

Economic Aspects of Cash Access Problems

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Abstract

Purpose: The aim of the article is to examine if difficulty of access to cash may influence the financial exclusion in Poland.

Design/methodology/approach: The analysis was performed using microdata collected in the survey on payment habits of Polish consumers and spatial data on ATMs locations. Estimated distance to points where cash can be withdrawn together with feature of respondents of the state of possession of a payment account helps to identify relationships between access to cash and financial exclusion. To prove significance of the relationship, a statistical test is used.

Findings: The Covid-19 pandemic has highlighted the existence of a real risk associated with the problem of the physical availability of cash, which is caused by the systematic reduction of the network of ATMs and commercial bank branches handling cash, which are the main points where consumers can withdraw it. This may consequently lead to financial and social exclusion of certain groups of consumers for whom cash is the main, or even the only, means of making payments. Results support the thesis that payment account without (real) option of easy access to cash may discourage consumers from opening the account and contribute to increased financial exclusion. It is especially visible in rural regions and small towns where we observe high level of exclusion (lack of payment accounts) and longer distance to the nearest ATM.

Research limitations/implications: The presented results were based on simple statistical analyses. Further research should include econometric modeling using logit/probit models.

Originality/value: The obtained results are the first on the impact of access to cash on financial exclusion in Poland and consistent with the situation in other European countries. The results allow to show the importance of access to physical money in a broader context than just having means of payment to pay for purchases.

Keywords: physical money, access to cash, financial exclusion, ATM network, demand for cash.

JEL: D12, E41, E42, G59, O18, R21

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Aspekt ekonomiczny problemów z dostępem do gotówki

Streszczenie

Cel: celem artykułu jest zbadanie czy trudność w dostępie do gotówki może wpływać na wykluczenie finansowe w Polsce.

Projekt/metodologia/podejście: do analizy wykorzystano mikrodane zebrane w badaniu zwyczajów płatniczych polskich konsumentów oraz dane przestrzenne dotyczące lokalizacji bankomatów. Oszacowana odległość do punktów wypłaty gotówki wraz z charakterystyką respondentów dotyczącą stanu posiadania rachunku płatniczego pozwoliła na identyfikację związku pomiędzy dostępem do gotówki a wykluczeniem finansowym. Aby wykazać istotność tej zależności, zastosowano test statystyczny.

Wyniki: pandemia Covid-19 uwydatniła istnienie realnego ryzyka związanego z problemem fizycznej dostępności gotówki, co jest spowodowane systematycznym zmniejszaniem się sieci bankomatów i oddziałów banków komercyjnych obsługujących gotówkę, będących głównymi punktami, w których konsumenci mogą ją wypłacać. Może to w konsekwencji prowadzić do wykluczenia finansowego i społecznego niektórych grup konsumentów, dla których gotówka jest głównym, a nawet jedynym środkiem dokonywania płatności. Wyniki potwierdzają tezę, że rachunek płatniczy bez (rzeczywistej) opcji łatwego dostępu do gotówki może zniechęcić konsumentów do otwierania rachunku i przyczynić się do wzrostu wykluczenia finansowego. Jest to szczególnie widoczne na obszarach wiejskich i w małych miastach, gdzie obserwuje się wysoki poziom wykluczenia (brak rachunku płatniczego) i większą odległość do najbliższego bankomatu.

Ograniczenia/wnioski z badań: prezentowane wyniki bazowały na prostych analizach statystycznych. Dalsze badania powinny uwzględnić modelowanie ekonometryczne z wykorzystaniem modeli logit/probit.

Oryginalność/wartość: uzyskane tutaj wyniki są pierwszymi w obszarze wpływu dostępu do gotówki na wykluczenie finansowe w Polsce i spójne ze stanem w innych krajach europejskich. Wyniki pozwalają na wykazanie ważności dostępu do fizycznego pieniądza w szerszym kontekście niż tylko posiadanie środków płatniczych służących do dokonywania płatności za zakupy.

Słowa kluczowe: pieniądź fizyczny, dostęp do gotówki, wyłączenie finansowe, sieć bankomatów, popyt na gotówkę.

1. Introduction

The history of the last few decades has shown the unflagging role of cash in economies around the world. Despite the growing importance of cashless forms of payment, banknotes and coins are characterized by significant demand, the motives of which, as defined by Keynes (1936), are transactional, precautionary, and hoarding. While the transactional motive is increasingly losing its importance, the other two motives are beginning to play an increasingly important role, especially in times of crisis. The demand for physical money is highly influenced by the unique characteristics of cash.

Cash is universal because it does not require a bank account, specialized equipment, or knowledge from parties of a transaction. It does not discriminate with respect to age, gender, wealth, or ethnicity. Cash covers a wide range of transactions in terms of value, channels used, and parties to transactions. According to (Rösl & Seitz, 2022a; Krueger & Seitz, 2017), universality is an important feature from the point of view of financial inclusion.

Cash is resilient to events such as IT system failures, counterfeiting, and extraordinary events, they include various types of crises, etc. Cash often provides protection in the event of failures or other problems that prevent cashless purchases (Pietrucha & Maciejewski, 2020).

In an era of algorithms, cybercrime, and the restriction of individual freedom (e.g. the 2020 pandemic), our privacy is increasingly more at risk than ever. Financial privacy is also a fundamental human right. Tracking by the state or corporations of our payment behavior can threaten our civil liberties and, consequently, democracy.

