals are not available for Poland and Sweden for the entire period, so for these two countries we took only ATMs withdrawals into calculation.

The ratio of OTC to ATM withdrawals shows decline trend, indicating that the consumers shifted from bank branches to ATM cash withdrawals in most of countries from the sample. Romania, Croatia and Bulgaria record the highest decrease in ratio, while ratio for Hungary and Czech Republic is quite stable in the whole period. Denmark, with the lowest OTC to ATM ratio in the presented sample of countries, record further decline in the period from 2019 to 2021. The data show the overall trend of decline in OTC to ATM ratio, indicating that consumers reduced going to banks for cash, and using teller machines instead. This may be caused by the overall trend of reduction in bank branches in selected countries, which is also confirmed by data showing the biggest drop in bank branches per 100.000 people in Romania, Croatia and Denmark (see Evans et al., 2013 for other sample of European countries). Croatia is also the country with the highest increase, and the Denmark and Sweden countries with the highest decrease in the number of ATMs per million inhabitants, as presented in Figure 1.



Note: OTC to ATM ratio has been calculated as share of OTC withdrawals in ATM cash withdrawals, based on the number of total withdrawals. Poland and Sweden are not included due to lack of data for OTC cash withdrawals

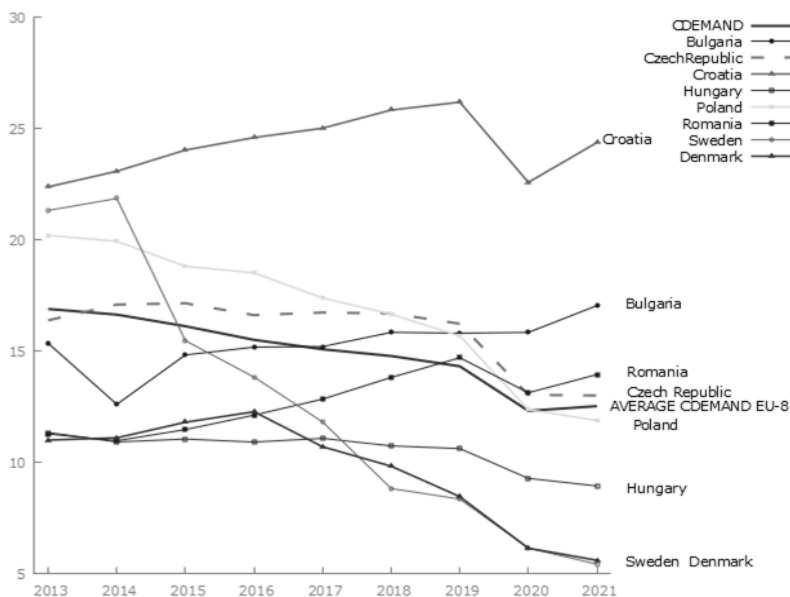
Figure 1 Trend in OTC to ATM cash withdrawals ratio for non-euro area member countries, 2013 – 2021

Source: Author's calculation based on ECB data

Based on the ECB official statistic data on ATMs cash withdrawals for each country, we measure cash demand as the sum of the number of cash withdrawals in ATMs, divided by the number of inhabitants (see Takala & Viren, 2012, Titova et al. 2021). The data on OTC cash withdrawals are not available for Poland and Sweden for the entire period, so we find this missing data as a serious gap which may influence the final result. Therefore, we took into calculation only

data on ATMs cash withdrawals since the data for most other countries from sample show that OTC withdrawals counts for less than 10 % of ATM withdrawals.

Cash demand indicator vary significantly across chosen sample of countries. The highest value of cash demand is computed for Croatia, and the lowest for Sweden and Denmark. Above average cash demand in sample of countries, with upward trend in 2021, beside Croatia, is recorded in Bulgaria, Romania and Czech Republic, while demand below average, with downward trend, except Sweden and Denmark, is recorded in Poland and Hungary (Figure 2).



Note: Cash demand has been calculated as the sum of cash withdrawals in ATMs and cash withdrawals on OTC, divided by total population

Figure 2 Cash demand for non-euro area member states, 2013- 2021

Source: Author's calculation based on ECB data

To conduct the analysis to determine cash demand for chosen sample, regression panel model based on ordinary least square method (OLS) was used, followed by two-stage least square model (2SLS), to control for potential endogeneity. Country fixed model in both regression models is applied.

The set of technological factors and socio-cultural indicators is considered as independent variables to explain the demand for cash in selected countries. As instrumental variables we used number of ATM and POS terminals per million of inhabitants, number of mobile cellular and fixed broadband subscriptions, unemployment rate and index of economic freedom. The chosen methodological approach is followed by the model in Titova et. al (2021).