Banknotes and coins are the only forms of public money available to the general public. They are not linked to private companies, and no transaction fees or exchange of personal data is required. Cash is part of the critical infrastructure of the state. It creates a system of control and balances between central banks, governments, financial institutions, and citizens. People's confidence in cash is based on responsible monetary policy and good governance. Cash guarantees competition, which prevents financial institutions from charging excessive fees for their services and acts as a hedge against negative interest rates.

The increased importance of the precautionary and hoarding motives causes a change in cash withdrawal habits: there are fewer withdrawals, but with higher values. It leads to a reduction in revenue, especially for ATM operators. Furthermore, rising costs are forcing cash service providers to optimize costs. As a result, the number of bank branches with cash services is decreasing and the ATM network is shrinking. It creates the risk of difficulties in accessing cash, especially in rural areas. It may consequently cause and/or financial exclusion of certain social groups.

The article looks at the problem of access to physical money payment infrastructures from a spatial perspective. The main goal of the paper is to prove the existence of relationship between difficulty of access to cash and financial exclusion. As a consequence, we can formulate the following research hypothesis: payment account without an (a) (real) option of easy access to cash may discourage consumers from opening the account and contribute to increased financial exclusion.

To prove the above hypothesis the author used two kinds of spatial data. The first one comprises the microdata collected during survey on payment habits conducted by NBP in 2020. The second one includes geographical locations of ATMs as a main point of cash access gathered during realization of the National Strategy for Cash Circulation Security.

Geographical locations of respondents and ATMs allowed us to estimate the distance to points where cash can be withdrawn. Additional features of respondents describe the state of possession of an payment account and help to identify relationship between access to cash and financial exclusion. A statistical test is used to prove significance of the relationship between the level of access to cash *via* ATMs and possession of payment account.

In order to prove the correctness of the above hypothesis, the following structure of the article was proposed. In the first part, the role of cash in the present day is presented, paying particular attention to the problem of access to cash and its impact on local communities and businesses. The second part describes an issue with access to cash with relation to phenomenon of financial exclusion. In the third part, the current state of access to cash in EU and Poland was presented. In the last part, the results of the hypothesis verification are discussed stating that one of the important factors which may cause financial exclusion is the difficulty of access to points where both consumers and businesses preferring cash can make withdrawals and/or deposits.

2. Role of Physical Money in the Modern Economy

2.1. Essence of Interest in Cash

In Poland, the demand for cash is steadily increasing with a decreasing trend in the use of cash for payment purposes. According to Table 1, which contains the results of three surveys of Poles' payment habits conducted by the National Bank of Poland, since 2011 the share of cash in retail transactions has declined in volume from 81.8% to 46.4% with a cash in circulation (CIC) increase by 178.5%.

Table 1

Estimated share of cash transactions (trx) in the total number and value of transactions in the NBP surveys versus circulation growth rates since the end of 2011

	2011/2012	2016	2020
Share of cash trx in POS in the sense of (in %):			
volume	81.8	53.9	46.4
value	63.7	40.7	29.3
CIC growth rate since 2011 (in %)			
	–	67.5	187.5

Source: Share of cash trx based on the following research on payment habits conducted by NBP in: 2012 (Kozłinski, 2013, pp. 123–124); 2016 (Manikowski, 2017, p. 58); 2020 (Kotkowski et al., 2022, p. 80); CIC growth based on monetary and financial statistics of NBP (<https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/>).

Consumers are not the only group with a high preference for cash. Businesses also belong to the group. For example, according to a survey conducted by the ECB (2022b) among companies operating in euro area countries, 24% of companies prefer to pay in cash. Almost all companies accept cash (96%). Companies generally consider cash to be better in terms of overall cost, transaction speed, and reliability, as compared to

other payment methods. Vast majority of companies deposit cash (85%), while around a quarter of companies use the withdrawal option. It should be noted, that the sample comprises companies employing one or more persons mainly in the retail, accommodation, food, arts, entertainment and recreation excluding the financial sector and companies working within the cash cycle. The considered sectors include the most private customers.

The demand for cash increases especially during periods of uncertainty accompanying various types of crisis and is usually global in nature. According to Tamele et al. (2021), Rösl and Seitz (2021), cash is a safe haven during all crises. The phenomenon was first pointed out by Bailey (2009). He observed an increasing demand for high-denomination euro currency during the 2008 financial crisis with a decreasing share of cash in POS transactions. A similar behavior was observed in Poland, with an unexpected increase in demand primarily for the highest denominations of PLN 200 and PLN 100.

A similar phenomenon occurred during the Covid-19 pandemic, widely considered in the literature, e.g. (Goodhart & Ashworth, 2020; Chen et al., 2022; Caswell et al., 2020; BoE, 2020; Auer et al., 2022). The occurrence has become known as the banknote paradox and has been described in detail by Zamora-Pérez (2021). In the context of Poland, it has been exhaustively described by (Kaźmierczak et al., 2021; Gurgul & Suder, 2020; Manikowski, 2021). Manikowski (2021) showed that the Covid-19 pandemic caused an increase in the share of the hoarding part of cash circulation in Poland by almost 8 p.p.: from 61-68.3% in 2019 to 69.2-76.1% in 2020, with average annual increases of 2.3-2.5 p.p. in previous periods. For the euro area countries, Lalouette et al. (2021) showed that only about one-fifth of the circulation is the transactional part. The remaining part is held as an asset and is used only occasionally for payments (28-50%) or is circulated outside the euro area (30-50%).

The financial crisis of 2008, the Covid-19 pandemic in 2020 and the war in Ukraine in 2022 showed that a sufficiently flexible supply of cash helped stabilize the economic situation. Thus, for example, Rösl and Seitz (2022a) compared the crisis period (Great Depression) of 1929-1933 and the financial crisis of 2008-2009. They demonstrated the important role of physical money as a stabilizer of the total money supply. They also demonstrated the same role of cash in other crises, such as the technological crisis in 2000. The authors concluded that cash should be seen as public insurance provided by central banks in crisis situations. They supported the conclusions of their analysis with examples from India, where the demonetization process was poorly prepared in 2016, and from Greece with a series of crises starting in 2008 and ending in 2014.

According to Rösl and Seitz (2022a), one of the reasons for the important role of cash, especially in times of crisis, is related to the unique characteristics that make cash not fully substitutable for other instruments,

including central bank digital money (CBDC). Rösl and Seitz (2022b) concluded that since anonymity is categorically rejected by the ECB, the digital euro would rather circulate together with cash than replace it in transactions.

It is worth mentioning the public consultation commissioned by the ECB (2021) on the digital euro. According to the survey, the most important characteristics for households and businesses were privacy, security, and general usability. They are the characteristic features of physical cash that we can describe as a “trust” in privacy, security, and usability.

According to Lepecq (2022), the particular characteristics of cash make it an indispensable anchor of the values of our monetary system, but also a key foundation of democratic values, including social inclusion, protection of privacy, and the fundamental right to public money. Lepecq believes that there is no perfect substitute for cash. According to Lepecq (2017), among others, cash is the first step towards financial inclusion.

2.2. Impact of Cash Restrictions on Local Community and Business

The geographical distribution of bank branches and the structure of the local banking market have a significant impact on households and businesses.

In the case of businesses, financial constraints may increase with physical distance to bank branches (Alessandrini et al., 2009): loans tend to be more expensive (Knyazeva & Knyazeva, 2012) with contracts more restrictive (Hollander & Verriest, 2016). This is justified by the higher costs of transporting and obtaining the so-called soft information from the lender or local communities (Degryse & Ongena, 2009). Several studies have highlighted that, unlike hard information, soft information is difficult to store and transfer between individuals (Drexler & Schoar, 2014; Qian et al., 2015).

Furthermore, Nguyen (2019) shows that even in markets with dense branch networks, closures can have a large impact on local credit supply. Ho and Berggren (2020) find that due to the increased distance to branches, branch closures reduce new business formation. According to Garri (2019), branch closures increase the probability of terminating a lending relationship.

For households, there is a significant positive correlation between the number of bank branches and average income in the area (Okeahalam, 2009; Huysentruyt et al., 2013), that is, poorer households tend to live in areas with fewer bank branches. The lack of banks affects household financial inclusion (i.e. having accounts and access to credit). Distance to and density of bank branches significantly affect household demand for and use of banking services (Ho & Ishii, 2011; Brown et al., 2015), and ultimately consumer welfare (Dick, 2008).

3. Cash vs. Financial Exclusion – Preliminary View

Many studies show that cash *per* transaction is still one of the cheapest payment instruments (ECB, 2022c, Table 11). However, in general, costs associated with cash handling are not negligible. According to Przenajkowska et al. (2020), social costs of all payment instruments in Poland in 2018 amounted to 1.21% of GDP, of which up to 0.78% are cash. In such a situation, financial institutions optimize cash handling costs by moving cash handling to the area of self-service operations using ATMs. Equipping ATMs with deposit functions also increases efficiency of cash recirculation, making it increasingly cheaper. As a result, cash-serving branches are being closed or transformed. Therefore, many consumers are losing the ability to directly contact bank staff. And such contact is particularly important for people who do not necessarily know innovative digital technologies well. This is particularly true for older people and those who live in rural areas. In such a situation, the role of ATMs, among others, grows in importance as it helps the consumers better understand and control their finances.

It is important to remember that ATMs today are not just a cash withdrawal tool. They also have many other functions, such as the aforementioned deposits. It is also possible to check the balance of the bank account, change the PIN, make a transfer, or charge a card. In other words, the ATM network facilitates financial inclusion and, consequently, social inclusion for many consumers. Therefore, ATMs are a way for banks to optimize their costs and, on the other hand, they can provide a physical, and often for many consumers the only, reliable point of contact with banking. In the digital age, cash has an invaluable value related to its physicality and trust, and also the absence of any prerequisites required to use it. So, it plays an important role in moving underbanked and unbanked people into the banking system. It is also not insignificant that cash has been deeply ingrained in all cultures and monetary systems for centuries. Although the degree of dependency varies from country to country, which is reflected in the demand for cash (Kotkowski, 2022).

Before a deepened analysis of relationship between access to cash and financial exclusion it is worth focusing for a moment on the concept of exclusion. According to the World Bank, financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way. Access to financial products and services may be provided by bank account, other financial institution and mobile service provider. Consequently, we may define and use in the paper the term of financial exclusion in narrow sense as a lack of payment account (in a bank nor financial institution) which can reduce access to useful and affordable financial products and services.