Based on chosen indicators, we have estimated the following model:

$$CDEMAND_{i,t} = \alpha + TECHNO_{i,t} * \beta_1 + COST_{i,t} * \beta_2 + MACROECONOMIC ENVIRONMENT_i \beta_3 + SOCIOCULTURAL_i \beta_4 + \varepsilon_{i,t} \quad (1)$$

Dependent variable is, as explained in the previous section, the sum of the number of cash withdrawals in ATMs, divided by the number of inhabitants.  $TECHNO_{i,t}$  is a vector of technological indicators,  $COST_{i,t}$  is a vector of price indicators that may influence the cash demand,  $MACROECONOMIC ENVIRONMENT_i$  is a set of macroeconomic factors and  $SOCIOCULTURAL_i$  is a vector of socio-cultural indicators.

Selected explanatory variables are presented in Table 1:

Table 1

Selected variables description

Variable	Description	Source
Cash demand	Number of ATM cash withdrawals /population number	Author's calculation based on data from ECB Statistical Data Warehouse
ATM	Number of ATM terminals per million inhabitants	ECB Statistical Data Warehouse
POS	Number of POS terminals per million inhabitants	ECB Statistical Data Warehouse
Deposit interest	Interest on household deposits up to 1 year (%)	ECB Statistical Data Warehouse
Non-interest income	Bank noninterest income to total income (%)	ECB Statistical Data Warehouse
Internet	Fixed broadband subscriptions (per 100 people)	World Development Indicators
Mobile	Mobile cellular subscriptions (per 100 people)	World Development Indicators
Economic Freedom	Index of economic freedom	Heritage Foundation
Gini	Gini coefficient of equivalised disposable income (1-100)	Eurostat
Corruption	Corruption perceptions index, reflecting perception of corruption within countries, scale 0 to 10.	Transparency International
Unemployment	Unemployment, total (% of total labour force) (modelled ILO estimate)	World Development Indicators
Education	Graduates in tertiary education/total population	Eurostat

Our data set consists of several technological indicators which characterize the availability of cash, such as ATMs, or the availability of POS terminals which enable digital payments. The spread of fixed broadband subscriptions in the country indicates the proportion of population with internet. As a high share of digital payments are intended to mobile payment, the number of mobile cellular subscriptions is also added to our model.

Technological factors, in general, encourage the use of non-cash payments. Increased number of points-of-sale that enables electronic payment



should affect the reduction in the usage of cash. Also, it is expected that the increase in the number of individuals using internet and higher number of mobile cellular subscription should negatively affect the cash usage. Many new payment solutions require that buyer have a mobile device. Higher accessibility of fixed broadband subscriptions should mean that consumers are more exposed to digital technologies and it is more likely that they can adopt new, non-cash methods of payment. On the other hand, most of the population in selected sample of countries have internet access, and the proxy of cash demand varies significantly. Higher availability of ATMs with cash function should have a positive impact on higher cash usage. Increase in card holders' growth is expected to have negative impact on cash usage. Literature offers different results (Alonso et al., 2018; Armelius, Claussen & Reslow, 2020, Snellman, Vesala & Humphrey, 2001).

The cost of cash usage is estimated by two variables: deposit interest and bank non-interest income to total income. The first variable, deposit interest on household deposits up to 1 year, is considered as an opportunity cost to cash usage. In macroeconomic theory, higher level of interest should be an incentive to reduce the cash usage. In our empirical model, it is expected that higher deposit interest should have a negative impact on cash usage. The second selected variable, bank non-interest income to total income, covers a wide range of different fees and commissions as a share in total bank's income. It would be better to use data on service charges such as card usage fees, commissions for cash withdrawals or ATM charges, but comparable data for all the countries from the sample were not available, so we use the ratio of non-interest income to total income. The impact of this ratio is uncertain, because while the overall use of noninterest income has decreased, as a consequence of financial crisis, some analyses find evidence that banks have increased their revenues from service charges as a substitute for interest income lost in the low interest rate environment (Haubrich, & Young, 2019., p.1).

Unemployment and the level of education, expressed as graduates in tertiary education in total population, can have an influence on cash usage, so we included them into macroeconomic indicators. Unemployment can have an overall negative influence on cash usage, since unemployed person spends less. Education is expected to have an inverse impact on cash usage, higher level of education is supposed to be connected with higher technological solutions and lower cash usage. However, this is uncertain and depends on the purpose of cash usage (see Fujiki, 2020).

Socio-cultural indicators have a strong influence on consumer behaviour (see Gajanova, Nadanyiova, & Lazaroiu, 2020; Akhisar, Tunay, & Tunay, 2015). For the purposes of this analysis, we choose a few socio-cultural indicators, Gini coefficient, and indexes of economic freedom and corruption index. While for technological factors, the impact on cash usage is quite predictable, the overall impact of socio-cultural indicators is uncertain. Index of economic freedom should

have inverse impact on cash usage – higher the value of index, lower the impact on the usage of cash. However, opposite results can also be expected. According to Schroth, Vyborny & Ziskovsky, 2022, in contrast to non-cash payments, cash leaves no digital trace, so the usage of cash supports individual's economic freedom. We use Gini coefficient for the purpose of testing the relationship between inequalities of distribution of income and cash usage.