According to the report of the World Bank (Demirgüç-Kunt et al., 2022, p. 9), 1.4 billion adults 15+ worldwide did not have an account in 2021, representing 23.8%. In developing economies, the share was higher, 29%. According to the World Bank, the lowest level of ownership of mobile money accounts, while the highest level of ownership of financial institution accounts is among the 51+ population. This may mean that this age group is more dependent on traditional money. The study also found a difference in account ownership status between rural and urban areas.

Having an account is a kind of gateway to use various financial services, including investing in health, education, and business (NCR, 2017). Therefore, the World Bank is strongly committed to financial inclusion through digitalization. According to Demirgüç-Kunt et al. (2022, p. 9), accounts allow their owners to safely and affordably store, send and receive money, meet daily needs, plan for emergencies, and make investments for the future. On the contrary, people without accounts have to manage their money through informal mechanisms, including cash.

According to the World Bank (Demirgüç-Kunt et al., 2022, p. 35), one of the reasons for financial exclusion (not having cash) among adults 15+ without an account is the distance to the nearest financial institution with 31% of indications following lack of money with more than 60% of indications and too expensive financial services with 36% of indications.

However, Demirgüç-Kunt et al. (2022, p. 136) state that installing a physical network of branches or ATMs in every location where they do not currently exist is not always a cost-effective way to reach an unbanked population. A common alternative is to form partnerships with post offices or retail stores to offer basic financial services in an agent-banking model. The benefit is that the agents (bank agent, mobile agent, or ATM) give account holders a way to deposit and withdraw cash safely, reliably and conveniently. Even if the final goal is to promote digital payments, cash will likely be part of the financial ecosystem for a long time. It refers to places where digital payments are not yet widely accepted for everyday purchases. A reliable cash-out service is the key to the success of digital payments.

4. Access to Cash in Europe and Poland

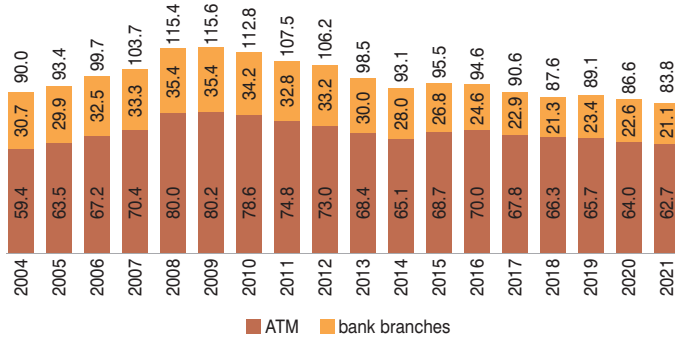
According to the study (ECB, 2022a, p. 50), the most common channel for cash acquiring in all countries in the euro area is the ATM with withdrawal shares ranging from 52% in DE and NL to more than 80% in FI, ES, PT and CY. In the case of Poland, the share of cash withdrawal operations in ATMs was 69.1%, which represented 54.5% in value terms (Kotkowski et al., 2022, p. 98).

However, the number of ATMs has been steadily decreasing for many years (since 2009); see Figure 1. Analysing Figure 2, it can be seen that

most European countries have a lower number of branches and ATMs *per* 100 K inhabitants than the middle of the range (MIN; MAX).¹

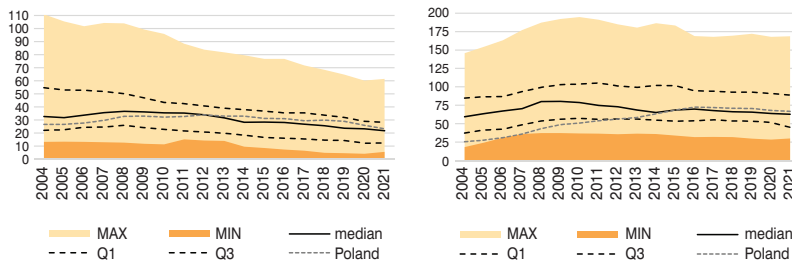
Poland looks relatively average with the number of bank branches and ATMs *per* 100 K inhabitants at the median level.

Figure 1
Number of ATMs and bank branches per 100 K inhabitants in the EU



Source: For ATMs: <https://data.worldbank.org/indicator/FB.ATM.TOTL.P5>; for commercial bank branches: <https://data.worldbank.org/indicator/FB.CBK.BRCH.P5>.

Figure 2
Number of bank branches (left) and ATMs (right) per 100 K inhabitants in the EU



Source: For ATMs: <https://data.worldbank.org/indicator/FB.ATM.TOTL.P5>; for commercial bank branches: <https://data.worldbank.org/indicator/FB.CBK.BRCH.P5>.

Let us take a look at the situation of perceived cash availability in a few selected EU countries, starting with the countries with the lowest use of cash at POS.

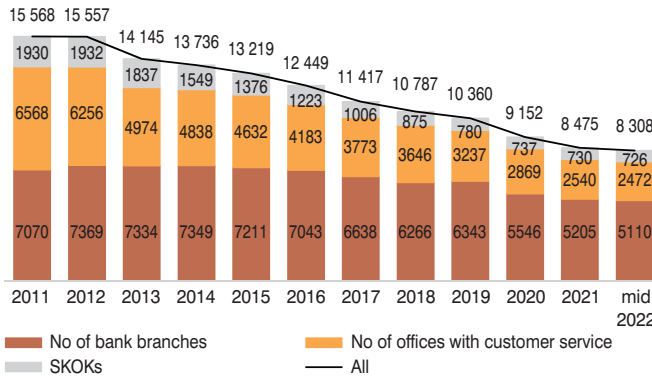
In Finland, the country with the most cashless economy in the eurozone, cash use at POS was 35% in volume terms in 2019 (ECB, 2020) and fell in 3 years to 19% (ECB, 2022a). However, according to the cited ECB SPACE survey of 2022, up to 57% of Finns consider it important to have the option to make payments in cash with the eurozone average at 60%.² The report (BoF, 2019) notes that the vast majority of Finns are satisfied

with access to cash. However, there is a perceived problem in rural areas, where 14% of Finns live.

On the other side of the ranking of cashless countries is e.g. Portugal with a rapidly ageing population. According to the ECB study (2022a), the use of cash in POS is 64% in volume terms. A shrinking network of ATMs and bank branches can also be observed. In 2022, ATMs were the dominant source of cash acquisition (86% of all withdrawals). It was noted that there are problems in rural areas with a tendency to deteriorate because banks increasingly encourage the use of cashless instruments, despite the relatively low cost of handling low-value cash payments.

In Poland, like in many EU countries, commercial banks and other financial institutions optimize the operating costs of their branch and office networks by reducing their number.³ This is shown in Figure 3, which illustrates the decreasing size of the branch and office network of banks and other credit institutions (e.g. SKOK institutions).

Figure 3
Number of bank branches and financial offices in Poland



Source: List of numbers and identifications of financial institutions assigned by the National Bank of Poland. EWIB 2.0 – <https://ewib.nbp.pl/>. Access on readers' request.

Another way to optimize costs is to eliminate cash handling in branches and offices and move it to the self-service area. In other words, banks relieve their staff of *strictly* cash handling activities by placing self-service devices, such as ATMs, in the branch. Additionally, equipping ATMs with a deposit option reduces cash processing costs.

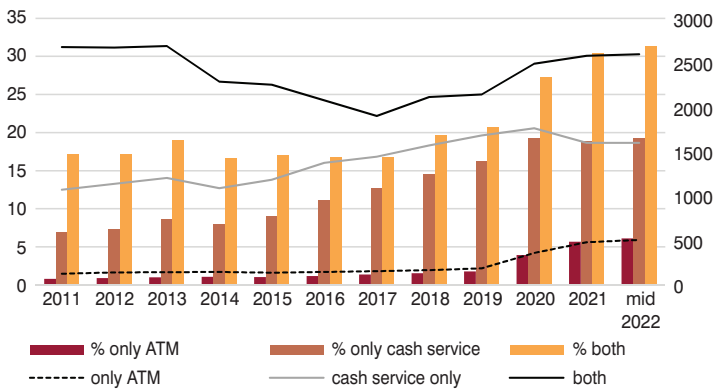
Figure 4 presents the number of units of banks and other financial institutions: only with ATM, only with cash service, and with ATM and cash service (right axis). In addition, the share of the units in the total number of units of banks and other financial institutions is given (left axis).⁴

From the graph presented in Figure 4 the following conclusions are to be drawn:

- during the last few years, the number of branches with ATM only (since 2019) and with ATM and cash service (since 2017) has been increasing,
- the share of branches with only cash services has been declining since 2020.

The observations confirm the minimization of operating costs by reducing the cash service offered by staff and transferring it to self-service devices such as ATMs. It has been particularly evident since 2020, a consequence of the Covid-19 epidemic, when the mobility of the population was drastically reduced. However, the process of equipping offices with ATMs has been evident since 2017.

Figure 4
Number of ATMs and bank branches with cash services



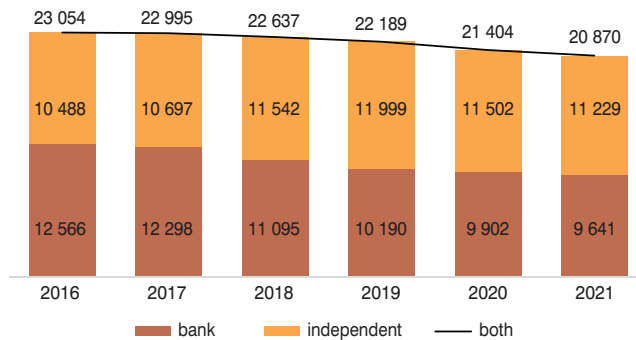
Source: Database of numbers and identification of financial institutions assigned by the National Bank of Poland. EWIB 2.0 – <https://ewib.nbp.pl/>. Access on readers' request.

Bank branches and offices of other financial institutions are not the only and most common cash distribution channels. They include ATMs. In Poland, they are owned by banks and independent providers, the largest of the latter is Euronet and IT Card. The number of ATMs is also decreasing, especially since 2016 with an increasing share of ATMs owned by independent operators – Figure 5. It is a consequence of the banks' policy of outsourcing ATM operations. This is another way to minimize costs by banks.