#### 4. RESULTS

Results of descriptive statistic for variables used in our analyses are presented in Table 2. The data show heterogeneity of the group, especially concerning the number of POS and ATMs per million inhabitants. Corruption perception index and mobile cellular subscription (per 100 people) also show a higher standard deviation. The least standard deviation is shown for variables of deposit interest and unemployment.

Table 2

Descriptive statistic of selected variables description

Variable	Mean	Median	S.D.	Min	Max	Obs.
CDEMAND	14,836	13,943	5,197	5,422	26,179	67
ATM	602,06	524,71	256,77	243,99	1339,0	67
POS	18227,46	19186,82	6799,87	6405,77	29428,7	67
DI	1,078	0,750	1,047	0,050	4,86	67
NITI	41,439	37,760	10,127	28,281	61,536	72
IEF	69,320	68,8	4,862	59,1	78,3	72
UNE	6,682	6,16	3,22	2,01	17,29	71
FBS	29,237	27,88	7,731	18,426	44,720	72
MOB	120,64	120,96	11,373	101,254	149,39	64
CPI	59,125	52,5	17,580	41,0	92,0	64
EDU	0,9159	0,818	0,267	0,615	1,568	63
GINI	29,901	28,25	4,372	24	40,8	72

*Source: Author's calculation*

The results of fixed-effects OLS and two stage LS panel regression are presented in Table 3. The equation (1) consists of technological, cost, macroeconomic environment and socio-cultural indicators as our explanatory variables for the dependent variable of cash demand for selected sample of countries.

Table 3

## OLS and two-stage LS regression for cash demand results

	Fixed effects	2SLS
ATM	0,2430 (0,0104776)	0,0014*** (0,0106837)
POS	0,0046*** (-0,00055)	0,0014*** (-0,00033)
Deposit interest	0,4017 (-0,386116)	0,0027*** (-1,35502)
Non-interest income	0,0001*** (-285760)	0,0001*** (-0,314327)
Internet	0,0159** (0,505285)	0,3836 (0,102742)
Mobile cellular subscriptions	0,0735* (-0,121837)	0,8576 (0,00775)
Economic freedom	0,0087*** (-707930)	0,0025*** (-0,719342)
Gini	0,7376 (0,104481)	<0,0001*** (-0,426489)
Corruption perceptions index	0,0935* (0,210258)	<0,0001*** (0,239888)
Unemployment	0,7083 (-0,127166)	0,5032 (0,0922967)
Education	0,5784 (3,21728)	0,8417 (-0,313773)
Constant	0,0133** (62,8248)	<0,0001*** (73,5049)
Observations	55	55
R <sup>2</sup>	0,931540	
R2		0,853886
(p-value)		(0,00130)
Normality test		0,366574
(p-value)		(0,832529)

*t*-statistics in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: Author's calculation

To evaluate the estimated equation, we report three tests: (a) Wald test for heteroskedasticity (b) test for normality of residual, and (c) autocorrelation test. For the first test, accepting the null hypotheses indicates that the units have a common error variance and that the instruments are valid, for the second test accepting the null hypothesis means that error is normally distributed. For the third test of autocorrelation, accepting the null hypotheses indicates absence of autocorrelation.

Our findings, based on the analyses of selected variables and regression results show the significant impact of some technological, cost and socio-cultural variables on cash demand in selected sample of 8 non-euro zone member countries. The number of ATMs and number of POS terminals are important factors for the level of cash usage. While the higher number of ATMs significantly affect the increase in the usage of cash, the number of POS terminals negatively affects the

usage of cash in non-euro zone member countries. These results confirmed the expectations since the higher number of ATMs are available in countries with the higher cash demand. On the other side, the rise in number of POS terminals which increase the possibility of card or mobile payments, is negatively correlated with increase in cash usage. These results are consistent with expectations that the payment system characteristics are important factor that affects cash usage, as provided also in some other studies (Titova et al., 2021, Alonso et al., 2018).

The deposit interest shows a negative impact on cash usage, therefore higher interest rates reduce the usage of cash, which is in line with expectations and macroeconomic theory. On the contrary, the share of bank's non-interest income to total income also shows a negative impact on cash usage meaning that the reduction in non-interest income, such as fees and commissions, leads to an increase in the usage of cash. This result is contrary to our expectations, but it can be a consequence of a wide range of bank's non-interest products that may be included to this variable, and the lack of more precise data. Better data availability for some kind of ATM fees or cash withdrawals commissions may have a different impact on cash usage in such model.