The main revenue for independent ATM operators in the card cash withdrawal segment is the so-called interchange fee, which was set by VISA and MasterCard in 2010 at the level of PLN 1.20/1.30 per withdrawal. For many years, a change in ATM cash withdrawal habits has been observed: a decrease in their number and an increase in the value of a single withdrawal.

This results in a decline in revenues for independent operators and leads to cost-optimization activities. In the case of ATM operators, we can see ATMs moving from areas of low demand (rural areas) to locations with higher population density (large cities). It affects access to cash in rural areas. The results can be seen in a study (Flash Eurobarometer, 2022) commissioned by the European Commission: 29% of the respondents, coming from rural areas of Poland, indicated difficult access to cash. This is confirmed by research carried out as part of the National Strategy for Cash Circulation Security – NSCCS (NSBOG, 2021). Using ATM location data from both bank and non-bank operators, the author of the article performed a spatial analysis of the ATM network from the point of view of distance from all population centers. The main results are given in Tables 2 and 3. Additionally, population density expressed in the number of people *per* 1 km² in individual communes and the number of ATMs in communes *per* 1,000 inhabitants is presented on Map 1. Table 2 shows the shares of the population located within 1, 5 and 10 km of the nearest ATM in the different types of communes. It can be seen that there is the worst access to cash in the rural regions, which includes rural communes and the rural areas of urban-rural communes.

Figure 5
Number of ATMs in Poland since 2016



Note: www.cashless.pl is the only source, where ownership structure of ATM network is presented; another source (<https://nbp.pl/system-platniczy/dane-i-analazy/karty-platnicze/>) includes only aggregate data of ATMs. The difference between data on aggregate level from the two sources is from 1.06% in 2017 to 2.46% in 2021. Consequently, in the Author's opinion, ownership structure of ATM network presented in the source used here is credible.

Sources: <https://www.cashless.pl/o-nas/sebastian-malarz>

Statistics on the distance to the nearest ATM are presented in Table 3, according to the size of the towns in which the population lives. The results confirm the existence of the worst situation in the towns with the smallest population.

Table 2

Population share of each type of commune within 1 km, 5 km and 10 km to the nearest ATM – as at the end of Q1 2021

Type of commune	% population up to (in %)		
	1 km	5 km	10 km
Urban	86.57	99.99	100.00
Rural	23.44	74.59	98.15
urban-rural:	54.64	84.15	99.04
– urban area	98.29	99.61	99.78
– rural area	7.01	67.28	98.24

Source: (NSBOG, 2021, p. 34) for 5 and 10 km and additional own calculation for 1 km based on the same data as used in NSCCS. Results presented in (NSBOG, 2021) have been obtained by the author of the paper.

Table 3

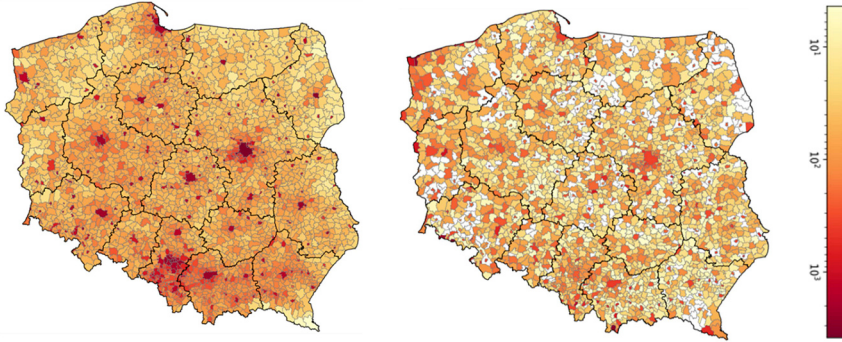
Statistics on the distance to the nearest ATM for towns and villages by their population size

No of residents	mean	min	max	median
(0–1000]	4.89	0.00	36.46	4.55
(1000–5000]	2.33	0.00	22.61	1.79
(5000–10000]	0.42	0.01	4.83	0.16
(10000–20000]	0.26	0.02	2.12	0.14
(20000–50000]	0.37	0.01	3.04	0.19
(50000–100000]	0.37	0.02	1.96	0.26
(100000–200000]	0.55	0.03	3.07	0.34
(200000–500000]	0.71	0.04	3.02	0.44
TOTAL	4.63	0.00	36.46	4.35

Source: Results presented in (NSBOG, 2021) have been obtained by the author of the paper (NSBOG, 2021, p. 35).

Map 1

Population density expressed in the number of people per 1 km² in individual communes (left map) and the number of ATMs in communes per 1,000 inhabitants (right map) – logarithmic scale



Source: (NSBOG, 2021, p. 34). Results presented in (NSBOG, 2021) have been obtained by the author of the paper.

5. Financial Exclusion in Poland From a Spatial Perspective

5.1. Data and Methodology

5.1.1. Data Sets

In the paper, we use two sets of data. The first set (named later as a *data1*) comprises spatial microdata gathered during a study entitled “*Payment habits in Poland in 2020*” executed by Narodowy Bank Polski in 2020. The study was carried out on a representative sample of 1 265 respondents, during the period from September 15 to October 15, 2020 (during the Covid-19 pandemic). The study consisted of two parts: a survey (completed using the CAPI method) and a 3-day payment diary (completed using the PAPI and CAWI methods).