As expected, the index of economic freedom shows negative impact on cash usage meaning that lower level of economic freedom encourages higher usage of cash in these countries. This influence shows high impact in both models, indicating the significance of this effect. Gini coefficient shows a negative impact on cash usage, meaning that countries with lower coefficient, satisfactory distribution of income and no inequalities negatively affect the usage of cash. Contrary to expectations, corruption perceptions index is positively related to demand for cash in this sample of countries, and the same result is for internet usage, i.e. the availability of fixed broadband subscriptions.

Macroeconomic environment indicators of unemployment and education show no significant impact on the demand for cash in our model. This might be explained by small differences in these variables across selected sample of countries, as seen in the results of descriptive statistic, or due to narrow selection of variables for this set. Expanding the choice of variables may be a recommendation for future studies on this topic.

## 5. CONCLUSION

The usage of cash shows a decline trend in the European Union countries. Digital transformation of payments changes consumers habits and threatens to push cash out of circulation. The importance of cash availability as a convenient way of payment and a store of value for European citizens is expressed in ECB Eurosystem's Cash 2030 strategy indicating that cash should be available to all eurozone citizens and business.

In this paper we have analysed the trends and determinants of cash usage in 8 non-euro zone European Union member countries in the period 2013 – 2021.

We conducted the OLS panel regression model supported by two-stage least square regressions, based on the chosen set of technological, cost, macroeconomic environment and socio-cultural set of indicators to test the impact on cash usage. We find that trends across selected countries concerning the demand for cash are quite heterogeneous, with some countries which have become almost cashless society, and others with high levels of cash demand and high availability of cash devices. Apart from the overall trend of decline in cash usage, cash is still preferable payment method in most of the countries from the sample. The results show the importance of technological, cost and socio-cultural indicators on cash demand in the selected sample. Outspread of ATM network increase cash demand, while higher number of digital POS terminals and mobile phone users decrease cash demand. The deposit interest is negatively correlated to cash demand, as well as the share of non-interest income in total income, although unexpected. Socio-cultural indicators such as index of economic freedom and Gini coefficient show significant negative impact on cash demand in this group of countries. On the other hand, we fail to find evidence on influence of selected macroeconomic environment indicators of unemployment and education level on cash demand in the sample.

We contribute to the existing literature by analysing the latest trends and determining the factors of influence on the demand for cash through econometric model by using country-level indicators in the sample of countries that should join common monetary union in some time (except Denmark and Sweden). Our findings confirm the overall trend of decline in cash usage in sample of countries, and indicate that macroeconomic environment is not of significant importance for demand for cash compared to technological, cost and socio-cultural indicators. Association of sampled countries to eurozone will increase the intra-currency cash migrations within the Union, but also total demand for currency, because the selected and analysed data in this research show a high level of cash usage in the sample. This could accelerate the ECB plans for introduction of digital euro in euro area, as a central banks digital currency (CBDC), issued for the general public.

Constraints of the model derive from insufficiently precise data which could significantly affect obtained results, and also the lack of data for some countries that are not in the obligation to introduce the euro. This constrains may be overcome in some future studies by reducing the sample on the group of countries that are joining eurozone in the near period, or expanding it by comparison with eurozone member countries. Also, the development of the digital euro as a supplement or even substitute for cash in the euro area might be an interesting topic for future research.

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**TRENDOVI I ODREDNICE UPORABE GOTOVINE U DRŽAVAMA ČLANICAMA EU IZVAN EUROZONE<sup>2</sup>****Sažetak**

*Tehnološki napredak i digitalne inovacije mijenjaju navike plaćanja potrošača diljem svijeta. Iako je gotovinsko plaćanje još uvijek dominantan način plaćanja u europskim zemljama, primjetan je trend pada. Jednostavnost i dostupnost bezgotovinskih načina plaćanja, uz sve manju dostupnost i ograničenja korištenja gotovine, prijete istiskivanjem gotovine iz optjecaja. S druge strane, Europska središnja banka istaknula je važnost gotovine kao pričuve vrijednosti i pouzdanog instrumenta plaćanja koji bi trebao biti dostupan svim građanima eurozone. Cilj ovog rada je analizirati trendove i odrednice uporabe gotovine u osam zemalja Europske unije izvan eurozone u razdoblju od 2013. do 2021. na temelju skupa odabranih pokazatelja. Rezultati pokazuju heterogenost unutar grupe, ali sa zajedničkim silaznim trendom, te značajan utjecaj tehnoloških i sociokulturnih pokazatelja na korištenje gotovine.*

**Ključne riječi:** *Zemlje izvan eurozone, navike plaćanja, potražnja za gotovinom, odrednice uporabe gotovine.*

**JEL klasifikacija:** *D12, E42, F55, G21, O31, O32.*

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