The second set of data (named later as a *data2*) includes spatial data collected by the author of the paper during realization of the National Strategy for Cash Circulation Security – NSCCS (NSBOG, 2021). Pillar 1 “Cash availability and acceptance” demanded collection of data on ATMs’ locations among independent provider and banks. The data comprises geographical locations of 20 759 ATMs which is 97% of the population all ATMs in Poland- see (NSBOG, 2021, p. 32).⁵ Locations of respondents and ATMs are defined by GPS coordinates.

5.1.2. Methodology

Based on the above mentioned data the distance from the place of residence of each respondent of the study “*Payment habits in Poland in 2020*” (the set of *data1*) to the nearest ATMs (the set of *data2*) was estimated. For

the purpose, the Haversine formula was adopted. In the next step payment account status for every respondents in different type of location like rural and urban regions with different amount of population were identified.

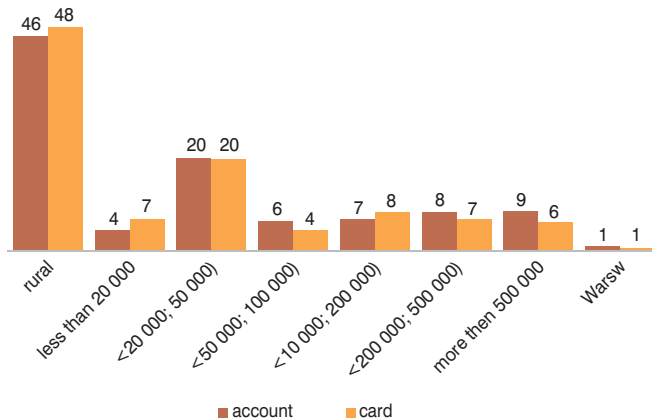
Thanks to such calculated data (distance and payment account status), it was possible to conduct statistical analysis to prove significance of the difference of distance average to the nearest ATM between respondents with and without an any account in every defined regions (by using the t-test with the null hypothesis that the true differences of mean distances between analyzed group is zero). The significance of differences in distances between such defined group of respondents can prove to exist relationship (but not causality) between access to cash and financial exclusion.

5.2. Results and Discussion

A study of the payment habits of Poles (Kotkowski et al., 2022, p. 38, Table 4), conducted in 2020, found that 11.5% of Poles do not have a payment account, while 18.3% do not have a payment card, including 6.8% who do have a payment account. It means that 11.5% of Poles 15+ in Poland were financially excluded. Spatial analysis of the microdata collected during the study (*data1*) allowed the author to identify rural areas and towns with fewer than 50,000 inhabitants with the highest levels of financial exclusion – Figure 6. A similar situation exists for payment cards.⁶ The highest level of exclusion just in rural region can be observed (46% for an account and 48% for a card).

Figure 6

Lack of payment account and card at different locations (weighted) in Poland (%)



Sources: Own analysis based on *data1*

It seems that one of the reasons for not having a payment account concerns the too long distance to points with cash. To prove the existence of a relation between financial exclusion and access to cash, the distances from the respondents' place of residence to the nearest ATMs were determined (based on *data1* and *data2*). The results obtained for respondents with and without a payment account living in a rural area and towns with fewer than 20K inhabitants are shown in Table 4.

Firstly, it can be seen that respondents of the payment habit survey with an account are slightly closer to ATMs than respondents without any account (according to averages of 1.36 km vs. 1.81 km). A statistical analysis showed the significance of the differences at the significant levels greater than 0.01 (p-value=0.0227). Secondly, in both rural areas and the smallest towns, there are also differences in favor of respondents with an account (2.74 km vs 3.13 km for rural and 0.89 km vs 2.23 km for less than 20,000). For rural areas, the difference in average distances is statistically insignificant (p-value=0.3046). But for rural areas together with towns with less than 20,000 inhabitants,⁷ the difference in average distances to the nearest ATM is statistically significant (p-value=0.0220).

Table 4

Base statistics of the distance of the respondent to the closed ATM (weighted)

	Mean	Median	Stdev	Count
With an account	1.36	0.49	2.09	1135
– Rural	2.74	1.96	2.66	402
– Less than 20K	0.89	0.44	1.44	148
Without an account	1.81	0.7	2.44	130
– Rural	3.13	2.32	2.93	58
– Less than 20K	2.23	1.29	1.78	4

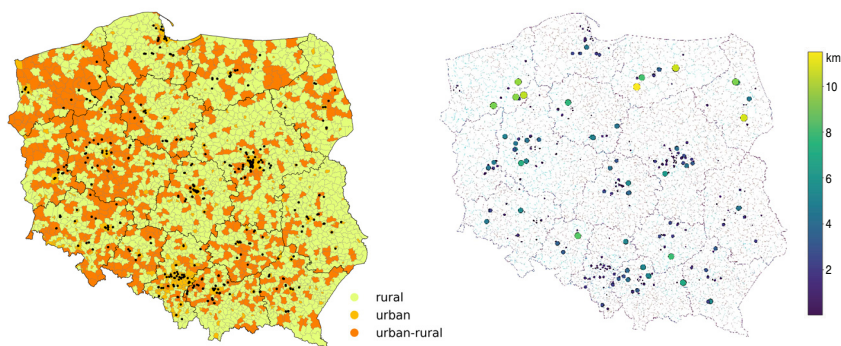
Source: Own calculation based on *data1* and *data2*.

Map 2 illustrates the location of the survey respondents in the different types of communes and the distance each respondent has to the nearest ATM. The results indicate that there is a relationship between access to cash and financial exclusion. That is, lack of easy (close) access to cash distribution channels, especially in rural areas, may be one of the reasons for not having a payment account. If the payment account of a cash user consumer does not have the option of easy access to cash, then the account for such a consumer may be useless (idea of the real option). As a result, it can lead to financial exclusion. Ultimately, it can also result in social exclusion.

Similar results were obtained by Beckmann *et al.* (2018), among others. They showed that in central and southern European countries, households without a bank account were significantly further away from bank branches (2.8 km) than households with a bank account (2.1 km). A significantly closer location to bank branches was also shown for the status of household credit. Thus, they showed the existence of a relationship in that a shorter distance to bank branches may induce households to establish a formal relationship with banks.

Map 2

Distribution of respondents in communes by type (left map) and distance from each commune to the nearest ATM (right map)



Source: Own analysis based on *data1* and *data2*.

6. Conclusions

A speculation since the 1970s about phasing out cash altogether has no sense in the current situation of high demand for physical money. The problem is quite different: What should we do to make cash more profitable?

Thus, for example, Finance Watch (2021) identified the need to make cash use more viable for POS payments, as well as for P2P transactions. The aim is to ensure availability of cash as a complement to cashless payment instruments in the ageing population of the European Union. They suggest paying attention not only to the geographical availability (proximity) of cash in rural areas via free-to-use ATMs, but also to other access points such as shops (cash back and cash in store), post offices, kiosks, etc.

According to the study conducted by BEUC (2019) – European Consumer Federation – consumers should have the right to choose how they can pay for goods and services. Each payment method has its advantages depending on the needs and preferences of the consumer. Cash has unique characteristics that provide financial inclusion. Cash is independent of power breaks or IT failures. Finally, it contributes to a more competitive retail payments market by preventing some payment card companies from dominating the market.

BEUC (2019) lists the possible consequences for consumers of the complete disappearance of cash as a realistic scenario: the financial and social exclusion of all those who, for whatever reason, are excluded from the digital society; no alternatives to electronic payments; the complete loss of privacy, as the cashless society is a fully traceable society; the full domination of the commercial sector in the payments market; the increased vulnerability of payment systems to IT failures or cyberattacks.

The analyses carried out in the paper support the thesis that difficult access to cash *via* ATMs may contribute to increasing financial exclusion. It is especially visible in rural regions and small towns where we observe high level of exclusion (lack of a payment account) and longer distances to the nearest ATMs.

In many cases, decisions to open a bank account and use it can be strictly related to the real options offered. For a cash-user (although not exclusively) such an option is easy access to cash. It means that, locally, the poor infrastructure of cash distribution/dispensing channels may discourage people from opening an account. Furthermore, in the current situation of cost reduction, cash stakeholders must find other solutions to avoid negative changes in access to cash. Past experience shows that efficient cash infrastructure in normal times is a prerequisite for its operational capability and resilience to future crises.

The studies presented in the paper justify the need for further analyses of access to financial services. They should include, *inter alia*, access to cash points like ATMs, bank branches, post offices, etc.

Additionally, we should pay attention on a main limitation of the adopted method. Namely, it is assumed to estimate distance to the nearest ATM from the place of the residence of respondent. However, consumers may withdraw cash close to work, during commuting, etc. Therefore, real distance needed to access ATMs may be lower than from the place of residence.

Another weak features of the adopted method is related to causality. The used statistic test of mean difference cannot point out the direction of causality. We would like to verify the thesis if difficult access to cash may cause lack of payment account. But the opposite direction may be possible: lack of willingness to open an account may encourage banks to close bank branches and ATMs in some regions.

Therefore, the obtained results should be expanded by a deepened analysis with adoption of the method which allows to prove the direction of causality.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Declaration

The author used the AI tool ChatGPT to help check grammar (only) in the preparation of this article.

Endnotes

- ¹ With Finland, Sweden, the Netherlands, Lithuania at the min. level, and Bulgaria, Austria, Portugal, Luxembourg at the max. level.
- ² In Poland, this is approximately 62% – (Kotkowski et al., 2022, p. 57).
- ³ In general, cost-cutting is not the only reason for reducing the number of branches. Others include bank consolidation processes.
- ⁴ Unfortunately, in the case of EWIB 2.0 provided by NBP, financial institutions are not obliged to indicate additional functions offered in branches. Hence, Figure 4 should be analysed in terms of the dynamics of change.
- ⁵ All data is available upon request from the reader.
- ⁶ It is worth noting the problem of respondents' correct identification of the type of area (rural, urban), which was repeatedly pointed out, for example, by the World Bank in its aforementioned research. Namely, of the 460 respondents who indicated a rural area as their place of residence, in reality 296 (64.35%) live in rural communes, 157 (34.13%) in urban-rural communes, and 7 (1.52%) in urban communes. On the other hand, for the 152 respondents who indicated in the questionnaire that they live in a town of less than 20,000 inhabitants, 35 (23.03%) actually live in urban communes, 9 (5.92%) live in rural communes, while 108 (71.05%) live in urban-rural communes.
- ⁷ Of the 612 respondents living there, more than 93% live in rural communes or urban-rural communes (primarily in the rural areas of the communes).

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